

Annual Report 2017



**Massachusetts Division of
Fisheries & Wildlife**

Annual Report 2017



Massachusetts Division of Fisheries & Wildlife

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About the Cover:

Interagency Cooperation – MassWildlife Biologists and Environmental Analysts from MassDOT evaluate rare and common freshwater mussels prior to a bridge replacement project. Staff from both agencies relocated >1000 mussels out of the construction area to avoid impacts to the resource. Through the Linking Landscapes partnership, both agencies work together to promote conservation of fish, wildlife, plants and the habitats they depend on. Photo by Troy Gipps/MassWildlife

Back Cover:

A Monarch butterfly on Common Milkweed in Grafton. Photo © Troy Gipps



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The Board Reports

Joseph S. Larson, Ph.D.
Chairperson

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 operations of the Massachusetts Division of Fisheries and Wildlife (MassWildlife), reviews the agency's programs, and sets policy and regulations pertinent to wildlife in the Commonwealth.

The Board has continued its tradition this year of holding monthly meetings at locations around the state, holding public hearings on proposed regulatory changes, and addressing many issues of specific concern. 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 and of agency programs. The Board also incorporates brief reports or comments from the Commissioner of the Department of Fish and Game and from a representative of the Massachusetts Environmental Police in the agenda of every meeting.

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.

Longtime Chair George Darey stepped off the Fisheries and Wildlife Board at the end of the November meeting of Fiscal Year 2017. By his own reckoning, Mr. Darey had missed only five meetings in 38 years, having served as Chair for 34 of those years. He told the meeting he had enjoyed watching MassWildlife grow, with all the new staff over the years. Noting that he served with four different directors, Mr. Darey stated that they were all great people who brought different qualities to a difficult job. He expressed his admiration that Director Buckley was working so well and so closely with his staff and on so many different projects, stating that it was truly impressive and that he would greatly miss being part of it. But he also said he believed it is important to know when to walk away. Mr. Darey appointed Mr. Roche as act-

ing chair until the Board held its elections and chose a permanent chair, which it did the following month.

Over the course of the fiscal year, the Board examined the details of a Timber Rattlesnake Restoration Project that had been first introduced in January 2014. One detail of the project that received a lot of scrutiny this fiscal year was the planned creation of a rattlesnake population on an island in the Quabbin Reservoir that has a potentially suitable hibernaculum in which the snakes could overwinter and is closed to the public. Subsequent to the Board's own discussions, Dr. Larson (who became Chair in December) and a subcommittee of the Board created a process that involved a group of stakeholders from the region around the Quabbin and from various statewide conservation and recreation groups in an extended discussion about the proposal. After a series of public meetings of this stakeholder group and over 200 comments from the public, the Fisheries and Wildlife Board voted unanimously at its April meeting to suspend the Quabbin portion of the larger Timber Rattlesnake Restoration Project.

Administrative Matters

Update on the Final Piping Plover Habitat Conservation Permit

At the July 2016 meeting, Chief of Conservation Science Jon Regosin reported that the Piping Plover Habitat Conservation Permit (HCP) had received approval on July 8, 2016. He gave the Board an overview of the HCP, including why MassWildlife needs it, how it works, and what it will mean for 2016 and beyond.

Board Elections

The Board held its annual election of officers at the December Board meeting, electing Dr. Joseph Larson to be the Chair, Mr. Michael Roche as the Vice Chair, and Ms. Bonnie Booth as the Secretary of the Board.

Update on the 14th Edition of the Natural Heritage Atlas

Chief of Regulatory Review Eve Schlüter gave the Board an update in March on the progress toward publication of the 14th Edition of the NHESP Atlas. It was estimated that the 14th Edition of the NHESP Atlas would be published in July

2017. Dr. Schlüter returned to the Board in June to report that the 60-day public-comment period had ended and the agency was finalizing the maps. She reminded the Board that staff would be printing and sending three maps to each town, as is usual.

Review of the Revised MassWildlife Organization and Chart

In May, Director Buckley reviewed the changes that were made in 2015 to the MassWildlife organizational chart and how it is working so far. He reported that the lack of some key managerial staff positions – the Assistant Director of Wildlife and the Office Manager for the Boston office, in particular – has prevented the full implementation of the plan because the Assistant Director of Operations and the Associate Director, respectively, were still doing two jobs to fill those personnel gaps. He also reported that, despite the lack of full-time managers, the staff has generally increased coordination across sections with remarkable results, particularly in the Forestry/Habitat Management/ Prescribed Fire functions. The Director reported that the focus at year's end was on filling the vacant positions and supporting the work of the acting managers, and that there would be changes in focus as managers are hired and more can be done.

Staff-Board Working Committee

Also at the May meeting, the Board created an ongoing working subcommittee of Board members and staff that would coordinate to move forward productively on big issues that the public may have questions or issues with. The subcommittee was conceived as an in-house group to develop a strategy to present information on issues, policies, or new regulations, including when to engage the public and stakeholders, and how to introduce potentially controversial new policies, with the members reporting back to and advising the entire Board in open discussion.

Update on LART and the Bear-attack Protocol

Acting Assistant Director for Wildlife Mike Huguenin reported to the Board near the year's end that the MOUs were being drafted by a team from both MassWildlife and OLE. He outlined each of the draft MOUs in turn, discussing the background and purpose, as well as the corresponding responsibilities of each agency involved, and the protocols to be followed during and after any incident.

Adopted Regulations and Other Votes of the Board

Update and Adoption: Walking Trails Policy and Wildlife Lands Policy

Chief of Wildlife Lands Craig MacDonnell returned to the Board at the start of the fiscal year with amended drafts of a walking trails policy and a related wildlife lands policy that had been initially developed by staff the previous year, after which the Board members had discussed the policies in some detail and had offered written edits to both. The final policies were adopted by the Board by unanimous vote at its August meeting.

Vote: to amend the Division of Fisheries and Wildlife's rules and regulations at 321 CMR 2.0, 3.0, 4.0, and 11.0 governing Miscellaneous Regulations Relating to Fisheries and Wildlife, Hunting, Fishing, and Nature Preserves; and to rescind the Division of Fisheries and Wildlife's regulations at 321 CMR 6.0, the Dog Restraining Order, and at 321 CMR 8.0, which is a placeholder regulation that specifies the location of the State List of Endangered Wildlife and Wild Plants at 321 CMR 10.0

As had been reported to the Board in fiscal year 2016, Governor Baker's Executive Order 562 had charged state agencies with reviewing every regulation published in the Code of Massachusetts Regulations. For each of its regulations, the Division had to recommend keeping the regulation in its then-current form, modifying/amending the regulation, or rescinding the regulation. In July, the Board voted unanimously to keep, amend, and rescind the respective regulations as recommended by staff.

Adoption of Remote Participation

At the October meeting of the Board, the Director reported that if a state public body wanted to be able to have its members participate remotely in a meeting, it must by vote adopt remote participation first, and then it can use it as needed going forward. After a brief discussion, the Board voted unanimously to adopt remote participation.

Vote: Acceptance of Letter of Support to the Massachusetts delegation for the Blue Ribbon Panel's recommendations

Also at the October meeting, Director Buckley presented a draft and requested that the Board adopt a letter of support in the form of a resolution for the Blue Ribbon Panel on Sustaining America's Diverse Fish and Wildlife Resources' recommendation to Congress to dedicate \$1.3 billion annually in existing revenue from the development of energy and mineral resources on federal lands and waters to the Wildlife Conservation Restoration Program to diversify funding and management of all wildlife; to request that the Massachusetts Congressional Delegation support House Resolution 5650, which would implement this recommendation; to encourage other Wildlife Boards and Commissions to do the same; and, to support state policy and legislation that

would broaden dedicated funding mechanisms for wildlife conservation and implementation of the Massachusetts Wildlife Action Plan, and to serve as the state's required 25% match in the event that new dedicated federal funding is secured. After a brief discussion, the Board voted unanimously to adopt the resolution as proposed.

Proposals for the Expanded Youth Waterfowl Hunt, Early Goose Season, and the 2017-2018 Migratory Bird Seasons and Methods of Take; (March) Public Hearing; (April) Vote In February, the Board heard the staff's proposals; in March, it held a public hearing; and, in April, it voted unanimously to adopt the regulations as proposed.

Fire Policy Presentation and Adoption

Chief of Conservation Science Jon Regosin provided the Board with a detailed review of the reasons MassWildlife uses prescribed fire in its habitat management work, stating that prescribed burning enhances management of numerous SWAP species, state-listed species, game species, and natural communities, and to reduce wildfire risk and increase public and firefighter safety on Wildlife Management Areas. Habitat Biologist Caren Caljouw described the development process for the policy, reporting that the Habitat Program had convened an internal MassWildlife working group and then convened a partners' group, which participated in three meetings, numerous follow-up discussions, and a partner review of the draft policy and handbook. After a brief discussion in which Board member Dr. Brandi Van Roo reported her intensive study of and enthusiastic approval of the policy, it was unanimously adopted by the Board.

2016 Deer Review and 2017 ADP Allocation Recommendation (Michael Huguenin and David Stainbrook)

Deer and Moose Project Leader David Stainbrook presented the annual Deer Review to the Board at its June meeting. Proposals for New, Updated, or Amended Regulations

First Proposed Regulation Change: Youth Waterfowl Hunt (H Heusmann)

Waterfowl Biologist H Heusmann brought two proposed Waterfowl regulation changes to the Board, one addressing the Youth Waterfowl hunter age limits and the other proposing changes to the September Canada Goose season at the November meeting. In summary, Mr. Heusmann stated that the proposed changes are to raise the Youth Waterfowl hunt age to 17 and to allow shooting hours to extend to ½-hour after sunset during the September goose season. The Board voted unanimously to send the matters to a public hearing.

Correction of WMZ boundaries (Jonathan Brooks)

Population Ecologist Jonathan Brooks gave the Board a very brief report during the February meeting on some boundary irregularities and other reasons to slightly adjust the WMZ boundaries in some places. The Chair asked that the Leagues be made aware of the impending change, so that sportsmen are not taken by surprise if their favorite hunting spot changes zones. After a brief discussion, the Board voted unanimously that the matter be sent to a public hearing.

Agency Program Reviews

August Meeting

Review of MassWildlife's Education Programs (Pam Landry)

Central Wildlife District Activities (Bill Davis)

State-listed Mussel Conservation in Cooperation with the Cronin Aquatic Resources Center (Peter Hazelton)

September meeting

Connecticut Valley Wildlife District Activities (Ralph Taylor)

The Young Forest Component of MassWildlife Habitat Management Goals (Brian Hawthorne)

October meeting

District Activities (Andrew Madden)

Invasive Species (Jon Regosin)

November meeting

Turtle Conservation in Massachusetts (Michael Jones)

December meeting

The Effect of the Road Network on Moose in Massachusetts (David Wattles)

January meeting

Birch Hill Young-forest Update (John Scanlon)

Other Presentations on Topics of Interest to the Board

Ducks Unlimited Accomplishments in Duck Stamp Grants Program (Sarah Fleming and Deanne Drouillard)

At the June meeting, Ducks Unlimited's (DU) Manager of Conservation Programs Sarah Fleming opened the presentation by stating DU's mission: Ducks Unlimited conserves, restores and manages wetlands and associated habitats for North America's waterfowl. She reported that these habitats also benefit other wildlife and people, and pointed out that, as is true for MassWildlife, science provides the foundation for all of DU's conservation work. Ms. Fleming reported that, through this focus on science, DU gains information on species, refines its landscape priorities, develops biologically based habitat objectives, evaluates the success of its work, and supports public-policy efforts.

Ms. Fleming reported that, in the 80 years of its conservation work, DU has protected over 14 million acres, with 900 species benefiting from marsh conservation. She noted that this work is economically important because 2.6 million migratory bird hunters generate \$3.40 billion in revenue per year, and Massachusetts counts more than 538,000 hunters and anglers who spend \$626 million annually and support 9,101 jobs. She then showed total acres and number of projects for the Eastern Seaboard, New England, and Massachusetts, respectively, detailing three protection and three restoration projects in Massachusetts as examples.

Ms. Fleming then reported on DU's conservation goals for Massachusetts, stating that the organization continues to develop cost-share programs to fund its projects. Those habitat goals include enhancing wetlands on public waterfowl areas; enhancing coastal wetlands; restoration of lost freshwater wetlands, and reduction of nutrient and sedimentation loads to rivers and bays to improving submerged aquatic vegetation; protection of key parcels with habitat adjacent to protected lands; and protection of key parcels to buffer tidal marsh from development.

Ms. Fleming then introduced her colleague, Deanne Drouillard, who is the Manager of Eastern Region Partnerships for Ducks Unlimited Canada (DUC). Ms. Drouillard reported that DUC is celebrating Canada's 150th anniversary by conserving 150,000 acres of some of the country's most important natural habitat, stating that it's a gift for all Canadians and DUC partners in the USA.

Ms. Drouillard showed a map of the Eastern Habitat Joint Venture (EHJV) Target Areas, and stated that the 'Atlantic' Provinces actually consists of four of the six provinces. She reported that the Target Areas support 31 species of waterfowl, of which 13 are priority waterfowl species identified in the EHJV Implementation Plan, and provide key habitat for production, molting, and staging of these 13 species as well as other NAWMP priority species. She detailed the diversity of the landscapes in the areas, and talked about the threats to each. Using maps to demonstrate her points, Ms. Drouillard reported on DUC's Conservation Priority Areas and on birds that were banded in Atlantic Canada and recovered in Massachusetts. She then detailed the species of ducks and other waterfowl that DUC works to conserve and studies in the Atlantic Provinces, and went into its work with Common Eider in detail.

Ms. Drouillard then focused on the partnerships that she said had a leveraging effect on DUC's work. She reported that DUC received a total of \$3,500,308 from 40 states in Fiscal Year (FY) 2017, which was an increase of 22% over the previous year (FY 2016: \$2,863,140 from 37 states),

and showed a map of the states indicating those that had contributed a significant increase, held steady, or saw a significant decrease in their funding over the previous year. She also explained the effect of DU, NAWCA, and Canadian matching funds for each American dollar, where one dollar translates to almost \$10 in final investment. Applauding 40 years of partnership, Ms. Drouillard reported that the over \$1.7 million contributed by the Massachusetts Division of Fisheries and Wildlife since 1975 has resulted in over \$15 million leveraged by DU, Inc.; other states; and the Canadian contributors, and that over 18,307 acres of habitat have been secured and/or restored across New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland, and Labrador as a result.

Ms. Drouillard then showed a map with the locations of Massachusetts' project contributions around the Bay of Fundy, between New Brunswick and Nova Scotia, and introduced the Estabrooks Project, which was recently dedicated to Massachusetts in tribute to its contributions. She closed by showing the meeting a flyover video taken of the beautiful agricultural land-wetland property, and noted that the agricultural land had lain fallow for 40 years and was now back in stewardship with local agricultural partners.

Massachusetts Fisheries and Wildlife Board

Joseph S. Larson, Pelham, Chairperson
Bonnie Booth, Spencer
Ernest W. Foster IV, Scituate
Michael P. Roche, Orange, Secretary
Brandi Van Roo, Douglas
Stephen A. Sears, Dalton
Frederic Winthrop, Ipswich

Fisheries

Todd A. Richards
Assistant Director, Fisheries

Overview

Fishing in Massachusetts is an important economic and social activity for both residents and non-residents. According to the 2011 National Survey of Fishing Hunting and Wildlife Associated Recreation published by the U.S. Fish and Wildlife Service, nearly half a million resident and non-resident anglers fish Massachusetts waters, resulting in more than \$100 million in wages, salaries, business earnings and state and federal tax revenues.

The Commonwealth possesses an enormous quantity and variety of freshwater fishing opportunities. Our lakes, ponds, streams, and rivers provide excellent fishing for warm and coldwater species of fish from Cape Cod to the Berkshires. Anglers can find themselves successfully catching bass, trout and panfish in urban settings or remote wildlife management areas.

The Fisheries Section responsibilities include a mix of management and research activities designed to provide excellent recreational opportunities and gain an in depth understanding of the fishery resource, its' status and trends. Fisheries activities require expertise in

fisheries management, policy, and aquaculture.

The fisheries section operates an extensive hatchery program that provides an excellent fishery for brook, brown, rainbow and tiger trout. We annually stock more than 400,000 pounds of trout in more than 500 waterbodies across the state, supplementing a wealth of fisheries resources in more than 240 towns. Our hatcheries also produce landlocked salmon for Quabbin and Wachusett Reservoir while providing surplus production that is traded with other state fish and wildlife agencies for northern pike and tiger muskellunge when their surpluses are available.

The fisheries section also carries out research and management on streams, rivers, lakes, and ponds designed to monitor fish communities statewide and provide information to anglers on the more than 20 game fish species that have excellent self-sustaining populations across the Commonwealth.

This was an important year for the fisheries section in terms of staffing and operations. The biological staff gained one new employee, Steven Mattocks, who was hired into the vacant Aquatic Biologist I position. Ste-



Photo by Nicole McSweeney/MassWildlife

ven came to MassWildlife after completing his Master's Degree at UMass Amherst studying herring and the history of dams in Massachusetts. Our hatchery system also saw some changes with the completion of the McLaughlin Hatchery pipeline that provides 6 million gallons a day of water from the hypolimnion of Quabbin reservoir directly to the hatchery. A wood pellet boiler was also installed at McLaughlin, reducing the consumption of oil to heat the facility.

Fisheries Operations, Annual Report – Steven Mat-tocks, Fisheries Operations Biologist

1. Biological sampling for fish community assessment
Coordinating fisheries sampling efforts between district fisheries staff and field headquarters biologists is important for ensuring efficient and comprehensive sampling throughout the state. Weekly communication with field headquarters project leaders and regular correspondence with district staff was a major focus in FY 2017. Conducting fisheries surveys within districts, and with district staff, helped integrate new staff at the field headquarters office with district staff. To further enhance communication and sampling standardization, the fisheries annual stream survey meeting was held on June 5, 2017, and was attended by district fisheries biologists and technicians across the state. Stream sampling priorities, sampling protocols, and fish identification were major themes of the meeting. Stream survey protocols were discussed and fish identification exercises were conducted with the district biologists and technicians as an annual refresher of survey techniques and fish identification features. Priority sampling lists were supplied to district staff at the annual meeting. Other documents provided to district staff include the fisheries database and GIS layers (shapefile and KMZ), voucher collection lists, updated sampling cover sheets and length frequency sheets, EPA rapid habitat assessment guidelines, and the PowerPoint presentation used at the meeting.

Stream and lake sampling priorities were generated by field headquarters fisheries staff prior to the annual meeting, and before the start of the sampling season. Survey locations were prioritized based on criteria formed by fisheries staff (e.g. gaps in current fisheries data, streams with historical surveys, potential rare and endangered species occurrence, and potential locations for naturally reproducing coldwater fish resources). In addition, surveys were prioritized

to fulfill data requests submitted by internal and external sources. Stream survey priorities were reviewed by fisheries biologists and any notes or changes to the lists were made prior to the annual meeting. Logistical challenges that occurred during sampling coordination and prioritization among field headquarters staff were also addressed.

In order to update and maintain field equipment for fisheries sampling, new gear was budgeted for, and ordered. Major gear purchases and upgrades during FY 2017 include fyke nets, gillnets, boat electrofishing upgrades, new parts for barge sampling unit, and a myriad of other items integral to fisheries surveys. Outboard motors and small engines (generators) were winterized and maintained according to manufacturer recommendations.

2. Data entry and QAQC

Massachusetts Division of Fisheries and Wildlife staff conducted 455 surveys throughout the state during FY 2017 (Figure 1). Stream surveys were conducted by all districts throughout Massachusetts. Sampling locations filled many data gaps, which will lead to enhanced monitoring and management practices. Some surveys were conducted on streams and rivers that had previous samples, while other surveys occurred on streams with historical surveys or even no previous data. The continued surveys of Massachusetts waters allows for monitoring changes in fish assemblages over time and space.

The total number of fish captured for each species was recorded, as well as the total number of surveys completed within watersheds (Table 1). In addition, species summaries were produced, which include the minimum, maximum, and average lengths of each species captured (Table 2, 3). This information captures the size and age structure of fishes sampled in FY 2017.

All fisheries survey data collected by district and field headquarters staff were entered into the fisheries survey and inventory database. Data was then checked for quality and accuracy using pivot tables in Microsoft Excel, R scripts and table outputs using R Studio, as well as graphical displays (box plots, scatterplots). Boxplots of coldwater and warmwater fish lengths were plotted using jitter boxplots to show variation among lengths (Figure 2). Errors in data were corrected before updating GIS layers.

Watershed voucher collections were updated with fish collected by Masswildlife staff during fish surveys. Fish that were missing from voucher jars were added (if surveyed and vouchered), and a new voucher request list was generated and provided to district staff.

3. Data summaries and requests

Multiple data acquisitions were received during FY 2017. After data needs were outlined by individuals or organizations making the requests, data were partitioned using Excel or R Studio. Data release agreements were provided by the Operations Biologist prior to submitting data from the fisheries survey and inventory database. Many requests were made by individuals seeking information on fishing locations. Sampling requests by state, federal, and non-government agencies were also frequent.

Future sampling requests were also annotated and coordinated by the Operations Biologist. If the sampling request fit within the Masswildlife fisheries sampling goals and priorities, requested locations were added to priority sampling lists for either district staff or field

headquarters biologists.

4. Other management assignments and activities

Public engagement is critical for communicating the science and management practices of Masswildlife, and engaging stakeholders is important for recruiting anglers and support for recreational fishing. The Operations Biologists participated in the second annual Shutesbury Elementary School “Life in the day of a fisheries scientist” program. The focus of the program was to introduce elementary school students to concepts of aquatic science, including fish identification, fish diets and feeding habits, fish growth and otolith structure, aquatic macroinvertebrate species and habitats, and GPS technology. The Operations Biologist worked stations that demonstrated fish diets and feeding habits, as well as backpack electrofishing concepts and techniques. Twenty-five 5th grade students spent an entire day doing aquatic science related activities, including laboratory activities and applied field work on Amethyst Brook in Amherst. The program was successful and generated excitement among the students, and built anticipation for next year’s program among parents and future students.

Figure 1. Fisheries survey locations for FY 2017.

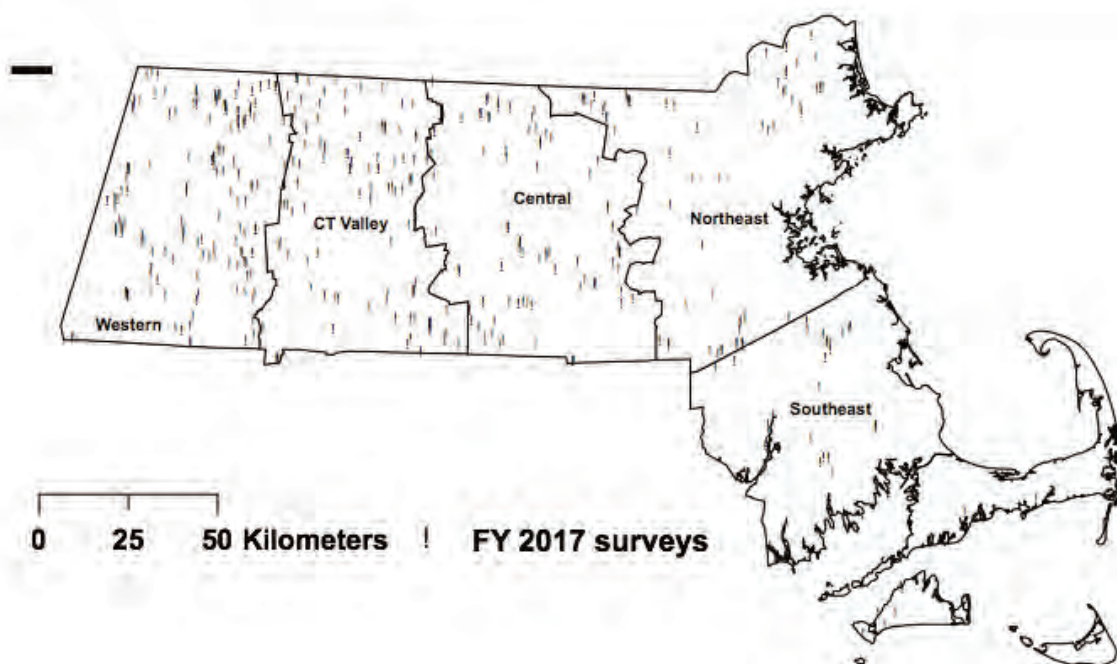


Figure 2. Lengths of select warmwater fishes (panel A) and coldwater fishes (panel B) surveyed during FY 2017.



Table 1: Number of species captured (panel A) and number of samples conducted within watersheds (panel B) during FY 2017 surveys.

A

Fish Code	n	Fish Code	n
A	9	H	79
AE	554	K	71
AN	2	LC	292
AS	21	LLS	187
ATS	209	LMB	1,995
B	3,992	LND	6,863
BB	536	LNS	124
BC	223	LT	385
BF	12	M	258
BL	9	NG	13
BM	247	NP	8
BND	21,139	P	1,999
BNM	171	RB	209
BS	82	RBS	254
BT	465	RFP	50
BXP	6	RP	632
C	47	RT	28
CC	1	SC	6,257
CCS	81	SD	46
CM	14	SK	24
CP	822	SL	120
CRC	1,685	SMB	598
CS	4,634	SS	10
EBT	5,949	SSR	2
F	2,720	TD	805
FM	15	TT	1
GRBS	1	WP	306
GS	709	WS	3,316
GSF	1	YB	336
GZ	24	YP	3,834

B

Watershed	n
Blackstone	25
Buzzards Bay	9
Cape Cod	2
Charles	3
Chicopee	59
Concord	17
Connecticut	32
Deerfield	63
Farmington	14
French	8
Hoosic	14
Housatonic	44
Ipswich	7
Islands	6
Merrimack	10
Millers	30
Nashua	39
Neponset	3
Parker	5
Quinebaug	15
Shawsheen	2
South Coastal	4
Taunton	28
Ten Mile	1
Westfield	58

Table 2: This table shows the minimum, maximum and mean length of fish species displayed by species code. All fish were collected during FY 2017 surveys.

Fish code		Length		
		Mean	Minimum	Maximum
1	A	125	44	140
2	AE	264	50	890
3	AN	259	223	295
4	AS	198	82	400
5	ATS	81	27	131
6	B	101	20	296
7	BB	225	30	383
8	BC	204	52	362
9	BF	577	483	673
10	BL	117	50	135
11	BM	40	16	63
12	BND	54	6	106
13	BNM	49	17	75
14	BS	64	44	165
15	BT	119	46	560
16	BXP	65	35	96
17	C	448	107	959
18	CC	99	99	99
19	CCS	109	35	315
20	CM	70	39	87
21	CP	199	50	625
22	CRC	69	20	202
23	CS	59	16	171
24	EBT	100	26	405
25	F	79	25	492
26	FM	36	20	52
27	GRBS	92	92	92
28	GS	95	20	262
29	GSF	168	168	168
30	GZ	270	270	270

Table 3: This table shows the minimum, maximum and mean length of fish species displayed by species code. All fish were collected during FY 2017 surveys.

Fish code		Length		
		Mean	Minimum	Maximum
31	H	27	19	87
32	K	64	32	107
33	LC	75	44	143
34	LLS	127	46	554
35	LMB	190	22	574
36	LND	69	20	141
37	LNS	97	30	190
38	LT	540	334	866
39	M	77	29	106
40	NG	32	20	38
41	NP	658	510	924
42	P	108	27	250
43	RB	129	32	265
44	RBS	81	27	178
45	RFP	103	63	194
46	RP	105	45	282
47	RT	362	276	455
48	SC	62	14	101
49	SD	45	35	65
50	SK	68	32	95
51	SL	128	60	185
52	SMB	141	39	530
53	SS	62	36	131
54	SSR	43	40	46
55	TD	59	22	94
56	TT	125	125	125
57	WP	227	44	411
58	WS	130	10	518
59	YB	155	35	300
60	YP	148	30	341

Fisheries Watershed Project – Jason Stolarski, Ph.D., Project Leader

1. Seasonal Assistance

Hannah Diebbol and Eli Lagacy were hired as seasonal fisheries technicians within the fisheries section in late May 2016. Hannah and Eli assisted with the lake and pond sampling efforts from May through the end of June. When not conducting lake and Pond Samples they assisted in stream and river sample and conducted creel surveys. They were responsible for the preparation, staging, and cleaning of sampling gear and assisted while deploying sampling gear, boat electrofishing, weighing and measuring fish, and recording data. When not in the field Hannah and Eli entered historic fish sampling data into an electronic database, filed raw datasheets, entered current years data into electronic form, performed maintenance of sampling gear and scanned raw datasheets for inclusion into our electronic filing systems. At the end of the fiscal year Hannah and Eli had taken part in 16 lake and pond surveys, and entered approximately 300 historic fisheries samples into an electronic database. They were essential members of the fisheries section while they were here and allowed the section to complete a greater amount of field work than otherwise would be possible.

2. Lake and Pond Map Revision

Massachusetts division of fisheries and wildlife pond maps are an essential tool for anglers. These maps provide information on species composition, catch trends, access, and bathymetry but have not been updated for 20 years or in some cases even longer. As a result, critical pieces of information such as species stocked, points of access, and catch trends are out of date or inaccurate. Over the past 3 years the fisheries section has been working to update these maps.

Advances in GPS and sonar allow the rapid collection of bathymetric data that, combined with modern statistical techniques, are used to create high resolution bathymetric maps. Data are obtained using a paired global positioning system (GPS) and depth sounder. This device collects GPS coordinates and a depth sounding simultaneously and stores them within its onboard memory. Data are typically collected at two second intervals as a biologist navigates a grid pattern

across a waterbody by boat (Figure 1). Back in the office, the data are exported to a spreadsheet then using R scripts, NA values and redundant points are automatically removed. The points are then imported into ArcGIS, projected, and extreme depths (outliers) are visually identified and removed. False, or otherwise inaccurate depths can be recorded when the sounder has difficulty receiving or holding the signal from the sonar beam as it reflects off the lake bottom. Inaccurate depths are most frequently recorded over dense aquatic vegetation, or when bathymetry changes rapidly. Inverse distance weighted interpolation is then used to create a 1m gridded bathymetry dataset which is then smoothed using focal statistics. The size of the focal cell used to smooth the original bathymetry data varies according to the size of the waterbody and complexity of its submerged features. Finally, contours are extracted using the contour tool (Figure 1).

New pond maps are made by placing these gridded data and contour polygons on top of topographic maps within ArcGIS and then adding additional features of interest such as dam location, major roads, access points, significant underwater hazards, and hydrography (Figure 2). Similarly, pond summaries are updated with current information concerning points of access, species composition, catch statistics, and stocking information. In addition, new information including the presence of conserved lands, drawdown information, and ramp coordinates are also added.

To date, bathymetry data have been collected for 112 waterbodies throughout the commonwealth, 45 during the spring of 2017. Gridded bathymetry data have been interpolated and contour polygons created for all of these waterbodies and pond summaries have been updated for 30 ponds, currently 17 are completed and posted online. Contour lines are bundled into a 1:10000 Massachusetts inland water bathymetry layer which is posted for download on MassGIS. Currently this layer contains contours intervals of 46 lakes and ponds throughout the state. We are also exploring the possibility of embedding these grids into an online map service for instantaneous retrieval and viewing on desktop and mobile devices.

3. Lake and Pond Sampling

Examination of the Masswildlife fisheries database

showed that, over the past 20 years, lake and pond habitats have been sampled at a much lower frequency relative to stream habitats. To fill data gaps, but also to update pond summaries with current fisheries data the fisheries section has begun to focus on conducting lake and pond samples in greater frequency. Waterbodies are selected based upon access, stocking, and use and are then sampled using minnow traps, fyke net, beach seine, gillnet and/or boat electrofishing depending upon accessibility.

Where boat access is limited minnow traps and fyke nets are deployed on the first day within littoral habitats of the waterbody. All gear is marked with reflective buoys and left to fish overnight. Dissolved oxygen, temperature, conductivity, and pH are then measured at 1m intervals at the deepest point in the waterbody. The following day, sampling gear is pulled and all fish captured are identified to species, weighted to the nearest gram and measured to the nearest mm. Fish may also be captured using beach seine during this time as well. When access permits, boat electrofishing is used to sample littoral habitats of the pond and fish are processed as before. In general, the entire shoreline is sampled or as much of the shore as time permits.

Back in the office, data are entered into a database, and checked for errors. Linear modeling is used to determine 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. The slope coefficient of the species and waterbody specific regressions and the mean studentized residuals from the statewide regression by site and species are used to characterize the relative condition of the fish contained within each waterbody. As data are collected on additional waterbodies, these analyses will become more precise and permit more complex modeling. During the 2016 fiscal year, the fisheries section has conducted fisheries surveys on 34 waterbodies throughout the commonwealth (Table 1).

4. Lake Trout Sampling

Lake Trout are known to inhabit only two waterbodies in Massachusetts: Quabbin Reservoir and Wachusett Reservoir. In response to concerns regarding the growth of the population in Quabbin Reservoir, a

mark-recapture project was initiated in 2006. In 2014, a similar effort was initiated in Wachusett Reservoir. 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 passive integrated transponder (PIT) tag using a PIT tag reader. If no tag is present, a 10mm passive integrated transponder tag (PIT) 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.

Back in the office, data are entered into a database and growth rates are calculated from recaptured fish. Linear modeling is used to determine the relationship between log transformed weight and length within and among years. Means of studentized residuals among years and sexes are used to evaluate changes in relative condition among these demographics.

This year a total of 344 Lake trout were tagged; 277 within Quabbin Reservoir and 67 within Wachusett Reservoir (Table 1). Within Quabbin Reservoir, 7 of the 277 fish captured were recaptures which displayed a modal recapture interval of 1 year and a maximum of 2 years. Among the 119 fish recaptured in Quabbin since 2006, the annual growth rate expressed as a percentage of body length is 1.3% which equates to approximately 9.5mm per year. Within Wachusett Reservoir, 3 of the 67 Lake trout were recaptures; each tagged in the previous year. Among the 9 fish recaptured in Wachusett since 20015, the annual growth rate expressed as a percentage of body length is 2% which equates to approximately 11.8mm per year. However, these statistics much be interpreted with caution due to the limited number of recaptured fish encountered since the inception of the project. As more recaptures are encountered in successive years this estimate is likely to change.

Analysis of relative condition among sexes indicates a decline in condition factor between 2011 and 2013 for both sexes within Quabbin Reservoir (Figure 3). It is difficult to access any trends in condition among male and female Lake Trout in Wachusett Reservoir due to the limited number of years of data (Figure 4).

5. Quabbin Salmon Marking

Each spring approximately 10000 salmon smolts are reared at the Palmer hatchery and stocked into Quabbin Reservoir by division staff. In past analyses these fish reach 15 in (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 tributaries and shoal areas of the reservoir. Juvenile salmon spend 1 to 3 years rearing in tributary habitats before out-migrating as smolts in unknown numbers. Thus, the fish entering the creel are an unknown ratio of hatchery reared and naturally produced fish. In spring 2016, the fisheries section 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. This 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. This summer, otoliths of legal fish were obtained from anglers at 2 Quabbin boat liveries to update our understanding of the age that salmon enter the creel and the maximum age of fish in the population. These data will be used to determine when the majority of non-tagged hatchery raised fish have left the population and thus when to initiate survey efforts.

6. Fisheries Database Maintenance

This year over 250 historic stream and lake surveys spanning from 1940 to the later 1980's were added to the fisheries database. These samples were either contained in old basin reports or were stored in lake and pond paper files. Prior to their inclusion into the database, these records existed only on paper. As such, this information was not searchable or considered when assessing the fisheries resources of a particular lake or stream. These efforts now permit biologists to review data collected over a roughly 80 year time span when assessing the ecological character of a waterbody. Furthermore, biologists are able to compare the fish community of a particular lake or stream over long time periods. Since our efforts to digitize and catalog all our historic sampling data began in the winter of 2014, 3716 samples have been entered into an electronic database, scanned, and can be and can be rapidly accessed by biologists from their computer. For comparison, during the same time period roughly 880

samples were conducted by division personnel.

7. Fisheries GIS Layer Development

As modern fisheries surveys are conducted and historic surveys are converted to electronic form these data are entered into the fisheries database. Several GIS products are created from these data and each time new information is added to the fisheries database these GIS layers must be updated. Following the addition of samples into the fisheries database, R scripts are used to create a table of summary data for each sampling point. Such information includes, species, abundances, sample type, date, presence of coldwater fish, hyperlinks to 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. Finally, sampling points are snapped to stream lines and polygons, and snapped coordinates are exported from ArcGIS and imported back to the fisheries database via R scripts. 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 subsetting these master layers using simple queries in ArcGIS.

Modern 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. Thus, to obtain the most precise data from near-shore areas, efforts to redelinate lentic shorelines was initiated. The fisheries database was queried and all lakes and ponds that were sampled by division personnel were identified. These 611 ponds were prioritized for delineation and thus far 380 have been redelineated and stored within an updated lake and pond shore GIS file.

8. Information and Education Retention and Recruitment Survey

MassWildlife began selling hunting and fishing licenses exclusively online in 2012. Users were required to enter basic information into a database to create and account and purchase a license. Currently the database currently holds roughly 8 million purchase records from close to a million individual users and contains important demographic and personal information from practically the entire sporting community in Massachusetts. The information and education section initiated a project to determine if sending a reminder to users resulted in greater license sales. I queried the Massachusetts fishing and hunting database to find two pools of users. The first were users who had purchased a fishing or sporting license in 2016 but not yet in the current year, and the second were lapsed users who purchased in 2015 but had not purchased since. For both groups I calculated an avidity score representing the number of years they had purchased said licenses in previous years and grouped them into classes; new, casual, and avid. Then, because not all users submitted email addresses broke the population of users into those with emails and those without. Within each avidity category, users were randomly chosen to receive one of 4 communications: email, postcard, email and postcard, and nothing (control). For those who did not supply email addresses users were randomly selected to receive a post card or nothing (control). Sample sizes were apportioned as equally as possible within each avidity class. Communications were sent out on May 1st and the evaluation period ended on June 13th at which time purchase data from the study group was evaluated using logistic regression. The main findings of the research indicate that new users purchase licenses at significantly greater rates when they receive a reminder relative to control groups. Furthermore, new users that have lapsed i.e. users that purchased in 2015 but not since also pur-

chased licenses at significantly greater rates relative to controls when receiving a reminder. However, the rate of purchase of lapsed users relative to new users that purchased first in 2016 is much lower. This may indicate that it becomes more difficult to reengage a user the longer that user has not participated in hunting or fishing.

9. USGS Impervious Cover Project

Performed complex database queries and wrote GIS models to compile fisheries and landscape scale habitat data in support of a USGS project investigating the effects of impervious cover of stream fish communities. Wrote R scripts to model the effects of landscape and habitat variables on several fish community metrics using logistic mixed effect modeling, and generalized linear modeling.

10. Sportfishing Awards Data Viewer

Currently Sportfishing awards leaders are displayed as a single table on a dedicated page within the Masswildlife website. I modified the sportsfishing awards database to permit rapid indexing to facilitate posting the entire database on the web. This will expand the functionality of this page of the website from just displaying the current years leader to displaying records for any combination of year, pond, and species through a simple query. The ability to view pond specific catch records may increase the participation and thus prominence of the sportfishing awards program.



Table 1: Waterbodies where fisheries surveys have been conducted including date the survey was performed and location of the waterbody.

Date	Waterbody	Town	District
7/6/2016	lake chauncy	westborough	Central
7/14/2016	Little Chauncy	Northborough	Central
7/15/2016	Wickaboag Pond	West Brookfield	Central
7/18/2016	Lake Wyola	Shutesbury	CT Valley
7/20/2016	Fort Pond	Lancaster	Central
7/21/2016	Big Alum Pond	Sturbridge	Central
7/26/2016	Cranberry Pond	Sunderland	CT Valley
7/27/2016	Oxbo	Easthampton	CT Valley
7/28/2016	Nashawannuck Pond	Easthampton	CT Valley
8/8/2016	Sampsons Pond	Carver	South East
8/30/2016	Otis Reservoir	otis	Western
8/31/2016	Onota Lake	Pittsfield	Western
9/2/2016	Goose Pond	Lee	Western
9/8/2016	Crocker Pond	Westminster	Central
9/9/2016	Richmond Pond	Richmond	Western
9/13/2016	Greenwater Pond	Beckett	Western
5/10/2017	Buel Lake	Monterey	Western
5/11/2017	Stockbridge Bowl	Stockbridge	Western
5/23/2017	Bartlett Pond	Northboro	Central
6/1/2017	Laurel Lake	Erving	CT Valley
6/2/2017	Hampton Ponds	Westfield	CT Valley
6/7/2017	Lake Cochituate (Middle Basin)	Framingham	North East
6/12/2017	Whitehall Reservoir	Hopkinton	North East
6/13/2017	Spectacle Pond	Littleton	North East
6/14/2017	Hopkinton Reservoir	Hopkinton	North East
6/15/2017	Sugden Reservoir	Spencer	Central
6/20/2017	Sabbatia Lake	Taunton	South East
6/21/2017	Lake Mattawa	Orange	CT Valley
6/21/2017	Cheshire Reservoir	Cheshire	Western
6/22/2017	Congamond Lake	Southwick	CT Valley
6/26/2017	Massapoag Lake	Sharon	North East
6/27/2017	Windsor Pond	Windsor	Western
6/28/2017	holland pond	holland	CT Valley
6/30/2017	East Waushacum Pond	Sterling	Central

Table 2: Number of Lake Trout tagged and recaptured Lake Trout from Quabbin and Wachusett Reservoirs since the inception of the two tagging projects.

Year	Quabbin Reservoir		Wachusett Reservoir	
	Tagged	Recaptured	Tagged	Recaptured
2006	279	NA		
2007	57	2		
2008	109	6		
2009	191	13		
2010	177	30		
2011	6	0		
2012	0	0		
2013	254	16		
2014	290	14	110	NA
2015	398	31	161	6
2016	277	7	67	3
Total	2038	119	338	9

Figure 1: Outline of Browning Pond in Spencer showing bathymetry points (A) and interpolated bathymetry data (B).

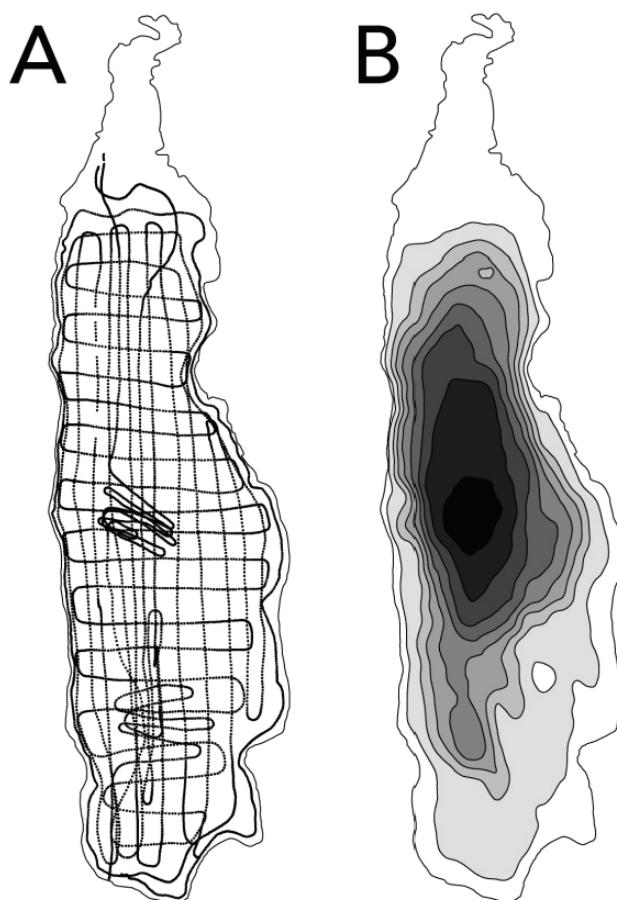


Figure 2: Completed pond map.

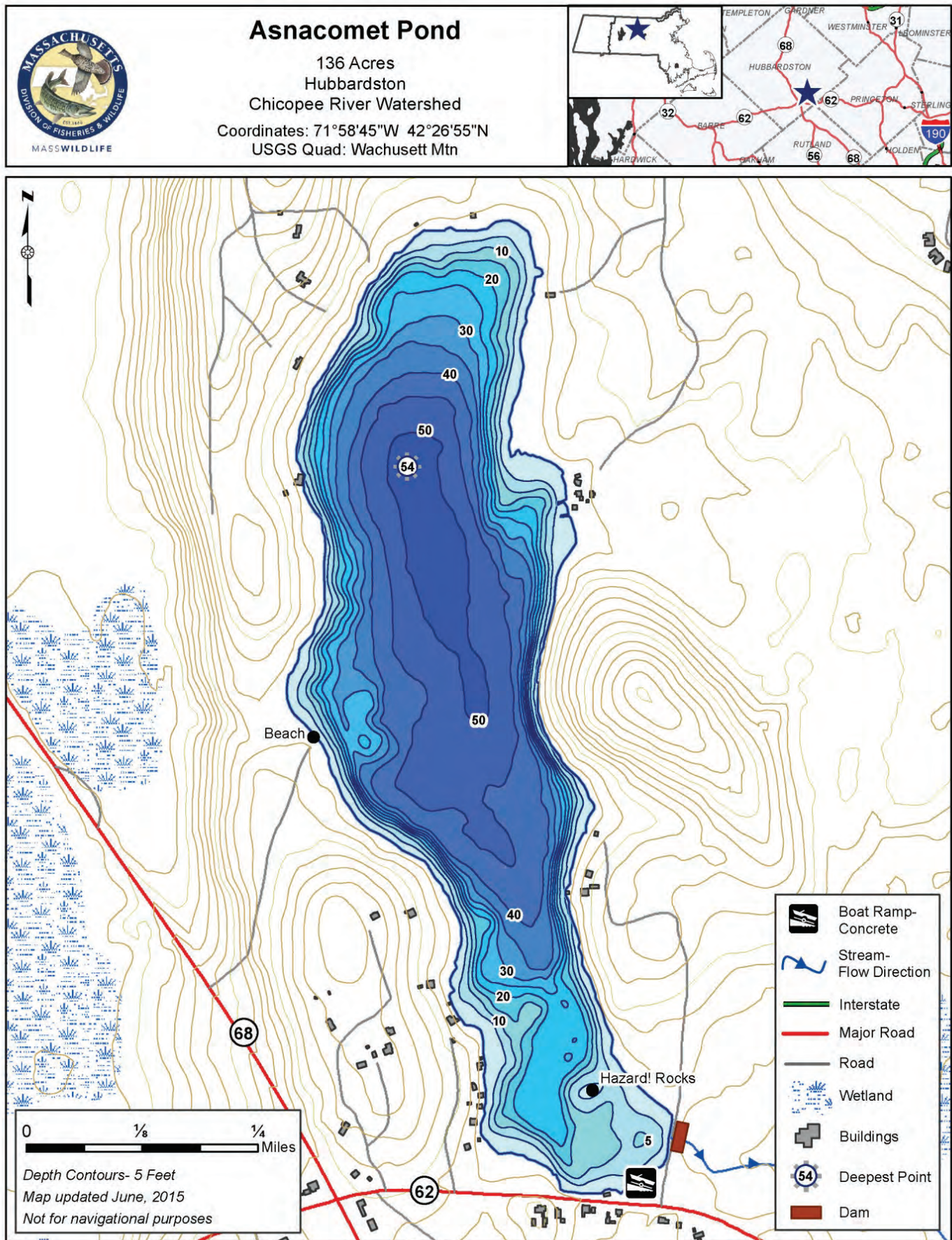


Figure 3: Male and female Lake Trout relative condition factor with 95% confidence intervals among years for Quabbin Reservoir. Shaded bars plotted on the secondary y axis depict the number of landlocked salmon submitted to the Freshwater Sportfishing Awards Program that were caught from Quabbin Reservoir over the same time period.

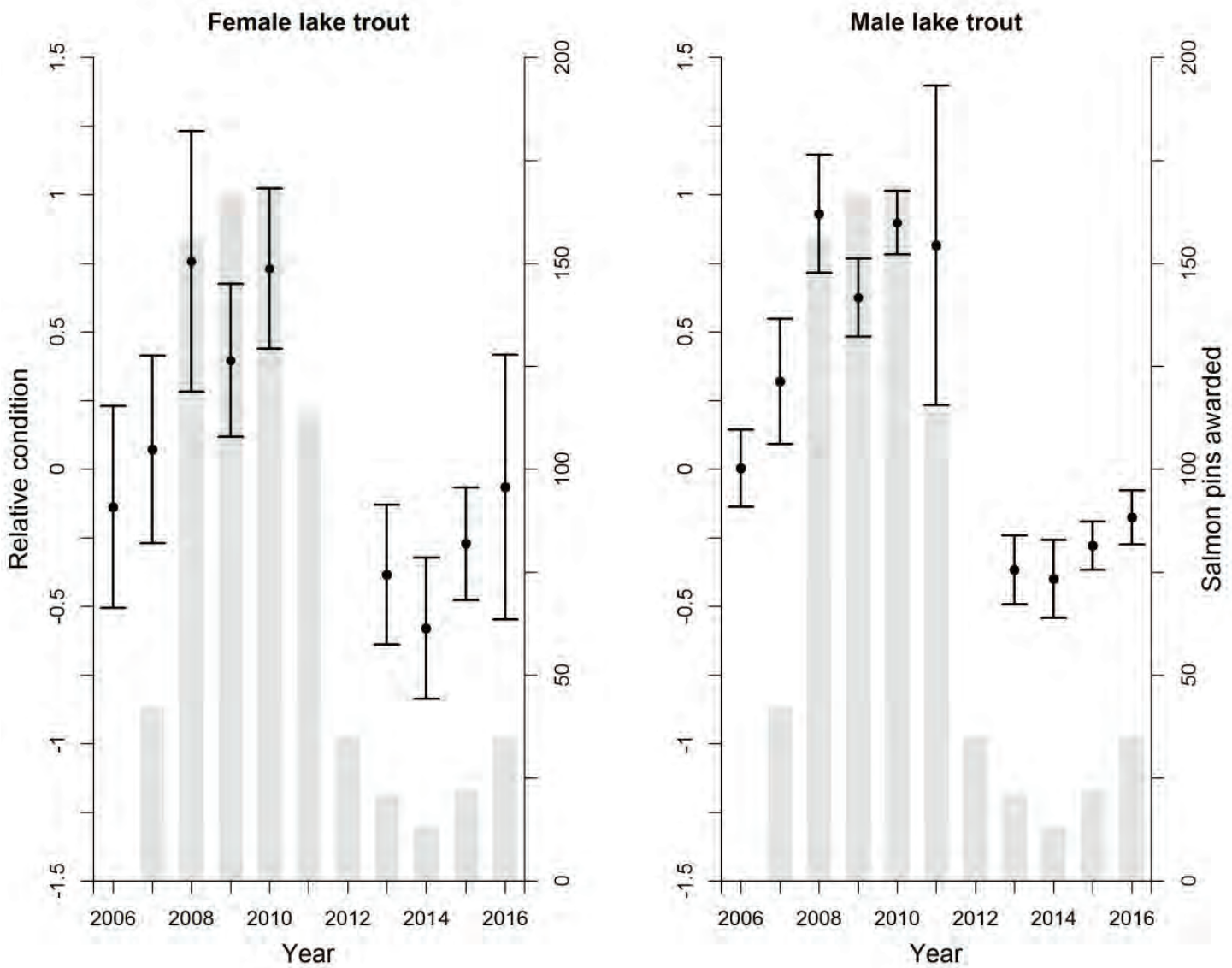
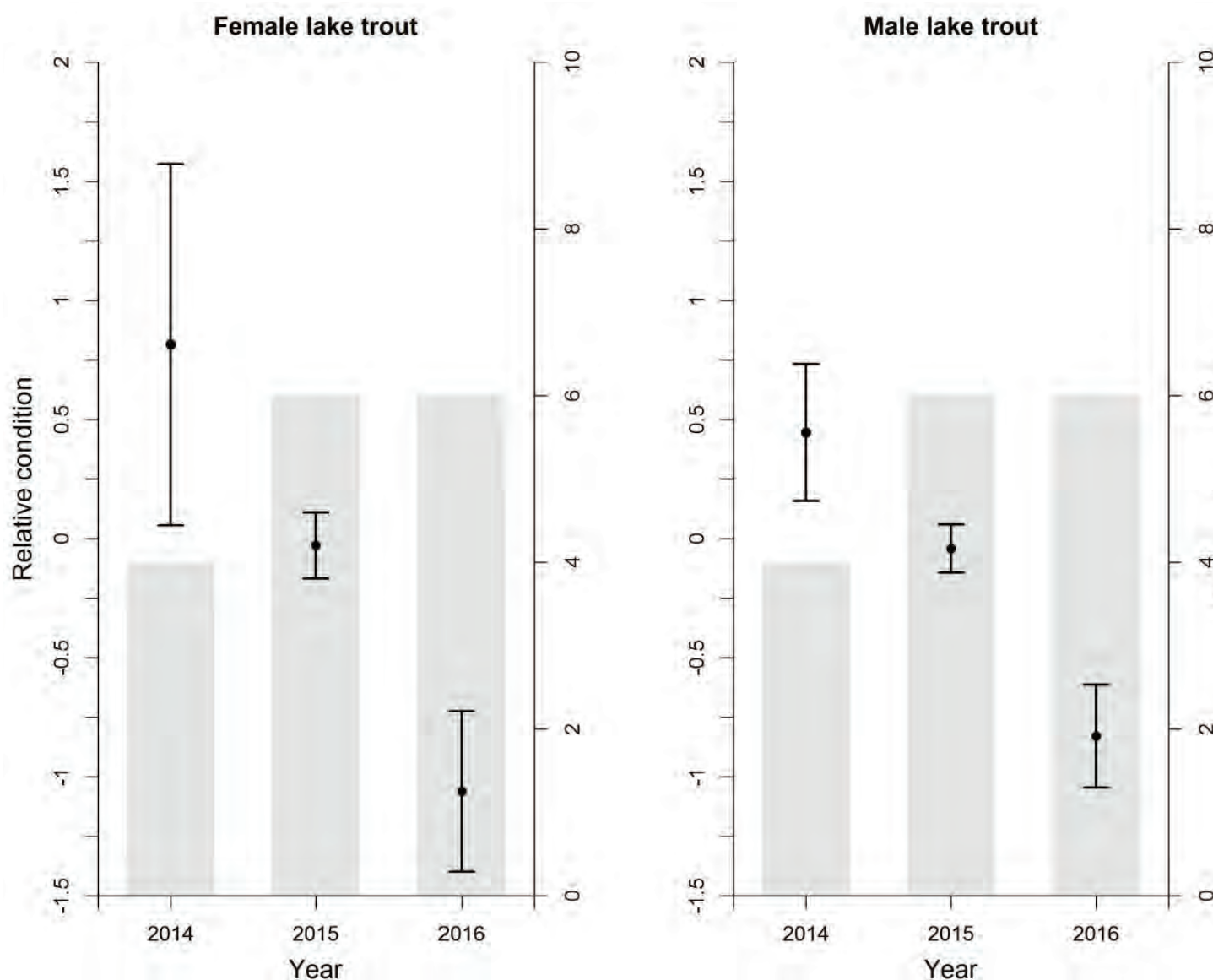


Figure 4: Male and female Lake Trout relative condition factor with 95% confidence intervals among years for Wachusett Reservoir. Shaded bars plotted on the secondary y axis depict the number of landlocked salmon submitted to the Freshwater Sportfishing Awards Program that were caught from Wachusett Reservoir over the same time period.



Fisheries GIS - David Szczebak, Project Leader

Activities included in this project in FY 17 concentrated primarily on continued development of the stocked waters application, revision of pond maps and narratives, and Coldwater Fishery Resource datalayer revision.

1. Stocked Waters Application

In FY2017 GIS staff devoted a good deal of time to refining and improving our trout stocking web application. The internal component, an online Google-based da-

tabase, was designed to house annual stocking schedules, orders, and allocations in one repository. Information from the 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 in FY2017 included optimizing the existing pages to reduce errors and slowness for hatchery and district staff using the database.

Staff reported a positive experience using the database, and quicker and smoother data entry and filtering of data.

The public-facing web application continued to garner very positive reaction from the public. For the period of spring trout stocking, from March 6, 2017 - June 30, 2017, the stocking application web pages received a total of 248,302 unique page views, making it the most-visited web page in the Department. Compared to spring, 2016 the online map of stocking locations saw a 111% increase in visitors while the stocking list saw a 25% increase. The rate of increase indicates a positive and growing appreciation of the application by the public.

2. Pond Map and Narrative Revision

In FY2017, the Fisheries section conducted more bathymetric surveys of lakes and ponds, and updated the pond maps available to the public. There was particular effort to map ponds in Southeast Massachusetts. Pond map write-ups were updated based on recent sampling as well as information provided by the MassWildlife District Offices. New pond maps begun in FY2016 and accompanying write-ups were posted to the MassWildlife web site. Bathymetric surveys were conducted on an additional 43 ponds during fall, 2016 through spring, 2017. A list of ponds for which new bathymetric surveys were conducted in FY2017 is as follows; these ponds will be made available to the pub-

Pond name	Town
A1 Site	Westborough
Lake Ashmere	Hinsdale
Ashumet	Mashpee
Bartlett Pond	Northborough
Big sandy Pond	Plymouth
Lake Boon	Hudson
Browning Pond	Oakham
Canton Reservoir	Qunicy
Cook Pond	Fall River
Coonamesset	Falmouth
Lake Cochituate	Framingham
Dearth Hill Pond	Brimfield
Eames Pond	Paxton
Fort Pond	Lancaster
Great Herring Pond	Plymouth

Pond name	Town
Hamblin Pond	Barnstable
Hamilton Reservoir	Holland
Hampton Ponds	Westfield
Hopkinton Reservoir	Hopkinton
Johns Pond	Mashpee
Long Pond	Plymouth
Long Pond (Brewster)	Brewster
Long Pond (Littleton)	Littleton
Manchaug	Sutton
Mashpee/Wakeby	Mashpee
Lake Massapoag	Sharon
Lake Mattawa	Orange
Moosehorn Pond	Hubbardston
Nipmuc	Mendon
Otis Reservoir	Otis

Pond name	Town
Oxbow	Easthampton
Pontoosuc	Pittsfield
Quaboag Pond	Brookfield
Rocky Pond	Boylston
Sabbatia Lake	Taunton
Sheep Pond	Brewster
Sugden Reservoir	Spencer
Wallum Lake	Douglas
Wequaquet	Barnstable
Whitehall Pond	Rutland
Whitehall	Hopkinton
Windsor	Windsor
Winnecunnet	Norton

lic once maps and write-ups are complete :

In addition to the pond maps and writeups made available to the public, we also produced a GIS layer of the bathymetry collected during our surveys. This 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 at:

<http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/dfwbathy.html>

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

http://maps.massgis.state.ma.us/map_ol/oliver.php

3. Coldwater Fisheries Resources Datalayer Revision
Using sampling data from the past year we updated the Coldwater Fisheries Resource (CFR) data layer to be current as of January, 2017. Based on the sampling data, 70 new streams were designated as Coldwater. The updated CFR information was uploaded to the MassWildlife website as both a searchable list, and as an interactive web map. The updated data was also made publicly available through the state MassGIS website.

When updating our new stream sampling information, we have occasionally found sampling done on streams not mapped in the base map hydrographic layer, NHD (National Hydrographic Dataset). These locations were mapped in GIS, then passed back to the USGS for inclusion in the national data. The MassWildlife copy of the data was then synced to the national model.

Hatchery/Trout Program Annual Report – Ken Simons, Chief of Hatcheries

The total number and pounds of each size category of each species of trout produced and stocked by the Division's five hatcheries in FY2017 are listed in Tables 1 and 2, respectively. Overall, a total of 556,297 brook trout, brown trout, rainbow trout and tiger trout with a combined weight of 466,834 pounds were stocked. The annual production goal is 400,000 to 450,000 pounds. This 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 permit that each hatchery is issued by the Massachusetts Department of Environmental Protection and the Federal Environmental Protection Agency.

The program goal is for at least 50% of the fish that are stocked to be in the 12+ size category and in FY2017 seventy one percent of the stocked fish met this criteria. Spring and fall stocking included some outstanding fish, including 250,213 rainbow trout that were more than 14 inches long and averaged 1.2 pounds apiece. More than 2,200 broodstock-size brook trout and brown trout were stocked from Palmer and Sandwich Hatcheries that were more than 15 inches long and averaged nearly 3 pounds each.

In fall 2016, a total of 79,932 trout were stocked. The fall crop included 52,102 rainbow trout that were 14+, 19,830 rainbow trout that were 12+ and 8,000 brown trout that were 9+. A total of 72,213 pounds of rainbow trout and 3,466 pounds of brown trout were stocked.

In spring 2017, a total of 476,365 trout that weighed 391,155 pounds were stocked. A total of 249,478 rainbow trout that weighed a total of 267,638 pounds were stocked. 79% of these rainbow trout were 14+ and averaged 1.2 pounds each. The spring rainbow crop also included 89,936 brook trout that weighed a total of 44,965 pounds. These brook trout ranged in size from 6 inches to more than 18 inches. Fifty percent of the brook trout were 12+ and averaged 0.8 pounds apiece. 134,502 brown trout between 6 inches and 18+ inches with a total weight of 75,759 pounds were also stocked. Thirty eight percent of the brown trout were 12+ and averaged 1.1 pounds apiece. Spring stocking also included 2,449 14+ tiger trout with a total weight of 2,793 pounds (Tables 1 and 2). The tiger trout averaged 1.1 pounds apiece. 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.

Roger Reed Hatchery produced a total of 393,500 fertilized brown trout eggs and 729,800 fertilized brook trout eggs in FY2017. Sandwich Hatchery produced a total of 300,192 fertilized brown trout eggs, 268,196

fertilized brook trout eggs and 183,804 fertile tiger trout eggs in FY2017.

Roger Reed Hatchery produced a total of 11,200 land-locked Atlantic salmon in FY2017 (Table 3). 10,500 salmon that averaged 9.2 inches were stocked in Quabbin Reservoir in May and 700 salmon were transferred to the New Jersey Division of Fisheries and Wildlife's Hackettstown Hatchery in exchange for 21,300 northern pike fry that were stocked in the Quinsigamond Lake system (Flint Pond, Newton Pond, Sewell Pond and Quinsigamond Lake).

Construction was completed on the mile-long pipeline that provides McLaughlin Hatchery with 6 million gallons of water per day by gravity directly from Quabbin Reservoir via a connection to the Chicopee Valley Aqueduct. Water began flowing to the hatchery in the pipeline on December 22, 2016 when the pipeline valves were opened in a ceremony that included Commissioner George Peterson, Director Jack Buckley and Massachusetts Water Resources Authority Executive Director Fred Laskey and MWRA Advisory Board Member Lou Taverna. The hatchery is expected to save at least \$60,000 in electricity costs annually from reduced use of the Swift River pumping station. The MWRA will also benefit from electricity generated by a in-line turbine, which will be operational in August 2017.

The pipeline replaces water pumped directly from the Swift River (the Swift River pumping station will remain as a backup) as the primary supply for the hatchery.

The pipeline water originates at an intake located 60 feet below the surface in Quabbin Reservoir. Compared to water pumped directly from the Swift River, pipeline water it is warmer in the winter and cooler in the summer, both beneficial attributes for growing quality trout. The pipeline will be particularly beneficial to the hatchery during summers when Quabbin Reservoir is at capacity water too warm for trout is spilling from the surface into the Swift River. The pipeline will also eliminate many other problems associated with pumping water uphill from the Swift River to the hatchery, including pump breakdowns, power failures or blockage of the water intakes by snow, ice, leaves or other debris.

A second project that will save substantial energy and money at McLaughlin Hatchery was completed this year. A wood pellet boiler designed to heating the 15,000 square foot hatchery building complex was installed to replace the hatchery's aging oil-fired boilers. The pellet boiler is expected to save approximately 7,000 gallons of oil per year and reduce annual heating costs by \$11,500. Funding for this project was provided by a grant from the Leading by Example Clean Energy Grant Program-Renewable Thermal Project Grant from the Department of Energy Resources.

Two staff were hired to fill vacant hatchery positions in FY2017. Cameron Young filled the vacant Wildlife Technician II position at Sandwich Hatchery. Ryan Cleveland filled the vacant Wildlife Technician II position at Montague Hatchery.



Photo by Marion Larson/MassWildlife

Governor Charlie Baker and Energy and Environmental Affairs Secretary Matthew Beaton joined anglers and state and local officials at the McLaughlin Fish Hatchery in Belchertown on June 24, 2016 for a groundbreaking ceremony to celebrate the construction of a nearly mile-long water pipeline and hydropower turbine that now supplies six million gallons of water daily to the hatchery, produces renewable energy, and reduces the hatchery's electric demand.

Table 1. Summary of the number of trout produced at each of the Division's five fish hatcheries in FY2017 (fall 2016 and spring 2017).

Species	Size Category (inches)	Number of Fish					Total Number of Fish
		Bitzer	McLaughlin	Palmer	Sandwich	Sunderland	
Rainbow	9+	12200	0	0	4800	9667	26667
Trout	12+	0	8800	0	0	35730	44530
	14+	25000	189123	0	36090	0	250213
	Sub-total	37200	197923	0	40890	45397	321410
Brook	6 - 9	2500	0	0	0	40560	43060
Trout	9+	0	0	0	1000	0	1000
	12+	29650	0	0	10061	5447	45158
	18+	0	0	340	378	0	718
	Sub-total	32150	0	340	11439	46007	89936
Brown	6 - 9	25000	0	0	0	0	25000
Trout	9+	8000	20920	0	2000	33900	64820
	12+	21550	0	0	10517	19056	51123
	14+	0	0	0	0	0	0
	18+	0	0	691	868	0	1559
	Sub-total	54550	20920	691	13385	52956	142502
Tiger	14+	0	0	0	2449	0	2449
Trout	Sub-total	0	0	0	2449	0	2449
Total		123900	218843	1031	68163	144360	556297

Table 2. Summary of the pounds of trout produced at the Division's five fish hatcheries in FY2017 (fall 2017 and spring 2017).

Species	Size Category (inches)	Total Weight of Fish (Pounds)					Total Pounds of Fish
		Bitzer	McLaughlin	Palmer	Sandwich	Sunderland	
Rainbow	9+	5682	0	0	1295	7294	14271
Trout	12+	0	3687	0	0	25335	29022
	14+	24442	229485	0	42631	0	296558
	Sub-total	30124	233172	0	43926	32629	339851
Brook	6 - 9	416	0	0	0	6941	7357
Trout	9+	0	0	0	304	0	304
	12+	22528	0	0	9054	4106	35688
	18+	0	0	818	798	0	1616
	Sub-total	22944	0	818	10156	11047	44869
Brown	6 - 9	6195	0	0	0	0	6195
Trout	9+	3466	8333	0	500	7259	19558
	12+	18326	0	0	11927	18306	48559
	14+	0	0	0	0	0	0
	18+	0	0	1803	3110	0	4913
	Sub-total	27987	8333	1803	15537	25565	79225
Tiger	14+	0	0	0	2793	0	2793
Trout	Sub-total	0	0	0	2793	0	2793
Total		81055	241505	2621	72412	69241	466834

Table 3. Summary of landlocked salmon, brook trout eggs, brown trout eggs and tiger trout eggs produced in FY2017 (fall 2016 and spring 2017).

Hatchery	Species	Size Category (inches)	Number	Weight (Pounds)
Palmer	Landlocked salmon	8+ inches	11,200	2,896
Palmer	Brook trout	eggs	729,800	N/A
	Brown trout	eggs	393,500	N/A
Sandwich	Brook trout	eggs	268,196	N/A
	Brown trout	eggs	300,192	N/A
	Tiger trout	eggs	183,804	N/A

Anadromous Fish Investigations - Caleb Slater, Ph.D., Project Leader

1. General

In FY 17, MassWildlife hired three 6-month seasonal workers to conduct the Atlantic salmon smolt production assessment work in Connecticut River tributaries and staff the West Springfield fishway on the Westfield River. This work includes stream samples at 50 sites on 45 streams that have been sampled annually as part of the Atlantic Salmon restoration program for the last 20 years-consequently making these sites the longest continuously sampled streams in the Commonwealth. This electrofishing crew is also used to fill “data gaps” by sampling previously un-sampled streams or re-sampling historic (> 20 years old) sites and aids other Project Leaders or District Biologists by conducting surveys as requested or by combining with other crews for large sites or boat or barge shocking. An additional three 3-month seasonal workers were hired to staff the Essex fishway on the Merrimack River in Lawrence, MA. Holyoke Gas & Electric, as directed by the conditions of their FERC hydroelectric license, hired seasonal employees to staff the Holyoke fishway and Firstlight Power monitored fish passage at the Turners Falls fishways. The Project Leader supervised these activities.

The U.S. Fish and Wildlife Service has withdrawn its support and resources from the Connecticut River Atlantic Salmon restoration program including its egg and

fry production at the White River Fish Hatchery and sea run broodstock operations at the Cronin Facility. Both of these USFWS operations were critical components of the program and without them, the Atlantic salmon restoration effort has no real viable chance of success moving forward. Therefore the Massachusetts Division of Fisheries and Wildlife has ended its efforts to restore Atlantic salmon to the Connecticut River after nearly 4 decades of effort. No Atlantic salmon fry were produced at the Roger Reed State Fish Hatchery in Palmer, and no Atlantic salmon fry were stocked in FY 17.

During FY 17, the Project Leader was actively involved in Federal Energy Regulatory Commission (FERC) Hydroelectric proceedings concerning:

- Application for a license at the Pepperell Paper dam on the Nashua River in Pepperell
- Application for a new license at the Watershops Pond Project on the Mill River in Springfield, MA.
- Evaluation of new downstream fish passage protections at the Holyoke Hydroelectric Project on the Connecticut River in Holyoke
- Application for relicensing of the Holyoke City #1 Project on the Holyoke Canal in Holyoke
- Application for relicensing of the Holyoke City #2 Project on the Holyoke Canal in Holyoke
- Application for relicensing of the Holyoke City #3 Project on the Holyoke Canal in Holyoke
- Application for surrender of the Nonotuck Project on the Holyoke Canal in Holyoke

- Application for surrender of the Albion Mill (A) Project on the Holyoke Canal in Holyoke
- Application for surrender of the Albion Mill (D) Project on the Holyoke Canal in Holyoke
- Application for relicensing of the Northfield Mountain Pumped Storage Project on the Connecticut River
- Application for relicensing of the Turners Falls Project on the Connecticut River
- Application for relicensing of the Bear Swamp Pumped storage facility on the Deerfield River
- Application for relicensing of the Fife Brook project on the Deerfield River
- Application for relicensing of the Riverdale Project on the Blackstone River
- Application for relicensing of the Tupperware Project on the Blackstone River
- Application for amendment to license (crest gate) of the Lowell Project on the Merrimack River
- Application for a preliminary permit for the Turners Falls Project, on the Turners Falls Power Canal

The Project Leader worked with the Massachusetts Department of Energy Resources, commenting on the applications of numerous hydroelectric projects seeking to qualify for “Low Impact Hydroelectric Certification” and/or “Green Energy” credits in Massachusetts.

- Holyoke Project, Connecticut River
- Collins Project, Chicopee River
- Gardners Falls Project, Deerfield River
- Byron Weston Project, Housatonic River
- New Home Project, Millers River
- CVA-Hatchery Project, Swift River
- Lawrence Project, Merrimack River
- West Dudley Project, Quinebaug River
- Cosgrove Project, Nashua River
- Loring Road Project, MWRA Aqueduct
- Oakdale Project, MWRA Aqueduct
- West Springfield Project, Westfield River
- Ware Lower Project, Ware River

During FY 17 the Project Leader assisted in the Bathymetry project by collecting depth data on 37 ponds, mainly in the South East district.

2. Connecticut River

The Project Leader actively participated in the Connecticut River Atlantic Salmon Commission (CRASC),

and continued as the chair of the CRASC Technical Committee. Many telephone, electronic, and written requests for information were also answered by the Project Leader. The FERC Relicensing of 5 hydroelectric projects on the Connecticut River (Northfield MT, Turners Falls, Vernon, Bellow Falls, and Wilder) continued this year. This is a 5 year process that will require close attention.

Because 2017 fish passage operations are ongoing at this time, this report summarizes the 2016 calendar year fish passage activities.

2.1 Holyoke

The City of Holyoke (Holyoke Gas and Electric Co. HG&E) bought the Holyoke Hydroelectric project from Northeast Utilities in 2002. The Project Leader has been involved in ongoing negotiations with the new owner to settle the outstanding issues and finalize the FERC license for the project (awarded in 2001). Holyoke Gas and Electric Co., as directed by the conditions of their new FERC hydroelectric license, hired seasonal employees for the Holyoke fishway in spring 2013. The Project Leader supervised their activities.

Fish passage operations commenced on April 1 when water temperature was 6.3°C and river discharge was 20,133 cfs. Discharge peaked at 30,693 on April 4. Initially, passage monitoring occurred from 0900 – 1500 h. On April 19, water temperature averaged 8.9°C, and 536 American Shad were passed, triggering fish passage operations from 0800 – 1700 h per standard procedures. On April 29, 5,929 shad passed triggering operations from 0800 – 1800 h daily. Daily operations continued for anadromous fish passage through July 15. Operations were then conducted 4 times per day, Monday through Friday from July 18 through November 15, with exceptions, for Shortnose Sturgeon collection. Exceptions included federal and state holidays and the period August 1 – 31 when operations were suspended after consultation with the National Marine Fisheries Service (NMFS), US Fish and Wildlife Service (USFWS), and Massachusetts Division of Fisheries and Wildlife (MassWildlife) to prevent undue stress on collected Shortnose Sturgeon due to high water temperature (>27°C). Additionally, the fish lifts were not operated during a canal outage October 15 – 27 because attraction water for the fish lifts is supplied from the canal system.

The Holyoke fish passage facility operated for 105 days during in the spring season passing a total of 422,634 anadromous fish (Table 1). 79 Shortnose Sturgeon were lifted during 2016. The number of days that passage was greater than 1% of the seasonal total was considerably less than 105. The number of days that passage is greater than 1% of the seasonal total, and the percentage of the total run that these days comprise, is a measure the temporal distribution of the run. The “over-1%-daily-passage” totals were: American Shad, 88% of 385,930 in 27 days; Blueback Herring, 97% of 137 in 20 days; Sea Lamprey, 91% of 35,249 in 14 days; Striped Bass, 88% of 638 in 22 days; Gizzard Shad, 92% of 598 in 29 days (Table 1).

2.1.1 Atlantic Salmon

3 Atlantic Salmon were counted during the spring fish passage season and one in the fall at the Holyoke fish lift (Table 1). 2015 passage (3) was 0.82% of the record passage of 1992, 7% of the previous five year mean, and 5% of the previous ten year mean (Table 2). All salmon were released and allowed to continue their upstream migration. No salmon were radiotagged in 2016.

2.1.2 American Shad

385,930 American shad were passed upstream. This was 54% of the record high passage of 1992. 2016 passage was 101% of the previous five year mean, and 142% of the previous ten year mean (Table 2). The total number of shad lifted in 2016, including shad transferred to trucks for transport (5,272) and sacrificed for biological sampling and agency studies (273), was 391,475. Examining the cumulative percent of shad passed at Holyoke, 50% of fish passed this project on the 44th day of passage, May 14 (Table 3). A total of 829 American shad were sampled for biological data on 53 days from 18 April through 22 June. Fork length, weight, sex, and scale samples were collected from all individuals. This represents 0.2% of the total American shad passed for the year and between 0.04% and 8% of the daily shad passage at the facility. The weighted percentage of the run sampled (the total number of fish passed on days of sampling expressed as a percentage of the entire run) was 75%. The weighted sex ratio of American Shad lifted at the Holyoke facility in 2016 was 55% males and 45% females.

5,272 shad were trapped and trucked for various restoration efforts (Table 5). 437 of these shad were trucked to the USFWS North Attleboro Fish Hatchery for spawning where 2,125,419 fry were produced. 1,072,252 fry were stocked in Pawcatuck River, RI, and 1,053,167 fry were released into the Pawtuxet River, RI.

2.1.3 Shortnose Sturgeon

An unprecedented 94 Shortnose Sturgeon used the fish lifts throughout the season. This dramatic increase is believed to be due to the redesigned Spillway Fishway entrance which was operated for the first time in 2016. Ninety-three fish were processed and released downstream per handling protocol, however there was one incidental mortality within the fish lift system. The Shortnose Sturgeon count included 15 re-collects (lifted more than once in the same year). Therefore, 79 unique Shortnose Sturgeon used the fish lifts in 2016.

Observations yielded one occurrence of stranding of a Shortnose Sturgeon in the canal system just downstream of the canal louver after dewatering. The fish was recovered and released to the CT River downstream of the project. In addition, two Shortnose Sturgeon were relocated from a pool in the bypass reach that was temporarily isolated when zone-of-passage (ZOP) flows were diverted for maintenance purposes.

2.1.4 American Eel

Eel ramps were deployed in the spillway fish lift entrance and the upper stilling basin on May 17, and the tailrace fish lift entrance on May 24. The South Hadley eel ramp and its attraction water system were completely rebuilt during 2016, delaying deployment until June 14. All eel ramps were operated until November 15 with exceptions for Project maintenance activities.

Juvenile eel passage totaled 38,449 in 2016, the third highest annual total recorded at Holyoke Dam. The majority were collected from the South Hadley (48.4%) and the tailrace fish lift entrance (48.2%) eel ramps. Another 3.4% were collected from the upper stilling basin eel ramp, and only 0.1% of the total was collected from the spillway fish lift entrance ramp (Table 6).

The 2016 season was characterized by exceptionally low river flow and high water temperature. The ma-

jority of eels were collected in two distinct peak periods, one during spring (43% of total) and one during fall (29% of total).

2.1.4 Other Anadromous Fish Species

Blueback Herring passage in 2016 was 137 (Table 1). This was 31% of the previous five-year mean and 55% of the previous ten year mean (Table 2).

Sea Lamprey passage in 2016 (35,249) was 36% of the record passage of in 1998 and was 178% of the previous five-year mean and 129% of the previous ten year mean (Table 2).

Gizzard Shad passage in 2016 was 598. This was 144% of the previous five-year mean and 210% of the previous 10 year mean (Table 2).

2.1.5 Resident Fish

2,519 individuals of 21 species were lifted in 2016.

2.2 Turners Falls

The fishladders at Turners Falls were operated for a total of 79 days from April 22 through July 8, 2016. Operational problems were reviewed as needed on an ongoing basis by agency personnel (Massachusetts Division of Fisheries and Wildlife, and United States Fish and Wildlife Service), and by the dam owner (Firstlight Power).

Upstream fish passage counts were made at the Spillway, Gatehouse, and Cabot fishladders by review of recorded passage. Digital recordings were reviewed by employees of Firstlight Power. All ladders were monitored twenty-four hours each day unless technical problems occurred. All fishladders remained open for passage twenty-four hours each day.

American shad and Atlantic salmon were identified and enumerated at the Spillway, Gatehouse and Cabot ladders, Sea lamprey were counted only at gatehouse (Table 7).

2.2.1 American Shad

The number of shad passing the Gatehouse fish ladder in 2016 (54,760) was 91% of the maximum passage

of 1992 (Table 7 and 8), 167% of the previous 5 year mean and 287% of the previous 10 year mean.

The number of shad passing the Spillway fish ladder in 2016 (19,399) was 46% of the maximum passage of 2015 (Table 7 and 8), 313% of the previous 5 year mean and 584% of the previous 10 year mean.

The number of shad passing the Cabot fish ladder in 2016 (34,709) was 37% of the maximum passage of 1992 (Table 7 and 8), 118% of the previous 5 year mean and 168% of the previous 10 year mean.

Examining the cumulative percent of shad passed at Gatehouse, 50% of fish passed this ladder on the 30th day of the migration 28 May, 2016.

Examining the cumulative percent of shad passed at Spillway, 50% of fish passed this ladder on the 29th day of the migration, 27 May, 2016.

Examining the cumulative percent of shad passed at Cabot, 50% of fish passed this ladder on the 28th day of the migration, 26 May, 2016.

Only 14% of the shad lifted at Holyoke (385,899) passed the Gatehouse observation window, well below the restoration goal of 50%.

2.2.2 Other Anadromous Fish Species

15,128 Sea Lamprey passed the gatehouse fishway in 2016. This represents 47% of the maximum passage of 2008 (Table 1 and 2), 127% of the previous 5 year mean and 86% of the previous 10 year mean.

3. Westfield River

The West Springfield fish passage facility operated for 96 days in the spring of 2016. The number of days that passage was greater than 1% of the seasonal total was considerably less than 96. The number of days that passage is greater than 1% of the seasonal total, and the percentage of the total run that these days comprise, is a measure the temporal distribution of the run. The “over-1%-daily-passage” totals were: American shad, 85 % of 6,003 in 18 days; sea lamprey, 86% of 456 in 22 days (Table 9).

3.1 Anadromous fish

During the spring/summer season 1 Atlantic salmon was trapped transported by Division personnel to the East Branch of the Westfield River upstream of the Knightville Dam.

A total of 6,003 American Shad; 1 Atlantic salmon; 456 Sea Lamprey; 1 Striped Bass; 0 Blueback Herring; and 0 Gizzard Shad were passed upstream in spring/summer 2016 (Table 9). The 2016 shad passage was 58% of the record high of 10,373 in 2012 (Table 9 and 10).

3.2 Non-anadromous fish

White sucker, brook trout, brown trout, rainbow trout, tiger trout, and smallmouth bass were documented passing upstream through the West Springfield fish passage facility in 2016 (Table 9).

4. Merrimack River

4.1 Essex Dam

The Essex Dam fish elevator operated for 86 days between 21 April and 15 July 2016. For the fall season the fishway was operated from 15 September through 1 November. During the spring migration period the Essex Dam fish elevator was operated seven days per week. Hours of operation were generally 8:00 a.m. to 4:00 p.m. throughout the season. During the fall four lifts were made per weekday.

Daily fish passage numbers for the 2016 fish passage season are summarized in Table 11. Annual fish passage numbers for the period of record (1982-2014) are summarized in Table 12.

4.1.1 Atlantic salmon:

Six adult Atlantic Salmon were lifted at the Essex fishlift during spring 2016. This was 18% of the record passage of 2011. Salmon returns were 5% of the previous 5 year mean, and 6% of the previous 10 year mean. No salmon were captured in the fall.

4.1.2 American Shad:

The total number of shad lifted in 2016 (67,528) was 76% of the record passage (89,421) of 2015 (Table 12). 2016 shad passage was 172% of the previous five year mean (Table 12) and 249% of the previous ten year

mean (Table 12). 1,151 shad were trapped and trucked to the USFWS Nashua Fish Hatchery for spawning where 2,059,799 fry were produced and stocked into the Charles River and 1,523,218 fry were produced and stocked into Merrimack River. 225 shad were sampled for biological data collection over 45 days between May 17 and July 1.

4.1.3 River Herring:

2016 passage was 417,240 (Table 11) this is the record high passage (Table 12). 2016 herring passage was 1100% of the previous five year mean (Table 12) and 2155% of the previous ten year mean (Table 12). 702 herring were sampled for biological data collection over 29 days between May 2 and May 31.

4.1.4 Other Anadromous Fish:

Total number of sea lamprey, striped bass, and gizzard shad passing through the Lawrence fishlift were 5,164, 1,603, and 112 respectively.

4.1.5 American Eel

An estimated 160 elvers were passed in the lift hopper and 1,981 passed the new permanent eelway at the dam for a total of 2,141.

4.2 Pawtucket Dam

FISH LIFT

Operation of the Pawtucket Dam fish elevator began (27 April) one week after shad began passing at the Lawrence fishway, approximately 12 miles downstream, and concluded on July 15. The system was operated seven days per week, generally from 7:00 a.m. to 6:00 p.m. Frequency of lifts varied between 0.5 to 2 hours based on the density of fish observed in the hopper bucket. Estimates of fish passage were made by CHI employees who observed the hopper bucket during each lift. Maintenance of the facility was satisfactory throughout the fish passage season.

The estimated total number of American shad passed at the Lowell lift in 2016 was 5,517 (Table 13).

The estimated total number of River Herring passed at the Lowell lift in 2016 was 142,087 (Table 14).

FISH LADDER

The Lowell Ladder was operated for a 4 week period

from May 16th through June 13th per agreement with ENEL and the Merrimack Technical Committee. This was a test of the ability and efficacy of the ladder to pass river herring and American shad. The Salmon-Soft video system was successfully operated on only 12 days of the 29 days, or 41% of the possible passage dates. Of those 12 days of operation (May 18-22, 26, June 2-3, 6-9) at least 2 days were partial recordings. Videos were reviewed with Windows Media player or VLC software.

4.2.1 River Herring:

In order to estimate river herring passage video was reviewed, either with full counts (May 18,19,20,21) or 5 minute time counts for every hour (May 22,26 & June 2,3,6,7,8,9). A regression analysis was performed to compare 20 individual one-hour counts of river herring passage to 5 minute expanded estimates. The R squared value was 0.778. Ladder counts were also compared to lift counts by date. The relationship had an R squared value of 0.8131. In order to develop a full estimate for river herring we used the total count for herring at the lift for the test window (84,232) and the 7 days where we had comparable numbers (30,357 for lift & 52,350 for ladder) to develop an estimate of the Lowell Ladder herring passage of 145,256 for the entire 28 day test period. When Lowell Lift estimates plus the Lowell ladder test window estimates, we estimate the Lowell Project as a whole passed about 287,343 river herring.

4.2.2 American Shad:

An improperly set gate hampered shad passage at the ladder exit in 2016. This issue made estimation of shad passage at the Lowell Ladder very difficult. Our best estimate is 5,922 for the entire 28 day test period. When Lowell Lift estimates plus the Lowell ladder test window estimates, we estimate the Lowell Project as a whole passed about 11,439 American Shad.

This represents 17% of the shad passing through the Lawrence fishway this season (67,528). While not the 50% goal it is significantly better than the average. Enel will continue to experiment with the floating screen in the tailrace- designed to guide fish to the fishway entrance

ed at the facility from 1986, the first year of operation, through 2016.

5 sea-run Atlantic salmon were seen at the Lowell fish-lift. All sea-run Atlantic salmon that entered the Lawrence fishlift were allowed to pass upstream as they are no longer required for broodstock.

Assorted riverine species have been noted but not counted.

5. Atlantic Salmon Restoration program

The collective efforts of the states of Vermont, New Hampshire, Massachusetts, Connecticut and the United States Fish and Wildlife Service to restore Atlantic salmon to the Connecticut River Basin ended in FY 13 after nearly 4 decades.

The underpinning of the Connecticut River salmon restoration program were the millions of eggs and fry produced by the U.S. Fish and Wildlife Service's White River National Fish Hatchery in Bethel, VT and sea run brood stock management and spawning operations at the Cronin National Salmon Station in Sunderland, MA. In August 2011 Tropical Storm Irene severely damaged the White River Hatchery leading to its depopulation and closure in early 2012. This event and continued disappointing returns of adult Atlantic salmon to the Connecticut River led the U.S. Fish and Wildlife Service to withdraw its support and resources from the Connecticut River Atlantic Salmon restoration program in July 2012. As a result the number of fry available for stocking was dramatically reduced in both 2012 and 2013 and the last Atlantic salmon fry and smolts were stocked in 2013.

The U.S. Fish and Wildlife Service egg/fry production and broodstock management operations were critical components of the restoration program and without them, the restoration effort has no real viable chance of success moving forward. Therefore, at its November 2012 meeting the Division's board accepted the staff's recommendation to end MassWildlife's efforts to restore Atlantic salmon to the Connecticut River. The last Atlantic salmon fry were stocked out of Roger Reed Hatchery in April 2013 and all remaining broodstock Atlantic salmon were stocked out as well.

Table x lists the annual runs of anadromous fish count-

In June of 2013 the USFWS informed the MassWild-

life that it will also be withdrawing its support and resources from the Merrimack River Atlantic Salmon restoration program.

6. Atlantic Salmon Fry Survival

Selected salmon stocked streams were sampled for juvenile Atlantic salmon stocked in 2013. In 2016 49 sites on 44 streams were sampled by personnel from the Massachusetts Division of Fisheries and Wildlife.

A single-pass technique utilizing a battery powered backpack shocker was employed on all streams sampled. All fish seen were captured. Fish were held in live cars after capture, identified to species, and measured for total length. Upon completion of subsequent 'work up', all fish were released back into the index

site. Index sites were selected to be proportionately representative of the habitat types in each stream. To prevent over or under estimation due to disproportionate stocking, index sites were selected, whenever possible, near the middle of a stocking section. The area of stream sampled was obtained by measuring the length of the sampled section and multiplying by the mean width for that section.

Very few salmon were captured in 2016- this is to be expected as most salmon fry stocked in 2013 will have smolted and migrated to the ocean in 2015.

For Anadromous fish passage data see Appendix A. (page 132).



Photo by Caleb Slater/MassWildlife

Coldwater Fisheries Project - Adam Kautza Project Leader

I began my employment as the Coldwater Fisheries Project Leader with the Division of Fisheries and Wildlife in May of 2016, just prior to FY17. Specifically for FY17, my activities during the first several months emphasized familiarization with the fisheries database and district fisheries personnel, as well as Massachusetts fisheries resources and division regulations and protocols in general. I traveled to each of the districts to assist with standard fisheries surveys and learn about each of the districts unique fisheries resources. Early on I was also tasked with acting as the Division representative on the state Drought Management Task Force (DMTF) where I attended meetings and gave updates regarding the effects of the 2016 drought on fish and fisheries across the state. The DMTF consists of a diverse group of individuals from state government, state and federal agencies, municipal water districts, and other entities. The group presents up-to-date precipitation, streamflow, and groundwater level information, which it uses to discuss whether or not to declare drought and drought severity in different regions of the state. In addition to sitting on the DMTF panel I participated in a series of meetings to revise the original Drought Plan to be more responsive and sensitive to the onset of drought conditions. I was also given the responsibility to participate in coldwater consultations as part of the water withdrawal permit renewals under the Water Management Act. Although we have had few formal consultations to date the process is designed to work with permit holders on ways to help minimize their impacts to coldwater resources. About six months into my tenure I began summarizing a general overview of the current status (e.g., distribution, relative abundance, etc.) and potential future management directions of our wild trout fisheries in Massachusetts into a presentation format. I have now given various iterations of this presentation to a number of interested user groups and stakeholders, such as Trout Unlimited and others, across Massachusetts.

Beginning about January 2017 I started discussions with my supervisor and other colleagues regarding the development of a wild trout management plan, with data to be collected over the next few years and a long-term plan put into place shortly thereafter. Much of the remainder of FY17 was given to researching trout management plans from other states, scouring our fisher-

ies database for indicators of exceptional wild trout fisheries, and pinpointing streams and stream reaches where additional data on fish assemblage composition, trout population density and biomass, habitat and water quality, access, etc. were necessary. In all I identified 112 streams that met minimum criteria for trout relative abundance and size structure to be included in a list of potential “prime” wild trout fisheries. These streams will be intensively surveyed to form a more complete and quantitative picture of their potential as quality wild trout fisheries. Management goals, regulations, and ideas to market these fisheries will be based on the data collected in our upcoming surveys set to begin in FY18.

Stream and River Project Leader

1. Assessment of warm- and coolwater stream and river resources.

Five large river systems were sampled in collaboration with District crews in FY17 (summer 2016); the Millers (10 surveys), Deerfield (18 surveys), Taunton (3 surveys), Quinebaug (5 surveys), and Westfield (5 surveys) rivers. Data from surveys were used to calculate or recalculate indices of similarity to Target Fish Communities (TFC, as in Kashiwagi and Richards 2009, see Figures 1-5). One system (Westfield River) was less similar to its corresponding TFC in 2016 (51.4%) than in 2009 (80%), perhaps reflecting 2016 drought conditions. The Quinebaug River, in contrast, appears to have become more similar to its TFC (74.1% in 2016 vs. 60.3% in 2009). Indices for the Millers, Deerfield, and Taunton were first calculated in 2016. Other large rivers sampled in FY17 (summer 2017) included the Manhan, Swift, Quaboag, Bass, Herring, Coonamesett, and Acushnet rivers. Similarity indices for these will be calculated in winter 2017/18 where reference streams are available.

Sampling priorities were identified in collaboration with District biologists and in accordance with TFC needs. Locations for surveys were created into GIS shapefiles for each district. These were given to S. Mattocks in February 2017 and incorporated into district-specific sampling requests. Additional sampling priorities were identified in collaboration with K. Hartel (Museum of Comparative Zoology, Harvard University; Charles River sites), E. Mass (Friends of Alewife Reservation, Little River sites), P. Huckery (Northeast District; Kents Island

Creek sites) and E. Erdman (MA Dept. of Public Health; Connecticut River sites).

Major requests for equipment in FY17 included two hoop fyke nets used in tidal water sampling, and additional electroshocking backpack batteries and chargers to facilitate river sampling.

In FY17, recommendations for the protection, enhancement or climate adaptation of streams were made in several contexts. For example, recommendations to protect and or enhance Priest Brook and adjacent riparian habitat were given to C. Buelow (NHESP) and J. Scanlon (Forestry). Recommendations were also given at several regulatory visits attended with R. Hartley and M. Marold in the Merrimack River system including projects to cap the Haverhill landfill, stabilize streambanks near Riverside Avenue, and fix infrastructure within the Haverhill canals.

2. Serve as the agency representative on the Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS).

Several meetings took place with J. O'Leary to review ACCCNRS duties and responsibilities. In the first meeting, background information on ACCCNRS activities to date was discussed. Later meetings discussed my ability to provide additional fish distribution information to the Climate Adaptation Tool (CAT) and develop vulnerability metrics for coldwater resources. John has also provided reference materials regarding climate adaptation and legislation in the state.

One action asked by USGS from the NEAFWA representative on the ACCCNRS was to provide recommendations for research needs regarding climate change and resource management in the northeast. After reviewing NEAFWA technical reports and engaging other NEAFWA members, a letter was written. An official version of the letter to USGS was signed by C. Sparks on 3/30/17.

The ACCCNRS biannual meeting in Tucson, AZ, was attended in November 2017. Follow-up telephone calls with USGS and the Northeast Climate Science Center regarding research to improve fish and wildlife management were also attended. The meeting's objectives and discussion points were presented to MDFW staff at a brown bag presentation in February 2017.

GIS gdb files of species observations, based on the fisheries database, were given to J. Brooks in January 2017. Species maps for the CAT were made based on these files. A final meeting with John discussed metrics that could be used to understand climate change and land use impacts on coldwater streams. These were drafted and given to him on February 2017 (Table 1).

Around mid-FY17, 50% of my time became devoted towards climate change issues, building on responsibilities associated with ACCCNRS and collaboration with the Northeast Climate Science Center. In summer 2016, a climate change vulnerability assessment of all fish and freshwater mussel Species of Greatest Conservation Need was completed. This information was included in a technical report by EcoSolutions and the Northeast Climate Science Center (Galbraith and Morelli 2016). Two AFWA Climate Change Committee conference calls have also been attended. In May 2017, two panels were participated in during the Regional Meeting of the Northeast Climate Science Center; one regarding natural resource management in the face of climate change, the other regarding coldwater refuge sites. Conference calls led by USGS (Dr. L. Thompson) regarding climate change vulnerability and evolutionary adaptive capacity have also been attended. Funding for ACCCNRS was not renewed by Congress in early 2017. Consequently, the Committee is currently inactive.

3. Informs Assistant Director of activities, issues and potential problems and performs other fisheries research and management assignments as required.

Over the course of summer 2016 and early summer 2017, fish-kill responsibilities were assumed for three, non-consecutive weeks.

TFC and similarity index data was shared with DEP (B. Maietta). Fish surveys for fish tissue analysis for Dept. of Public Health (E. Erdman) were coordinated. A project with UMASS (A. Roy) and DER to understand the benefits of dam removal on stream ecosystems was developed, as spearheaded by S. Mattocks. One fisheries intern from Becker College was mentored. Stephanie Waciszko, a Becker College Junior, is working with our crews for three months in summer 2017.

Meetings of the North Atlantic Aquatic Connectivity Collaborative were attended and a training workshop

with DER (C. Banks; June 2017) was coordinated to use their methods in assessing the impacts of culverts on stream health. Twelve MDFW and three DOT staff participated in the training, thereby increasing the agencies' ability to access one aspect of climate change adaptive capacity in streams. Lastly, invited talks were given to the East Quabbin Land Trust and Boston College on the impacts of climate change on wildlife and fish.

Most of the support work provided to other sections has been to Heritage. Priest Brook was visited and recommendations were provided, as requested, to Heritage and Forestry regarding riparian vegetation management (see Duty 1). Priest Brook will be surveyed in FY18. Assistance to Heritage was also provided during diamondback terrapin and freshwater mussel surveys, and regulatory site visits (Duty 1). Several days of spawning and one day of lake trout fin-clipping were completed with the hatcheries.

The discussion that followed the February 2017 climate change brown bag presentation focused (as requested by A. Gagnon, Northeast District land acquisitions) on potential strategies for protecting coldwater "feeder" streams. A site visit to the Nissitissit-Squannacook watershed was also conducted with her to review potential strategies. Fish surveys were also completed in order to provide data for a NFWF proposal to rebuild the connecting bridge to Kents Island (Duty 1). The associated proposal was reviewed and commented upon.

Three additional responsibilities assigned in FY17 were to 1) digitize historical fish distribution data on hard copy maps by McCabe 1942 and Hartel et al. 2002,

2) act as the Massachusetts representative in the Instream Flow Council, and 3) to participate as the MDFW representative on the MA Climate Adaptation Council. Data on McCabe 1942 maps (44) were transferred onto GIS shapefiles and made available to biologists in winter 2017. Work on the Hartel et al. 2002 maps was begun in spring 2017 and will continue in FY18. This information will be used to inform changes in spatial distribution of fishes over time as well as to create user-friendly maps for anglers.

In October 2016, the biannual Instream Flow Council meeting was attended in Pennsylvania. During the meeting, the Executive Committee accepted me as a member (as the Regional Director-elect). Since the meeting, further participation has included: several conference calls regarding, as well as review of, the updated Strategic Plan. Work has also begun to coordinate video and transcription services for the FLOW 2018 event, duties assigned as member of the planning committee.

Membership on the MA Climate Adaptation Council, led by UMASS-Amherst in collaboration with state and non-profit agencies has begun. In FY17, meetings to discuss the group's role in supporting the state's Adaptation Plan were attended. As a result of the March 2017 meeting, the role of chair to a coldwater resources working group was assigned, with the idea that an adaptive strategy to protect CFRs would be developed under the direction of the Governor's office. Perspective working group members have been contacted and guidance sought from the Governor's Office (K. Theoharides). Work will commence once guidance is received from Ms. Theoharides.



Photo © Troy Gippis

Table 1. Metrics of climate change adaptation in coldwater streams.

Increasing air temperature is the primary climate change effect threatening coldwater streams. Rising air temperatures are expected to increase water temperatures, and change the timing and magnitude of flows. Stream conditions, as a result, will change to the detriment of coldwater habitat quantity and quality (Eaton and Scheller 1996). However, climate change is only one factor with the potential to degrade coldwater streams. Effects from land use patterns, including from existing infrastructure, often mimic climate change effects by also increasing stream temperatures and altering flows (Trombulak and Frissell 2000, Poff et al. 2007). Dams and roads, in particular, can magnify climate change effects. The ability of coldwater streams to adapt to climate change will largely depend on the protection and/or restoration of landscape characteristics that buffer stream temperatures and flows. Several metrics can be used to gage how able coldwater streams are to withstand climate change.

<u>Metric 1:</u> Percent flow alteration of August median flow from groundwater withdrawal	Streams with groundwater inputs are more likely to flow year-round because of the extended storage effect in aquifers (Jefferson et al. 2007, Thompson 2007, Tague et al. 2008). Groundwater-dominated streams tend to have lower peak flows in winter and higher low flows in summer. Consequently, groundwater inputs can mitigate increasingly common flood and drought conditions, and promote habitat connectivity. Groundwater inputs can also mitigate increasing stream temperatures because seepage water is usually colder than ambient stream temperatures. Groundwater withdrawals, in contrast, can decrease stream flows indirectly by limiting recharge of aquifers as well as directly by reducing groundwater inputs (Alley et al. 2002). In Massachusetts, cumulative groundwater withdrawals that exceed 50% August median flow reduce the ability of some small to medium streams to support diverse fish communities (Armstrong et al. 2011).
<u>Metric 2:</u> Barrier density (no. of dams + culverts/ river mile)	Dams fragment habitat and disrupt physical process that maintain healthy stream habitats (Poff et al. 1997, Magillian and Nislow 2005, Poff et al. 2006). Dam releases seldom reflect natural flow patterns and reservoirs behind them can act as heat sinks that warm downstream temperatures. Furthermore, dams act as barriers to migration of organisms which support natural food webs and promote healthy fish populations. Perched and undersized culverts at road stream crossings can likewise disrupt upstream-downstream movement of organisms, and the exchange of sediment and nutrients (Nislow et al. 2011, Briggs and Galarowicz 2013). Dam removal and culvert replacement can successfully restore natural flow and temperature patterns as well as connect previously fragmented habitats (Poff and Hart 2002, Stanley and Doyle 2003, Poplar-Jeffers et al. 2009).

Metric 3: Percent (%) of basin that is impervious cover	Land use near and upslope of streams can have significant impacts on coldwater habitat quality and flow patterns. Urbanization, in particular, can concurrently increase runoff rate and decrease soil infiltration, resulting in flashier streams (Poff et al. 1997, Armstrong et al. 2007 and references therein). Runoff from urban development can also introduce pollutants and warm water into waterways (Paul and Meyer 2001, Arnold and Gibbons 2007). A hallmark of urbanization is an increase in impervious surfaces (e.g. roads, sidewalks, parking lots) across the landscape (Arnold and Gibbons 2007). Percent impervious cover was the best indicator of land use effects to streams in a recent survey; as little as 15% impervious cover in a basin can result in conditions that exclude some native fish species and rates of 25-30% can result in conditions that largely favor warmwater fishes (Armstrong et al. 2007).
Metric 4: Percent % riparian cover in 240 m buffer (120 m on either side of stream center line)	Intact forests along streams protect the ecological integrity of riparian habitats (Broadmeadow and Nisbet 2004, Coles et al. 2004). Maintenance and restoration of riparian vegetation along stream channels can buffer coldwater habitats from solar radiation and increased air temperatures (Barton et al. 1985, Morrelli et al. 2016 and references therein), as well as protect water quality from pollutants and siltation (Hughes et al. 2006). Riparian buffer strips 240 m wide (120 m along each bank) have been used to quantify the benefit of forested land on stream habitats (Coles et al. 2004). However, hydrological alteration in streams can overwhelm benefits afforded by intact riparian buffers (Roy et al. 2006), further emphasizing the need to protect instream flows (see Metric 1).

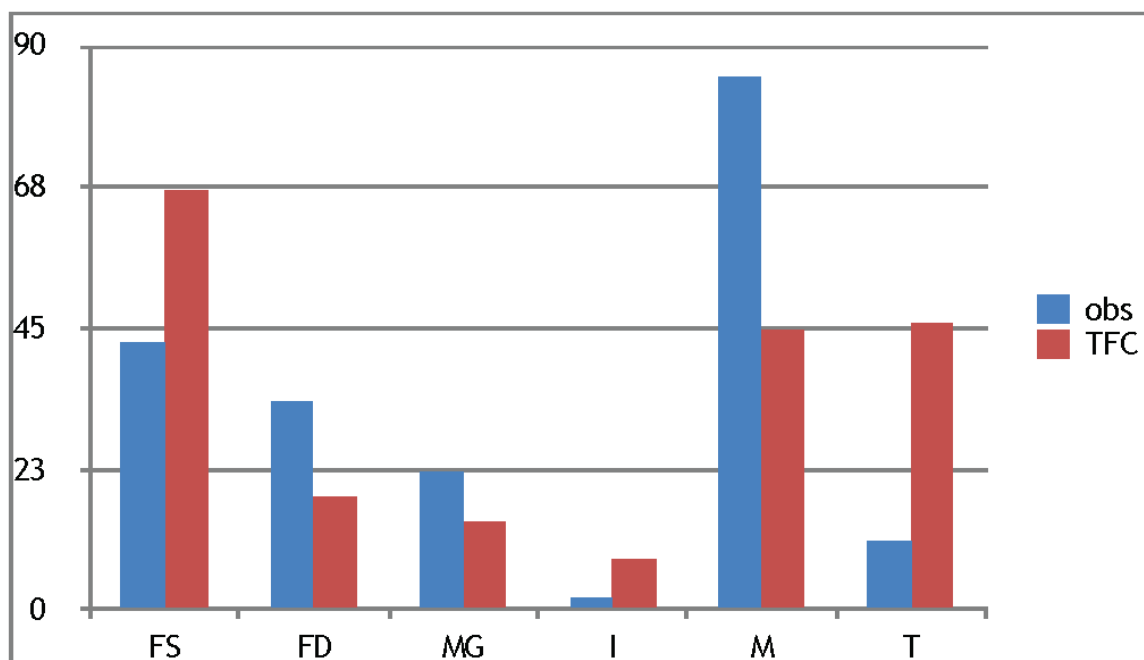


Figure 1. Comparison of observed (obs) vs. Target Fish Community (TFC) relative abundances of species habitat use and tolerance categories in the Millers River. FS=Fluvial Specialist, FD=Fluvial Dependent, MG=Macrohabitat Generalist, T=Tolerant, M=Moderately Tolerant, I=Intolerant.

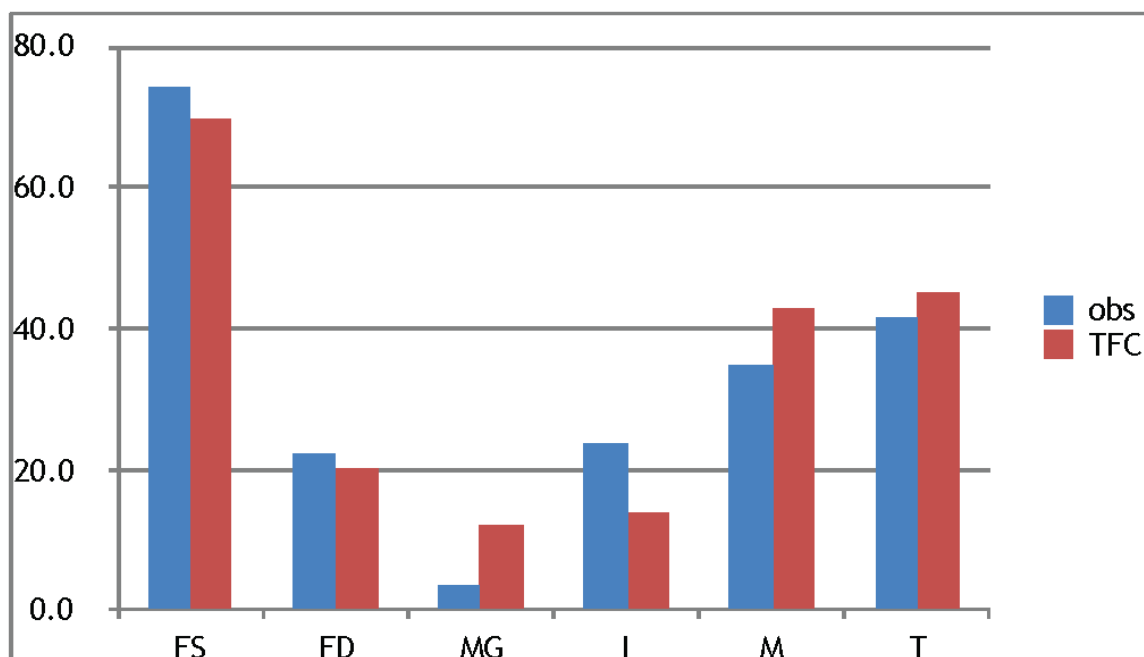


Figure 2. Comparison of observed (obs) vs. Target Fish Community (TFC) relative abundances of species habitat use and tolerance categories in the Deerfield River. FS=Fluvial Specialist, FD=Fluvial Dependent, MG=Macrohabitat Generalist, T=Tolerant, M=Moderately Tolerant, I=Intolerant.

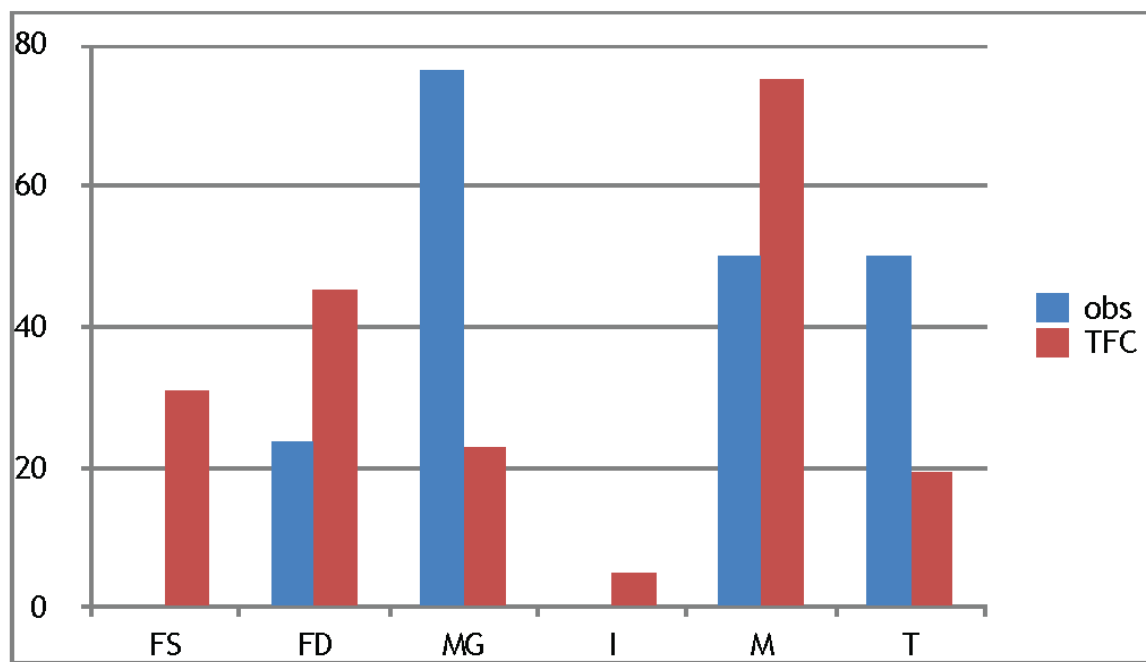


Figure 3. Comparison of observed (obs) vs. Target Fish Community (TFC) relative abundances of species habitat use and tolerance categories in the Taunton River. FS=Fluvial Specialist, FD=Fluvial Dependent, MG=Macrohabitat Generalist, T=Tolerant, M=Moderately Tolerant, I=Intolerant.

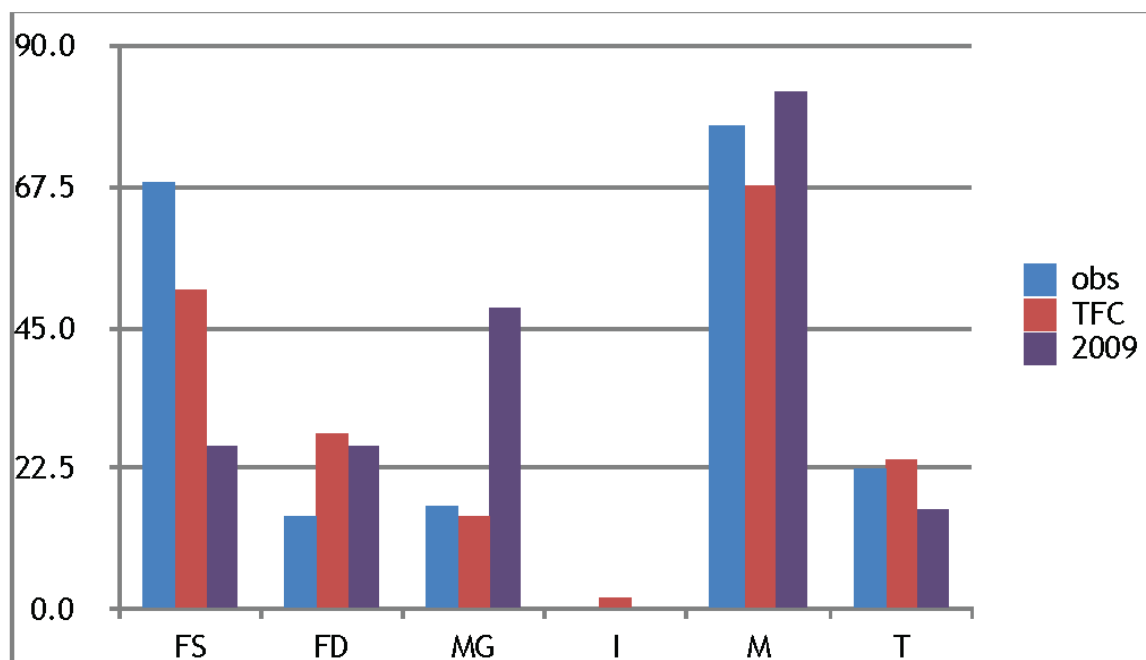


Figure 4. Comparison of observed (obs), Target Fish Community (TFC) and 2009 relative abundances of species habitat use and tolerance categories in the Quinebaug River. FS=Fluvial Specialist, FD=Fluvial Dependent, MG=Macrohabitat Generalist, T=Tolerant, M=Moderately Tolerant, I=Intolerant.

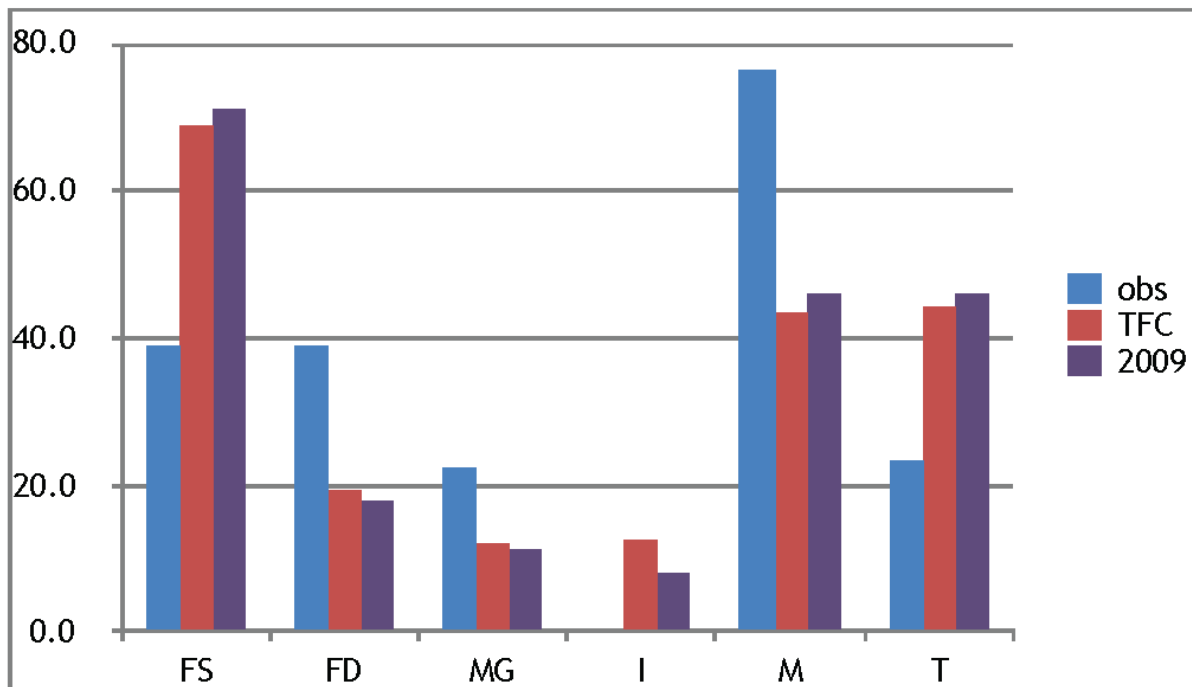


Figure 5. Comparison of observed (obs), Target Fish Community (TFC) and 2009 relative abundances of species habitat use and tolerance categories in the Westfield River. FS=Fluvial Specialist, FD=Fluvial Dependent, MG=Macrohabitat Generalist, T=Tolerant, M=Moderately Tolerant, I=Intolerant.



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Wildlife

Laura Conlee (partial year) / Michael Hugenin (partial year)
Assistant Director, Wildlife Research

Overview

The Wildlife Section is responsible for the conservation, management, and research of wildlife and game populations within the Commonwealth of Massachusetts; habitat management to maintain and enhance biodiversity on state Wildlife Management Areas (WMA); responding to human-wildlife conflicts; guiding and supporting the agency's Large Animal Response Team (LART); and supporting wildlife-dependent recreational opportunities. Toward these ends, professional biologists in the Section, including foresters, ornithologists, ecologists, and technicians, implement wildlife habitat management and the deer, moose, furbearer, upland game, black bear, wild turkey, waterfowl, and bird conservation programs; study population ecology; license and inspect commercial game preserves; test and license Problem Animal Control (PAC) Agents, wildlife rehabilitators, and falconers; inspect commercial deer farms and other wildlife propagators' facilities; issue and process antlerless deer, turkey, and black bear permits; and administer a statewide pheasant-stocking program. The Wildlife Section develops science-based regulatory, policy, and pro-

grammatic recommendations for the Fisheries and Wildlife Board; provides technical assistance on habitat assessments for proposed management on DCR and other public and private forestlands; serves as the wildlife representative on the agency's land acquisition committee; directs and coordinates with the University of Massachusetts and the USGS Cooperative Fish and Wildlife Research Unit on scientific wildlife research projects within the Commonwealth of Massachusetts; represents the agency on wildlife conservation and management issues in public forums and in partnership with local, state, federal, and private organizations and entities; and serves as the state representative on the Northeast Association of Fish and Wildlife Agencies' various technical committees, as well as for the Northeast Association of Wildlife Administrators.

Deer Management Program

David Stainbrook, Deer and Moose Program Leader

Harvest and Population

The statewide 2016 harvest of 12,249 deer represents the third-highest harvest reported in Massachusetts

Figure 1.

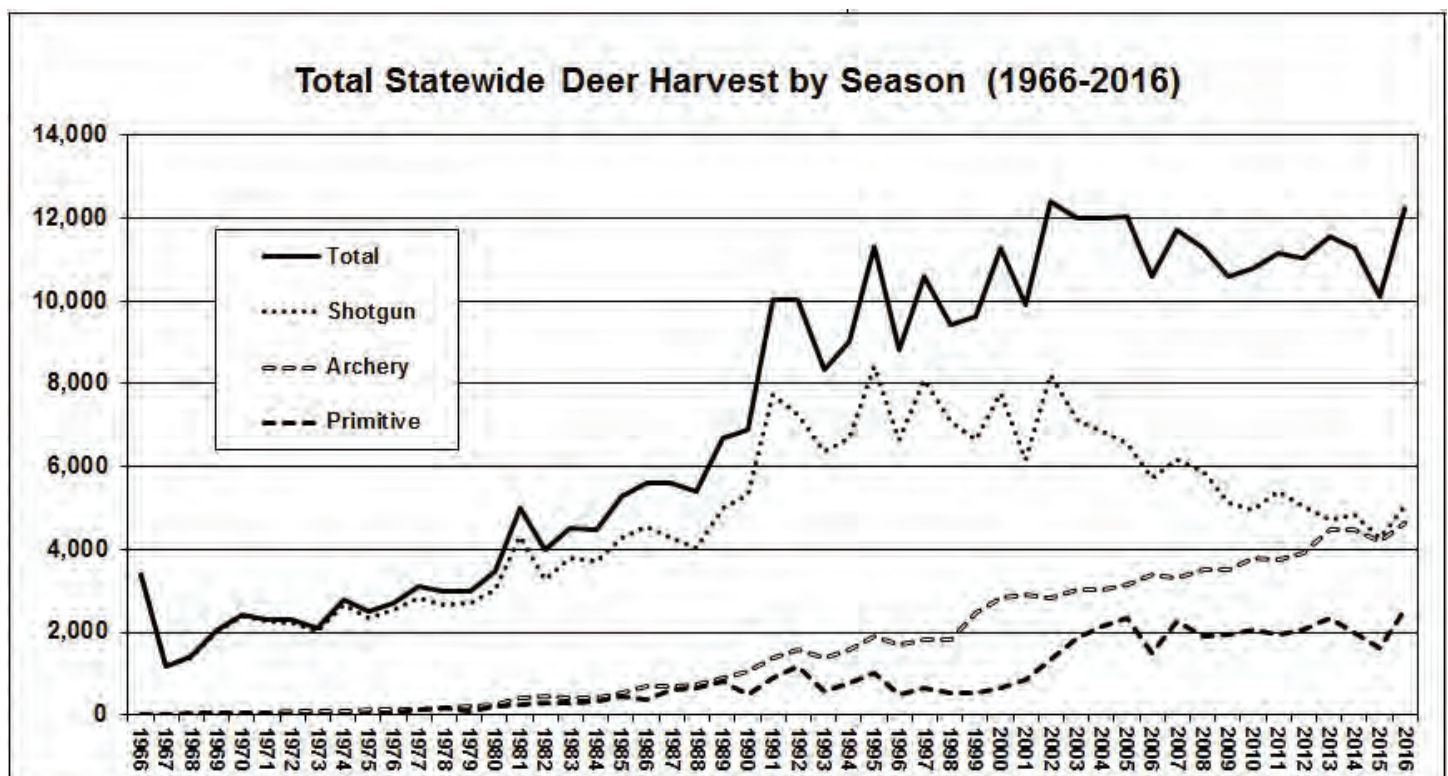


Table 1. The 2016 white-tailed deer harvest by season and sex/age class in Massachusetts, including Quabbin harvest.

Season	Adult Male	Female	Button Buck	Total	Percent Harvest
Paraplegic/Youth	56	72	10	138	1%
Archery	3,235	1,126	295	4,656	38%
Shotgun	2,587	1,870	463	4,920	40%
Primitive	1,165	1,126	244	2,535	21%
State	7,043	4,194	1,012	12,249	100%

Table 2. The 2016 white-tailed deer harvest by deer sex/age and the number of antlerless deer permits allocated and issued, by WMZ, for Massachusetts (Quabbin excluded).

WMZ	Male	Female	Button Buck	Total	Population Management	2016 Allocation	2016 Issued
1	270	70	14	354	Increase	400	396
2	454	38	3	495	Increase	175	147
3	406	128	14	548	Increase	1,100	1,076
4N	434	95	18	547	Increase	375	375
4S	247	53	4	304	Increase	275	282
5	373	160	25	558	Increase	1,250	1,236
6	96	28	6	130	Increase	300	301
7	331	225	53	609	Stabilize	2,250	2,176
8	494	247	51	792	Increase	2,500	2,476
9	672	375	78	1,125	Stabilize	4,100	3,808
10	1,077	981	269	2,327	Reduce	12,000	11,795
11	1,494	998	250	2,742	Reduce	11,000	10,753
12	155	67	14	236	Stabilize	800	781
13	271	396	100	767	Reduce	2,700	1,765
14	232	320	110	662	Reduce	2,700	1,333
Statewide	7,006	4,181	1,009	12,196		41,925	38,700

since 1966 (Fig. 1). The 2016 total harvest was about 20% higher than the 2015 hunting season and 10% higher than the previous 5-year average. The near record breaking harvest was attributed to great hunting conditions with snow cover during much of the season and also making up for the low 2015 harvest.

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 50 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. For example, a 2013 non-harvest-based deer survey on the Blue Hills Reservation (over 7,000 acres closed to hunting) near Boston yielded estimates of over 85 deer per square mile of forest.

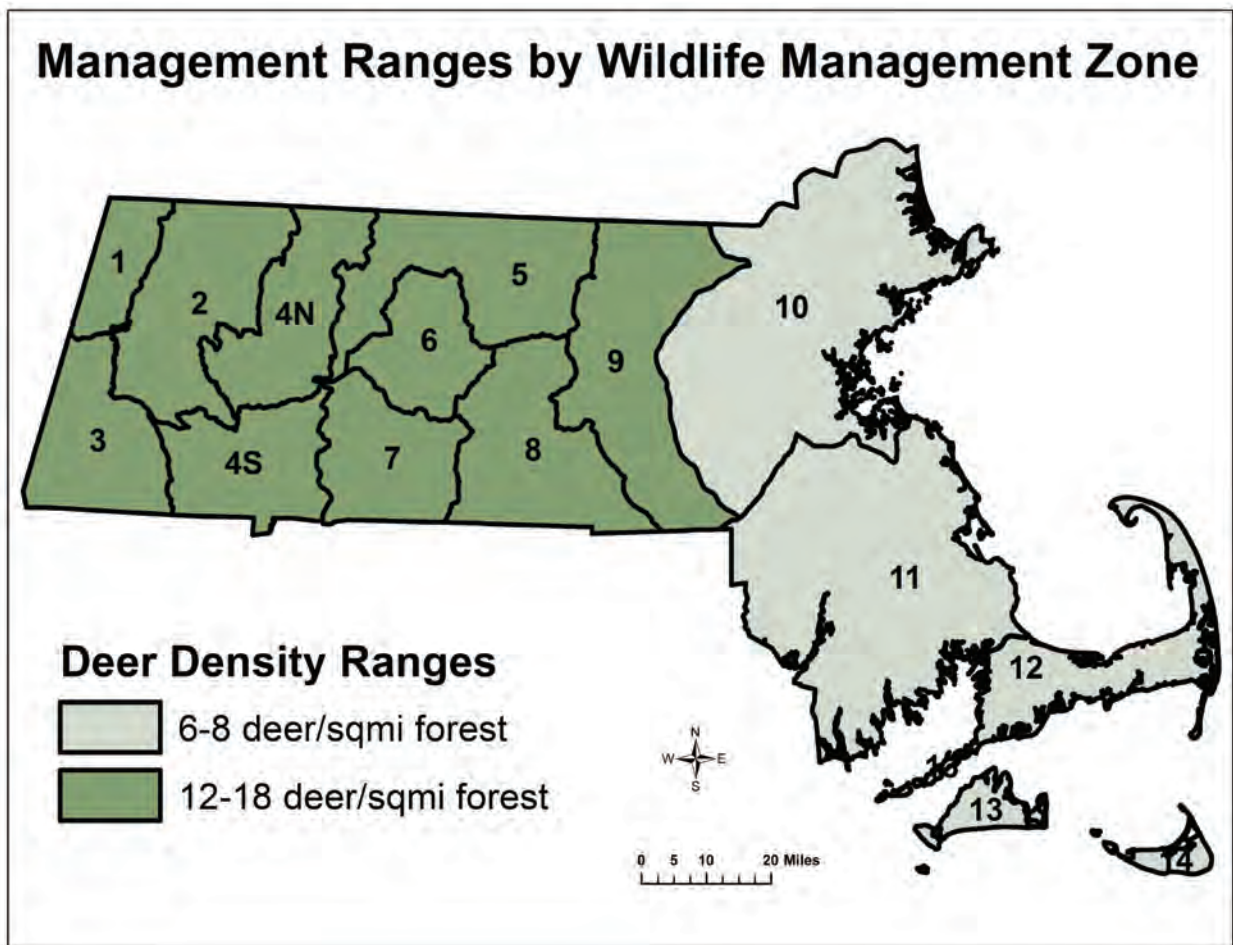


Figure 2. Map depicting management ranges for the 15 Wildlife Management Zones in Massachusetts, which satisfy the statewide deer management goal of keeping deer densities below the level where major impacts are seen to the habitat, but in balance with social desires/tolerance.

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; Fig. 2). Overall, we've met or are very close to our deer density management ranges in the western and central parts of the state (Figs. 2 and 3). However, some areas in the central WMZs appear to be on the lower end of our management range, so antlerless permit allocation has remained at a low level to stabilize or increase numbers, which led to fewer deer being harvested (Fig. 1 and Table 2). 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 MA because of the lack of hunter-access, which limits our ability to reduce deer numbers.

The ADP allocation for 2016 was 41,925 permits (slight reduction in WMZs 6 and 8). However, 38,700 permits (92% of allocated) were actually issued in 2016 (Table 2). 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 play and pay than in previous years. Prior to 2012, we were typically issuing about 95% of the allocated permits in most zones. The decided solution, 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 play and pay and the under-harvest associated with the permit under-issuance.

Research

No deer-related research projects occurred in FY 16/17.

Chronic Wasting Disease

Funding provided by the USDA APHIS ceased in early 2012, thus we did not collect or test any hunter har-

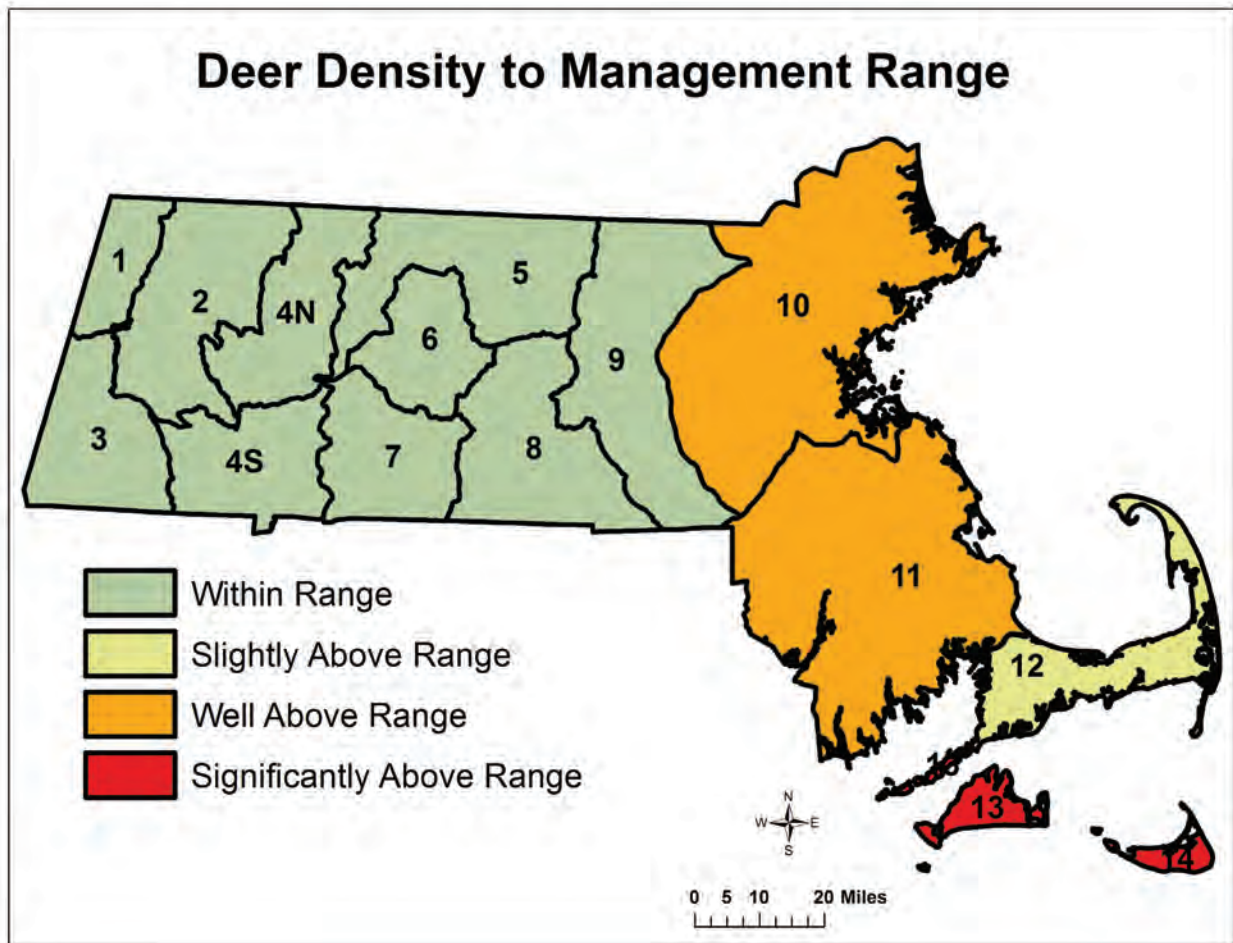


Figure 3. Map depicting how the current deer densities relate to the management ranges for the 15 Wildlife Management Zones in Massachusetts.

vested deer from MA in 2016. We will continue to sample for CWD from suspect deer provided we can allocate the funds required for testing.

Moose Program

David Stainbrook, Deer and Moose Program Leader

Traditionally, MassWildlife has collected reported data of moose-vehicle accidents (MVA). In 2016, 25 MVAs were reported. However, MVAs are not always reported to MassWildlife or to the MA Environmental Police; thus, these reports make up only a 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 (Fig. 4; reporting rate 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. The number of reports per town can be useful when making decisions about areas to focus on with signage on highways (Figure 5).

The current moose population in Massachusetts is estimated to be around 1000 animals. We use 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). The hunter observation data can be used to map moose distribution across the state (Fig. 6).

Chronic Wasting Disease

Funding provided by the USDA APHIS ceased in early 2012, thus we did not collect or test any moose in 2016. We will sample for CWD in suspect moose provided we can allocate the funds required for testing.

Reported Moose-Vehicle Collisions from 1980-2016 for Massachusetts

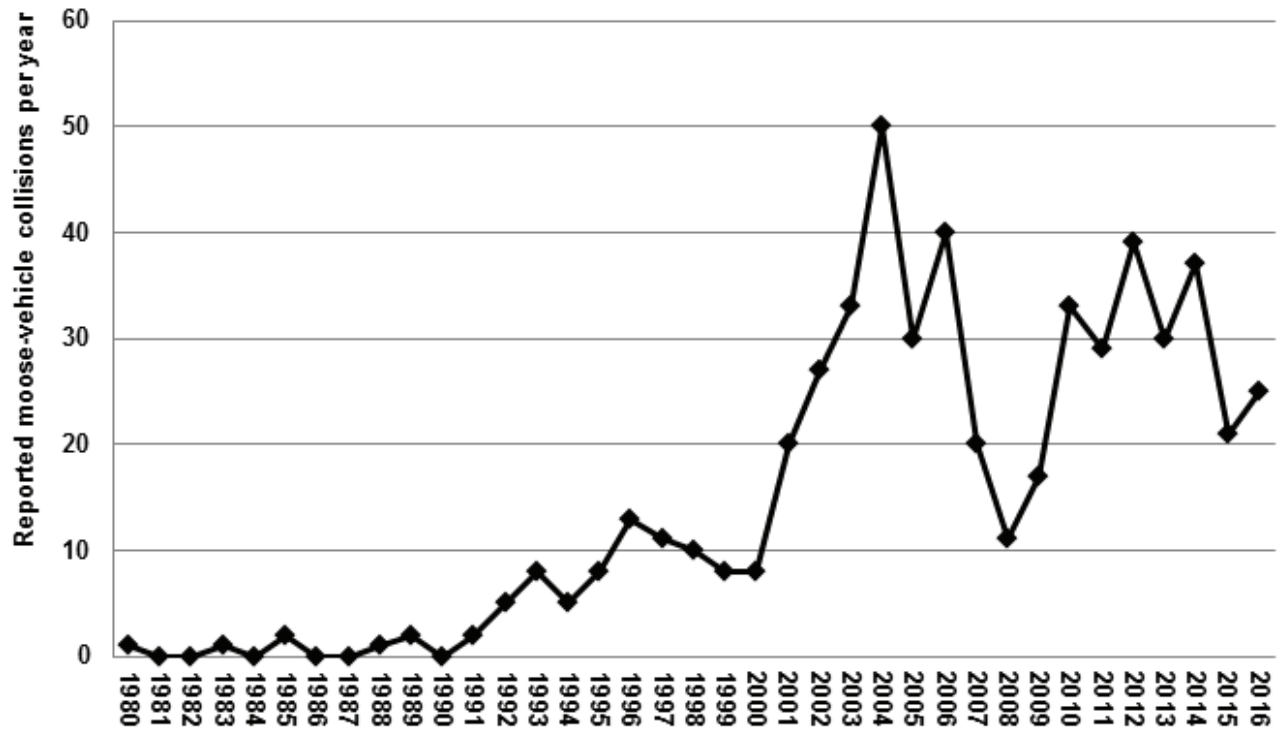


Figure 4. Total moose-vehicle accidents reported per year from 1980 to 2016 in Massachusetts.

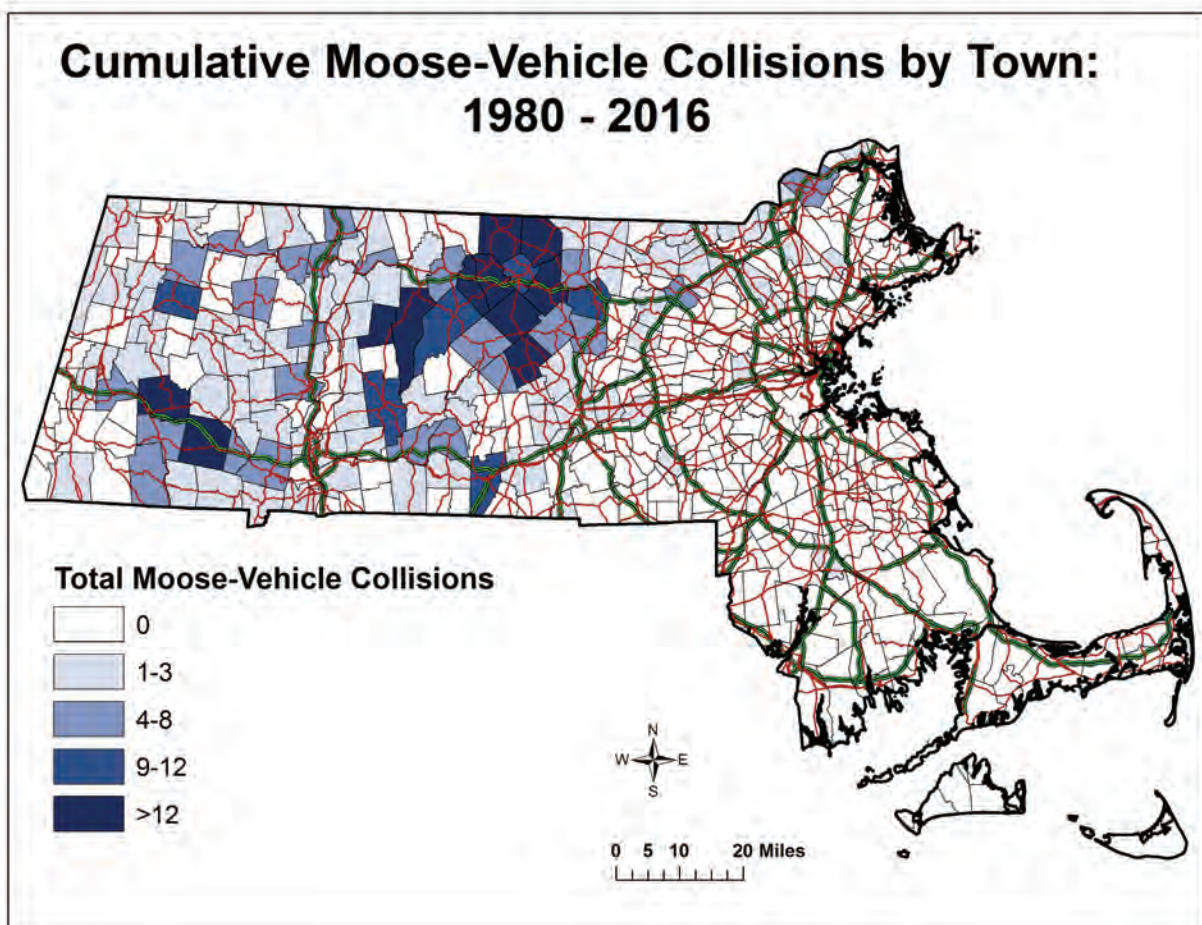


Figure 5. Total number of moose-vehicle accidents reported by town from 1980 to 2016 in Massachusetts.

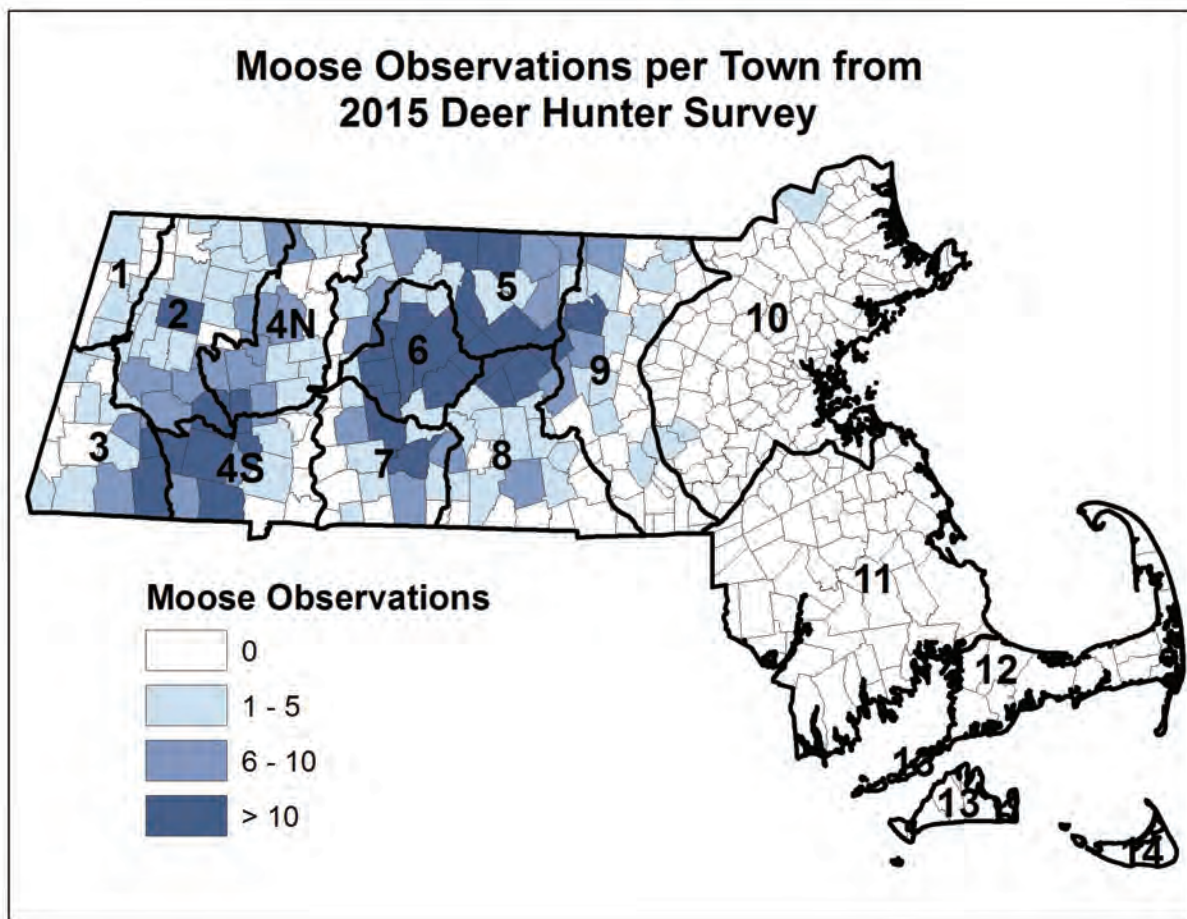


Figure 6. Observations of moose by town reported in the 2015 hunter survey in Massachusetts. The moose observations from the 2016 hunter survey have not been analyzed.

Black Bear Program

Dave Wattles, Black Bear Program Leader

Black Bear Distribution and Harvest Investigations

A record total of 15,079 bear-hunting permits were issued for the 2016 hunting season. A record total of 283 bears (240 in 2014) were taken during the 48-day season, including 190 during the 17-day September segment, 46 during the 18-day November segment, and 47 during the 12-day deer shotgun season segment. One hundred forty males, 139 females and 4 unknown were taken in Berkshire (n=106), Franklin (n=57), Hampden (n=65), Hampshire (n=42), Middlesex (n=1) and Worcester (n=12) counties. Seventy-six percent of bears were reported through the online system in 2016, compared to 66% in 2015, 74% in 2014 and 69% in 2013. Results from the 2016 Annual Hunter Survey showed that 28.7% of respondents reported that they purchased a bear hunting permit in 2016 and 23.1% reported they hunted bear during the 2016 season. Of hunters that reported hunting bear, 64.4% did so while hunting other game and 35.6% specifically tar-

geted bear. Thirty six percent of bear hunters hunted during the September bear only season, 65.2% of bear hunters hunted in the November season, which overlaps with deer archery season, and 77.7% of bear hunters hunted during the shotgun season, with only 3% of those hunters only targeting bear. There were 52 additional confirmed mortalities in CY 2016. These mortality records are collected by Massachusetts Division of Fisheries and Wildlife staff and through Environmental Police call logs and included: 30 road-kills; 14 bear taken under M.G.L. Ch. 131, Sec. 37, 1 electrocution, 1 public safety kill, and 4 of unknown causes. Mass-Wildlife received 116 bear calls and the Massachusetts Environmental Police received 339 bear calls.

A proposal to open bear hunting statewide and allow bear hunting during the shotgun deer season was approved by the Fisheries and Wildlife Board in 2014 and became effective for the 2015 bear season. Forty-seven bears were harvested during the new deer shotgun season in 2016 (59 in 2015).

Black Bear Research

The Massachusetts Division of Fisheries and Wildlife 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, 2017, 15 female and 3 male bears were being monitored with GPS collars and another 8 females with VHF collars. To date, 44 female bears have been monitored with GPS collars, of which most have been monitored for at least 2 reproductive seasons. Additionally, 4 male bears have been monitored with GPS collars. In 2017 we began collaring bears in our Western Wildlife Management District. MassWildlife monitored cub production/yearling survival at all successful winter dens or through encounters with sows/yearlings.

Furbearer Program

Dave Wattles, Furbearer Program Leader

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 em-

plays 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 1,774 furbearers were tagged at MassWildlife check stations during the 2016-17 season. The harvest (a combination of hunted, trapped, and/or salvaged) of tagged species included 534 beaver, 100 bobcat, 486 coyote, 280 fisher, 56 gray fox, 8 mink, 101 river otter, and 70 red fox. Trapper survey results indicated that a minimum of 46 raccoons, 34 muskrat, 15 skunks, 10 opossum, and no weasel were trapped during the 2016-17 season.

Division staff conducted a hunter survey of all license buyers that provided an email address in 2016. Coyote is the most popular furbearer that is hunted. Twenty-five percent of respondents indicated that they hunted coyote, and 42% of those respondents specifically targeted coyotes. Four percent of all respondents hunted fox, 5.3% hunted bobcat, 2.2% hunted raccoon, and 1.1 % hunted opossum. Bobcat, coyote, and fisher sighting questions were added to our annual hunter survey in order to calculate sightability rates by town and wildlife management zone. Results of those data indicate that coyote are common throughout the state, bobcat numbers appear to be increasing and expanding into more developed eastern zones (9, 10, and 11), and fisher appear well adapted to suburban areas, with our highest sighting rates currently occurring in the eastern WMZs.

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 prop-

erty 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 the DFW.

Licensed trappers tagged 511 trapped beaver during the 2016-17 trapping season, of which 41 were reported as taken under emergency permits. PAC Agents reported taking 191 beaver outside the trapping season (April 15, 2016 - October 31, 2016) under emergency permits and 188 beaver during the trapping season of which 28 were taken under emergency permit. Licensed trappers reported through the voluntary trapper survey that 180 beaver were taken under the local Board of Health 10-day Emergency Permit, which includes beaver taken outside the season (n=125) and only beaver taken during the season that were not sealed at a MassWildlife check station (n=55). In total, a minimum of 399 beaver were taken outside of the trapping season as nuisance animals. A minimum of 371 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.)

The Human-Wildlife Conflict Trends Project

Susan McCarthy, Wildlife Biologist

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 we developed a new online data collection system and emphasized the importance of rigorous data collection. The new data collection system gave us the ability to better categorize reports by providing the collector with a set of standard report types from which to choose. Also, we were able to collect data on the type of concern associated with the report. The new system has made data collection and data entry more efficient by first, allowing for multiple reports per page and second, by not requiring the collector to describe the report type therefore, not requiring the enterer to subjectively interpret and categorize the report type. Also, 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 district biologists with information to assist them when providing advice and management options to the general public regarding human-wildlife interactions/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 DFW offices regarding a variety of wildlife-related issues.

Summaries

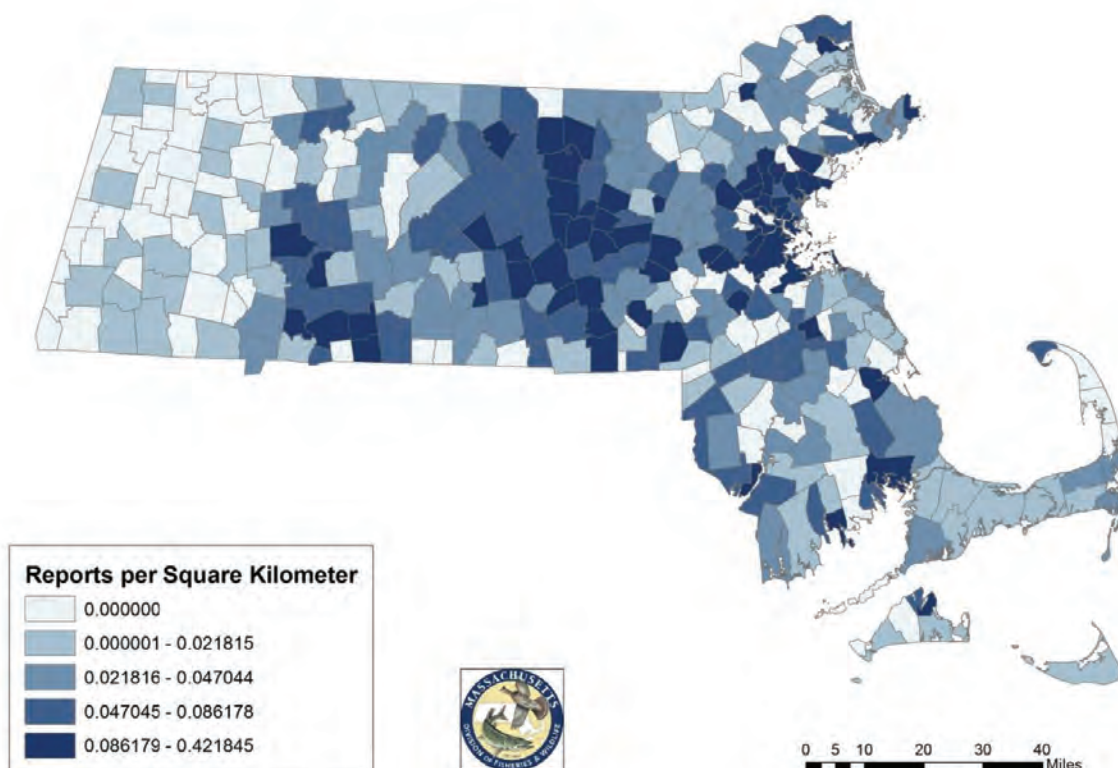
Via the new system, human-wildlife interactions were recorded in 256 of 351 towns across Massachusetts, totaling 925 (Fig. 1) from July 2016 to June 2017. Ninety-six percent of records (885) contained a species, 98% (911) contained a report type, 96% (884) contained a concern type, and 94% (871) contained a town.

We received reports of 43 different species, of which 12 made up over 75% of all reports (Fig. 2). We received more reports in May (168, 18%) than any other month followed by June (159, 17%), August (105, 11%), and July (87, 9%) (Fig. 3). The highest number of reports were of property damage (468, 51%) and the least number of reports were of public safety (56, 6%). Reports involving threats to public safety include; wildlife found inside a dwelling, wildlife approaching humans and/or pets on a leash, aggression toward humans, and human attack. Of the 56 reports of threat to public safety, 1 was reported as human attack which involved a mouse.

Conclusion

The electronic version of the animal report form account for the increased reports due to the ease entering data via an electronic form. The new animal report form seems to have improved MassWildlife staff's ability to collect more objective and robust data regarding human-wildlife interactions. Capturing more diverse human-wildlife conflict data may be the result of several factors; an increased emphasis on collection effort, the implementation of a new electronic animal report

Total Reports of Human-Wildlife Interactions for Fiscal Year 2017



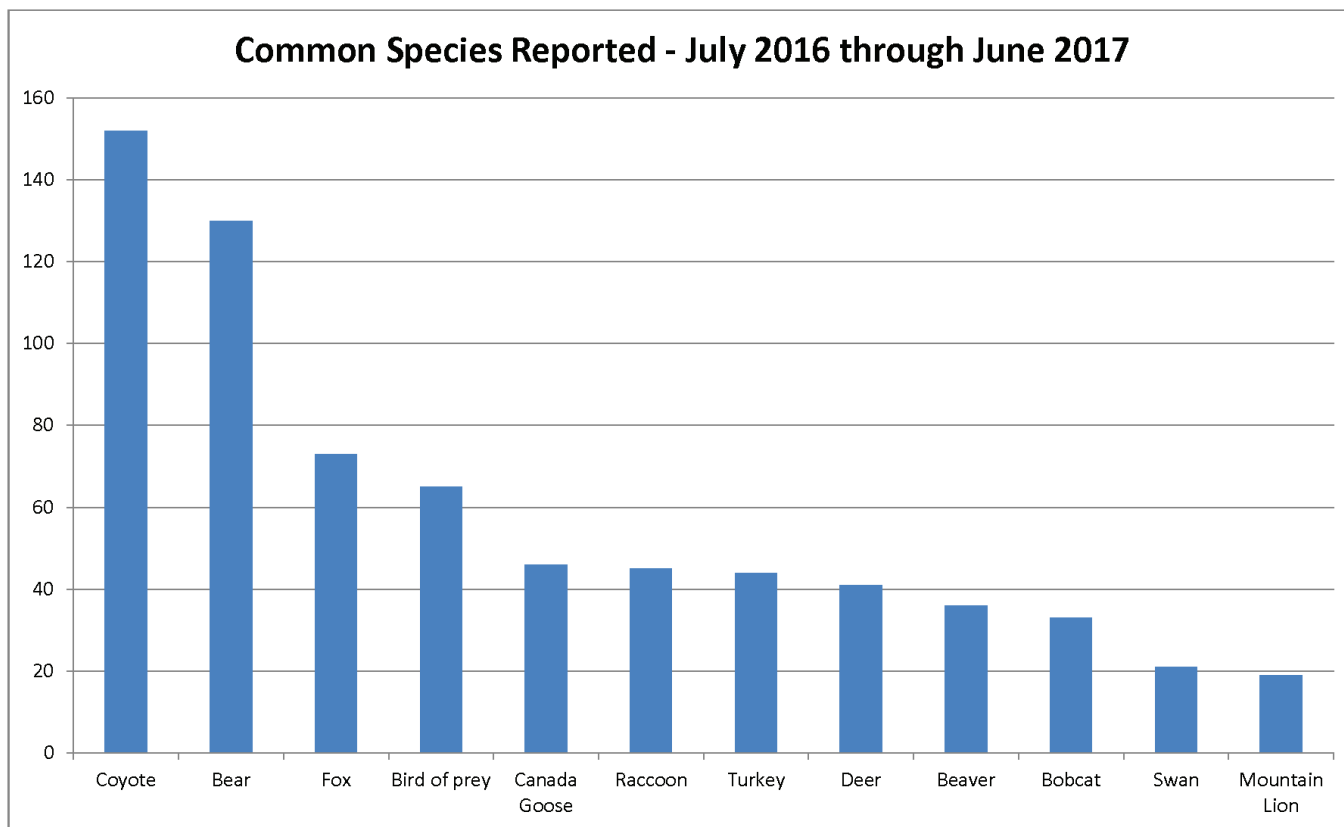


Figure 2.

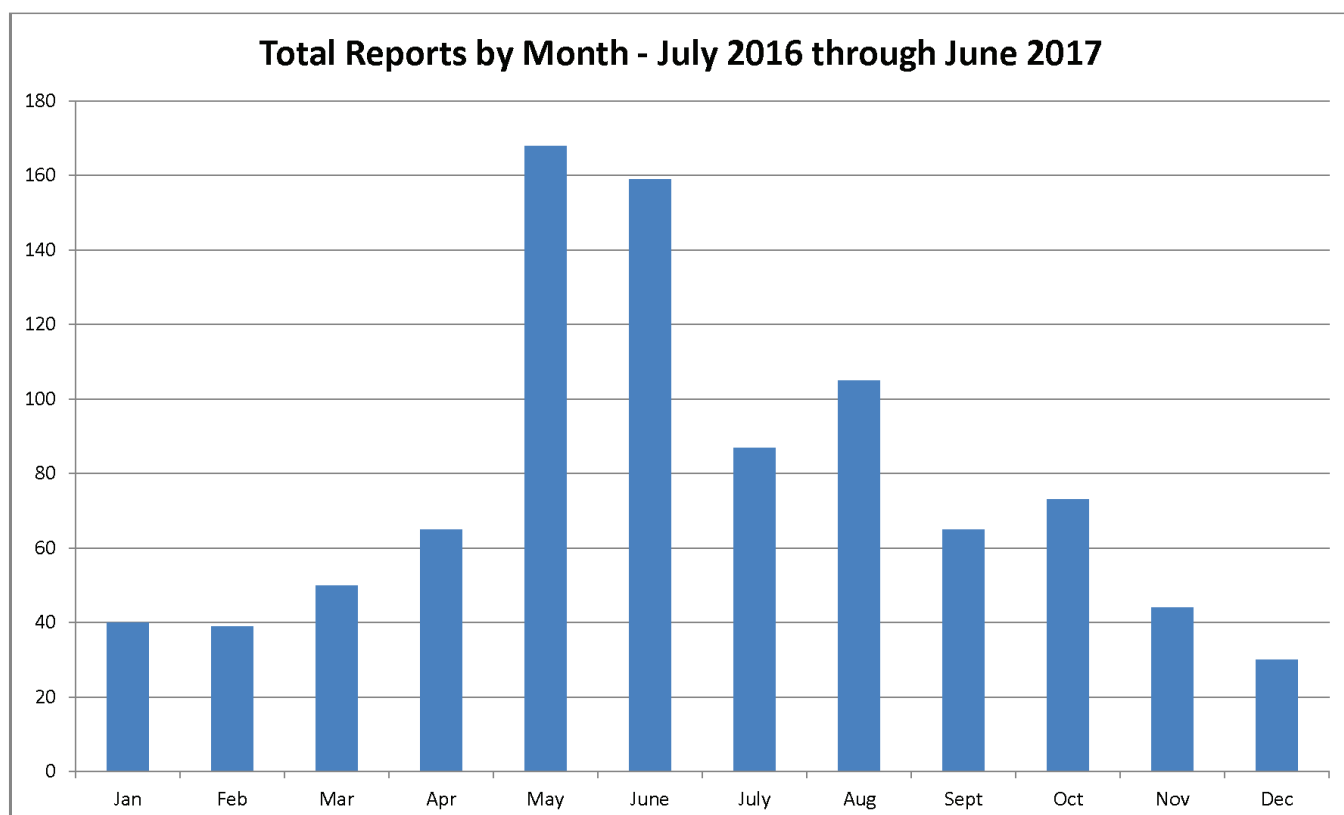


Figure 3.

form, an actual increase in conflicts, or a combination of some or all of these things. Regardless, MassWildlife staff has found data collection and data entry to be more efficient due to the new animal report form. Also, the new animal report form has proven effective at capturing more robust and less subjective data. Collecting these types of data, affords us the opportunity to conduct more in depth analyses. In areas where percentage of forest increases, interactions decrease. Understanding the relationship between landscape and interactions can help MassWildlife staff focus management strategies such as education.

Summarizing reports of interactions gives us the power to better inform both the public and MassWildlife biologists. Summary information can also be used to uncover trends in interactions both spatially and temporally. Total report density across towns has remained relatively consistent over time. In general, major metropolitan areas tend to report more interactions between humans and wildlife than do more rural settings. Also, the proportion of report type is nearly identical from last year to this year, and the three most common species remain bear, coyote, and fox.

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 are likely to occur. Specifically, we will utilize summaries of past year's data to inform Information and Education (I & E) staff on 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).

Upland Game

Wild Turkey

Dave Scarpitti, Upland Game Biologist

Brood Survey

Beginning in 1997, voluntary brood reports were solicited from MassWildlife staff and other cooperators/citizens statewide. Brood counts were collected from June to August in 2016. Overall, volunteer brood surveys identified 2955 poults and 1248 hens from June-August 2016. The total (3-months combined) brood index was 3.9 poults per hen (hens with broods) and 2.4 poults per hen (all hens). Brood production as measured through this survey has been relatively stable over the past several years, however the brood index from 2016 was on the lowest since 2009. Brood survey data were collected again from June – August 2017. In addition to the observation of hens and poults, survey respondents were asked in 2017 to also record any male turkeys observed. Data analysis and results for the 2017 turkey brood surveys are pending.

Hunter participation

In Massachusetts, a hunter who obtains a wild turkey hunting permit can harvest no more than 2 turkeys total in a calendar year. They have the option to harvest up to 2 bearded turkeys during the spring hunting season which then precludes them from fall turkey hunting. If one or zero turkeys are harvested in the spring hunting season, hunters may then have the opportunity to harvest one turkey of either sex during the fall hunting season. Although the number of hunters eligible to participate in the fall season is known (number of hunters that possess a wild turkey permit minus the number of hunters that harvested 2 spring turkeys), no reasonable estimate of actual fall hunter participation currently exists. Spring hunter participation is assumed to be high (>90%) relative to the number of permits issued.

In 2017, approximately 21046 wild turkey permits were issued prior to the spring hunting season. The number of spring turkey hunting permits issued in 2017 is slightly lower but still in excess of 21000 for the fifth consecutive year. The number of fall hunters remains unmeasured as most hunters who purchase a permit prior to the spring season still have at least 1 tag available for the fall season, however it is unclear how many that are eligible actually hunt for turkeys during

the open season. Hunter survey data may aid in estimating fall hunter abundance. Regardless, the fall only permit sales increase demonstrates a growing demand for fall turkey hunting opportunity, as again a record 4645 fall only permits were issued in 2016, nearly 300 more than were issued the previous year.

Fall 2016 Harvest

The 12 day fall wild turkey hunting season occurred from 24 October – 5 November 2016. Fall season length was expanded from a 6-day to a 12-day season statewide, and expanded into WMZ's 10-12 in 2012. A total of 238 wild turkeys were harvested, the highest fall harvest since 1999 (304). Harvest in the 1st fall season of 1990 was 329.

There were 97 male and 141 female (59.2%) wild turkeys harvested during the 2016 fall hunting season. The proportion of females harvested in 2016 was comparable, but slightly higher to most years over the past decade (41.8-59.8%) and represents the 5th consecutive year where the female harvest was greater than the male harvest. In the fall, sex identification of juvenile turkeys can be challenging to untrained hunters, so it is likely there is a substantial reporting bias where hunters report female harvests when actually they have harvested a juvenile male.

Archery hunters (including crossbow under special permit) continued to contribute a significant portion of the total harvest, accounting for approximately 28.6% of the total fall harvest; spring season archery hunters typically account for 4-5% of the total harvest. A large portion of this archery harvest can likely be attributed to archery deer hunters who are opportunistically harvesting turkeys. The high prevalence of archery harvest during the fall season, and the growth of fall only permits indicate continued growth in demand for fall turkey hunting opportunities. Due to the very low harvest in the fall season, additional expansion of hunting opportunity is warranted.

Hunter participation, weather conditions, and food availability may all influence the fall turkey harvest. 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. However, archery deer season hunters appear to be opportunistically harvesting turkeys when the seasons overlap each fall. That said,

overall fall hunter participation remains relatively unknown and is generally considered to be low relative to the number of total turkey permit holders. Further, sexing and aging of harvested fall turkeys is hampered by the inexperience or disinterest on the part of cooperating check station operators, many of which collected unusable or incomplete feather samples and inaccurate biological measurements.

Spring 2017 Harvest

The 4 week spring wild turkey hunting season occurred from 24 April – 20 May 2017. A record total of 3179 wild turkeys were harvested during the regular spring season, representing the highest spring harvest total ever. An estimated 12.1% of permitted hunters were successful in harvesting at least one turkey during the spring hunting season which is the highest computed hunter success rate since on-line licensing began in 2012. Approximately 3.0% of permitted spring turkey hunters harvested a season limit of 2 bearded wild turkeys. Actual hunter success rate is likely slightly higher than reported as an unknown number of hunters may obtain a permit but fail to hunt during the 4 week spring hunting season; annual survey efforts are being employed to determine hunter participation rate for the spring and fall seasons.

Bearded hens accounted for less than 1% of the total spring 2017 wild turkey harvest. In fact, only 4 total hens were reported during the spring season indicated the potential for some substantial reporting bias, primarily associated with online reporting in all likelihood. Bearded hens have comprised <1% of the total spring wild turkey harvest over the past decade, however there are typically 12-25 hens reported each year. Over 2.5X more adults (73.1%) were harvested compared to immature males (26.8%). The ratio of adult males to immature males was 2.73; it is likely that the high adult:immature ratio is due to hunter preference but also indicative of strong juvenile recruitment.

In 2017, harvest was highest in Worcester (n = 820), Franklin (n = 482), and Berkshire (n = 364) 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 now open for 4 weeks statewide, except for Nantucket which lacks evidence of wild turkeys and is closed to spring turkey hunting. Generally, western counties are showing re-

duced spring harvest while eastern counties are showing increasing turkey harvest, however spring turkey harvest in 2017 was higher in every county compared to 2016. Again, the distribution of hunter effort may be greatly influencing this trend, however it is also quite possible that as habitat in western portions of the state are less productive and turkey abundance/turkey hunting interest is declining.

A near record proportion of spring turkey hunters (7.4%) harvested turkeys with archery equipment in 2017; archery hunting for wild turkeys and other big game continues to increase in popularity particularly in areas of eastern Massachusetts where many towns and properties will only allow archery equipment as an acceptable means of take.

The record spring harvest in 2017 is likely the result of a couple of productive brood years in 2015 and 2016, and relatively reasonable winter conditions as well. Overall, hunting opportunities remain excellent across the state, as the relatively high turkey population statewide continues to offer quality hunting experiences.

2017 Spring Youth Turkey Hunt

The 9th annual mentored youth wild turkey hunt was held on 24 April 2016, 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. Youths aged 12-14 were given a special 1-day turkey tag. Youths 15-17 are required to be licensed and obtain a regular turkey permit to be eligible for the mentored youth hunt day.

An estimated 256 youths participated on the youth turkey hunt day (285 youth permits issued). Youths harvested a total of 84 turkeys (27 immature, 57 adult) on youth day, representing a success rate of approximately 33%. Youth success rates are typically 3X greater than regular spring season hunter success.

Ruffed Grouse

2017 Drumming Surveys

In 2017, 25 of 29 random drumming survey routes established statewide were active and just 4 were in constant zero status. All routes were surveyed between 15

April – 5 May. All but one (Route #3 Ashfield) constant zero route occurred in either the Northeast, Southeast, or Central wildlife district.

Overall, the average number of drums heard per stop (ANDS) per route on all random routes statewide in 2017 was 0.08, lower than previous years 2007-2015 (0.20-0.34) but identical to the ANDS in 2016. The ANDS per route in the Western District in 2017 (0.05) was the lowest recorded in the history of the survey. However, ANDS was slightly higher in the Connecticut Valley district in 2017 (0.18) compared to the past 2 years (0.14-0.16). ANDS was also slightly higher in the Central District (0.13) in 2017 compared to 2014-2015 (0.03-0.15). Several constant zero routes were surveyed in the Northeast and Southeast Districts, however no grouse were heard on any of those routes. One grouse was detected on a route that was previously a constant zero route in the Central District.

The ANDS per route for subjective routes completed statewide in 2017 was 0.40, slightly higher than 2016 and indicative to the statewide potential for higher grouse populations. Overall, grouse breeding activity as indexed by the drumming survey was lower in 2017 compared to recent years, largely a consequence to apparently very poor grouse abundance in the Western District. Grouse were heard on those routes, just in lower numbers than previous years which may indicate some natural variation in abundance, rather than drastic changes in distribution.

Grouse continue to be detected on a subjective route in the Southeast District (Route 41) and a new Subjective route in the Northeast District (Route 49, Ashby). Grouse are not widespread in these districts but can be locally abundant in areas with suitable habitat.

American Woodcock

Woodcock Singing-Ground Survey

Currently, there are 19 randomized singing-ground survey routes in Massachusetts. Of those 19, 9 were active in 2017. The average number of woodcock heard peenting per route (including constant zero routes) in 2016 was 1.39, below the long term 10 year average of 1.54. On the 8 active surveyed routes, a total of 25 woodcock were heard peenting, or 3.13 per non-constant zero route.

USFWS computes a breeding index using only routes that have been repeatedly completed over the duration of the survey. The breeding index (number of singing males per route) in 2016 (0.98) slightly below but similar to recent years. Regionally, woodcock populations have displayed a 0.93% annual decline since 1968. Until 2017, the trend in breeding male abundance over the past 10 years was stable within the Eastern Management Region, however this year there was a significant decline detected.

USFWS also estimates harvest for woodcock through the Harvest Information Program (HIP). A sharp increase in hunter numbers and number of woodcock bagged occurred in 2011 coinciding with a 50% season length expansion. However, the estimated number of hunters and harvest has been relatively stable from 2012-2016 at around 2000, similar to levels observed/estimated during previous years under a 30 day season framework. In 2017, there was a slight increase in woodcock harvest and hunter numbers.

New England Cottontail/Eastern Cottontail

Pellet Surveys and Trapping

DNA analyses were conducted on sample 240 pellet samples collected on 16 plots. All plots were surveyed from early January through March 2017. Plots were surveyed 1-4 times, with most being surveyed 3 or 4 times. The 240 samples were identified as follows: 3 unidentified, 2 snowshoe hare, 106 eastern cottontail, and 129 New England cottontail. All new England cottontail were identified on plots from Cape Cod, only eastern cottontail were identified within the Berkshire Focus Area. Of the plots that were surveyed that contained rabbits, all had eastern cottontail. Snowshoe hare samples were collected from southern Plymouth County.

Live trapping of rabbits occurred at 2 DFW properties in Sandwich, Barnstable County; the Sandwich Fish Hatchery and the Sandwich Game Farm and also at the Quashnet Woods WMA in Mashpee. Live trapping of rabbits occurred during January-February. Eighteen (12 male, 6 female) rabbits were trapped over 486 trap nights. Of those 18 trapped rabbits, 2 (1 male and 1 female) were transported to Roger Williams Park Zoo for inclusion in captive breeding efforts.

Waterfowl Program

H W Heusmann, Waterfowl Program Leader

Division personnel conducted nest-box checks on 51 of 52 study sites used to monitor wood duck populations statewide. One site could not be checked in the Connecticut Valley because of low water conditions.

The spring of 2015 was followed a harsh winter in the northeast with colder than normal temperatures and record snow falls. However, the moisture content of the snow was low and water conditions remained low. Nesting was delayed again this year.

Wood duck nesting attempts declined with only 256 nest starts compared to 297 last year and 321 in 2013. There were 191 hatches compared to 237 last year. Hooded mergansers, a species that has increased substantially in the past two decades also declined slightly to 131 starts compared to from 138 nest starts last year but there were 110 hatches compared to 109 last year. Overall box use was 70% compared to 76% last year. Due to other commitments, particularly the winter black duck banding program, and man-power shortages, most non-study sites in the Northeast and Southeast districts could not be serviced.

Massachusetts participates in the Atlantic Flyway Resident-geese Banding Program. The Atlantic Canada Goose Resident Population Management Plan only requires Massachusetts to band 550 geese but we band 800+ for the federal database. Geese are captured by roundups during the summer molt. A total of 792 Canada Geese were banded at 75 sites in 67 cities and towns in Massachusetts. The state total included 429 goslings and 363 adults. Crews also captured an additional 181 previously banded geese.

The 2015 airboating season was again marked by near drought conditions which hampered banding. Moon phases also compromised the program as the full moon the end of September curtailed the season during what is normally the most productive period. We ended up boating on 14 nights and banded 760 birds. Among birds banded, there were 634 Wood Ducks, 92 Mallards, 1 American Black Ducks, 11 Green-winged Teal, 9 Blue-winged Teal, and 8 Sora, 3 common moorhens and 1 American coot. . Thirty-seven previously banded birds were also recaptured. Airboat bandings were augmented by capturing 97 mallards at

6 sites where people feed them using bait traps and drop nets. Such ducks are an integral part of mallard ecology in the Northeast.

During the period of September 8–25, Massachusetts conducted a state-wide resident Canada Goose hunting season, with a daily bag of seven. The U.S. Fish and Wildlife Service (USFWS) Harvest Information Program (HIP) report is delayed in harvest estimates for the current year. However, the USFWS estimated a September season harvest of 2,700 in 2014. This compares to 2,100 in 2013, 1,600 geese harvested in 2012, 2,200 geese in 2011, 2,200 in 2010, 4,200 in 2009; 4,600 in 2008; and 2,600 the previous year.

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 70 days with a three-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 50 days with a three-bird bag limit in the Berkshire zone for Atlantic Population (AP) geese.

There was no Midwinter Waterfowl Survey conducted in 2015-16 due to federal budget cut-backs. A reduced survey covered only major Atlantic brant and snow goose concentration which did not include Massachusetts.

During the period January 16—February 6, 2016, Massachusetts held a late, resident Canada Goose season in the Central Zone and one in the North Coastal Zone January 23-February 13 with a five-bird daily bag in each zone. Unlike last year, the winter was relatively mild with scant snow fall. The USFWS is delayed in harvest estimates for the current year. However, the USFWS estimated a harvest of 1,300 in 2015 compared to 1,500 in 2014, 4,500 in 2012, 2,800 in 2011; 2,900 in 2010; 1,200 geese in 2009; 2,300 geese in 2008; and 3,100 birds in 2007.

Postseason banding of wintering Black Ducks continued as part of an experiment to determine if two-season Black Duck banding efforts can improve the precision for Black Duck survival rates. Continued banding was requested while analysis of the first 5 years of banding was evaluated. All Mallards and Mallard x Black Duck hybrids could be banded and broken down into

five plumage types. Bait-trapping was carried out at 20 coastal sites in 11 towns from the New Hampshire to the Rhode Island borders. Trapping was carried out in January and February 2016. Unlike the severe winter of 2014-15 when trapping success was high but there was also winter mortality due to prolonged severe cold, the winter of 2015-16 was mild and ducks were not stressed. Totals of 387 American Black Ducks, 39 black-plumaged hybrids, 2 intermediate types, 1 Mallard-plumaged hybrid, and 79 Mallards were banded. In addition, there were 67 previously banded birds including 7 birds by other banders.

During April and May, we participated in the Northeastern states' waterfowl breeding survey, which is based on sampling randomly selected 1-kilometer-square plots. Massachusetts checked 91 of the 1,306 plots checked in this year's survey. The population estimate in the Northeastern states for Mallards was 260,793 pairs +15%, was up slightly over last year but part of a long term decline since 1995. The estimate for Black Ducks was 15,214 pairs +38%. Wood Ducks, 210,335 pairs +17%; and Canada Geese, 354,215 pairs +16%. In general wood duck and Canada goose populations are increasing while mallard and black duck populations have declined. Data from this survey is used to set hunting season regulations tailored to the Atlantic Flyway.

As part of the study on the newly described Wellfleet Bay Virus, first detected off Cape Cod, 39 adult female and 13 adult male eiders were captured and banded in Boston Harbor during a one day trip to Calf and Outer Brewster Islands. Thirteen previously banded birds were recaptured. Most females were captured on nests while all the males were mist netted on the water. All birds were blood sampled in conjunction with ongoing virus testing by USDA-Wildlife Services.

Massachusetts entered its 18th year of the federal Harvest Information Program (HIP). Beginning in 2012, all migratory bird hunters could register for HIP only via an online registration system. Hunters are no longer issued a HIP number but their license indicates they completed the HIP survey. Hunters had the convenience of registering from their home computer, at venues selling hunting licenses, or at any MassWildlife office. Waterfowl and woodcock hunters are automatically given a HIP survey each time they buy a waterfowl stamp with a new hunting license through the state's

MassFishHunt system. In 2015 11,140 hunters had registered with Massachusetts HIP.

Massachusetts issues individual egg-addling permits for resident Canada Goose control under a federal program begun in March 2007. In 2015, we issued 44 such permits, all of which were returned. The permittees reported addling 1,096 eggs in 237 nests, while USDA/APHIS Wildlife Services addled 475 eggs in 101 nests under their statewide permit.

The waterfowl program leader attended the Atlantic Flyway Council technical and council meeting in Albany, New York in July, 2015 and then tele-conferenced in September and October at the next meetings as the U.S.F.W.S. is condensing the regulatory cycle from separate Early and Late Season regulations into a single cycle. The program leader then attended the Technical Section meeting of the Atlantic Flyway Council held in Virginia Beach in February 2016. He is a member on the Mallard, Black Duck, and Canada goose committees as well as voting representative for Massachusetts.

Habitat Program

John Scanlon, Habitat Program Supervisor

The Habitat Program is a component of the Mass-Wildlife Biodiversity Initiative, which in part seeks to maintain and restore the native diversity of birds and mammals through active land management. The Habitat Program facilitates applied management across a range of upland and wetland sites on both public and private lands to conserve birds, mammals, and other wildlife identified as species of conservation concern in the Massachusetts State Wildlife Action Plan (SWAP). Upland sites include grasslands, shrublands, and forestlands. Wetland sites include marshlands, shrub swamps, and forested swamps. Applied management practices include invasive plant control, mowing, prescribed burning, and tree clearing.

Habitat Program staff contract and administer these practices across >180,000 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 assist the MassWildlife Realty Program and District offices with land acquisition, monitoring of >150 Wildlife Conservation Easements (WCE's) on >40,000 acres of private lands, and with

providing technical assistance to private and other public landowners interested in enhancing wildlife habitat for native birds and mammals through forest harvesting operations. The Habitat Program also assists with reviewing and prioritizing applications for funding under the MassWildlife Habitat Management Grant Program.

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, young forest, and late-seral stage forest habitats) on WMA and WCE lands throughout Massachusetts.

Provide technical assistance to other public and private landowners and conservation organizations on management of grassland, marshland, shrubland, and young forest habitats. Public and private landowners and conservation organizations include, but are not limited to, the U.S. Army Corp 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).

To achieve the first objective, the Habitat Program follows landscape composition goals for WMAs approved by the Massachusetts Fisheries & Wildlife Board that include 20-25% early-successional habitat (including 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 ≥150 years old. Habitat Program staff actively participate in the MassWildlife prescribed fire crew to conduct prescribe burns on fire-associated habitats in compliance with the MassWildlife Prescribed Fire Policy. Habitat Program staff also conduct small scale invasive plant control efforts on WMAs in compliance with all local, state, and federal permitting requirements.

In addition, Habitat Program staff contract and administer commercial tree clearing, mowing, mulching, stumping, harrowing, seeding, and invasive plant control contracts to restore and enhance grassland and shrubland habitats on WMAs through existing statewide contracts and procurement procedures in compliance with all local, state, and federal permitting requirements. Habitat Program staff also contract and

administer commercial forest harvesting operations designed to create young forest habitat through a public, competitive bidding process in compliance with all local, state, and federal permitting requirements.

To accomplish the second objective, Habitat Program staff conduct technical reviews and site visits of proposed management activities on USACE, DCR, town, and private conservation lands.

Project Accomplishments

Project Administration

Habitat Program staff conducted biological monitoring, management planning, and applied active management practices on more than twenty sites in FY2017 to help achieve landscape composition goals for a spatial and temporal diversity of successional habitats at the landscape level (Tables 1-3). Staff assisted with preparation and/or updating of habitat site plans and prescribed burning plans for these WMA's, created and administered habitat management contracts with private vendors at these sites, and planned or contracted biological monitoring at these sites. Habitat Program staff also maintained GIS databases of management and monitoring information for these sites.

Biological Monitoring

Regular monitoring is essential for practicing adaptive natural resource management and typically includes one or more of the following: 1) 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; 2) identification and location of invasive plants for subsequent control efforts; 3) identification and location of rare plants in order to design appropriate mitigation during harvesting activities; 4) photo documentation of pre- and post-harvest conditions; and/or 5) wildlife sampling to determine habitat use (e.g., breeding bird surveys, butterfly/moth surveys).

During FY2017, Habitat Program staff conducted pre-treatment monitoring of herbaceous vegetation including ferns, and broadleaved non-woody plants on previously unmanaged portions of the Birch Hill and Leyden WMAs. Post-treatment vegetation monitoring occurred on managed portions of the Southwick WMA and the Frances Crane WMA North. Breeding bird surveys were conducted on 18 previously managed sites totaling 1,480 acres (Table 1).

Table 1. FY2017 Biological Monitoring Sites

Site Name	Town	Type of Monitoring	Acres
Birch Hill WMA	Royalston/Winchendon	Breeding Bird Survey	60
Birch hill WMA	Royalston/Winchendon	Vegetation Survey	20
Eugene Moran WMA	Windsor	Breeding Bird Survey	70
Farmington River WMA	Otis	Breeding Bird Survey	80
Fox Den WMA	Worthington	Breeding Bird Survey	40
Frances Crane WMA North	Falmouth	Breeding Bird Survey	200
Frances Crane WMA North	Falmouth	Vegetation Survey	40
Frances Crane WMA South	Falmouth	Breeding Bird Survey	70
Herman Covey WMA	Belchertown	Breeding Bird Survey	120
Hiram Fox WMA	Chesterfield	Breeding Bird Survey	50
Leyden WMA	Leyden	Vegetation Survey	20
Maple Hill WMA	West Stockbridge	Breeding Bird Survey	50
Montague Plains WMA	Montague	Breeding Bird Survey	200
Muddy Brook WMA Patrill Hollow	Hardwick	Breeding Bird Survey	100
Muddy Brook WMA Jackson Road	Hardwick	Breeding Bird Survey	60
Noquochoke WMA	Dartmouth	Breeding Bird Survey	40
Southwick WMA	Southwick	Vegetation Survey	20
Stafford Hill WMA Hilltop Area	Cheshire	Breeding Bird Survey	60
Stafford Hill WMA Barn Area	Cheshire	Breeding Bird Survey	50
Wayne F. MacCallum WMA	Westborough	Breeding Bird Survey	60
Winimusset WMA	New Braintree	Breeding Bird Survey	90
Total			1,480

Table 2. FY2017 Habitat Planning Sites

Site Name	Town	Plan Type	Acres
Burrage Pond WMA	Halifax	Wetland Hydrology Study	106
Camp Cachalot WCE/ Southeast Pine Barrens WMA/Maple Springs WMA/Myles Standish SF	Plymouth & Carver	Fire Management Plan	1,200
Montague Plains WMA	Montague	Fire Management Plan & Prescribed Burn Unit Plan & Draft Habitat Site Plan	2,230
Frances Crane WMA North	Falmouth	Prescribed Burn Unit Plan	331
Frances Crane WMA South	Falmouth	Prescribed Burn Unit Plan	111
Leyden WMA	Leyden	Prescribed Burn Unit Plan & Draft Habitat Site Plan	21
Muddy Brook WMA	Hardwick	Prescribed Burn Unit Plan & Draft Habitat Site Plan	57
Southwick WMA	Southwick	Prescribed Burn Unit Plan & Draft Habitat Site Plan & Invasive Plant Mapping	265
Herm Covey WMA	Belchertown	Draft Habitat Site Plan	125
Wayne F. MacCallum WMA	Westborough	Invasive Plant Mapping	375
Total			4,715

Habitat Management Planning

Habitat Site Plans and companion Fire Management and/or Prescribed Burn Unit Plans were undertaken at 12 properties totaling 2,754 acres (Table 2) and are described below. 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. Lastly, 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.

Burrage Pond WMA - A hydrologic study was completed to facilitate wetland restoration at this site to support habitat management for waterfowl, woodcock, and other wetland-associated wildlife species.

Camp Cachalot WCE/Southeast Pine Barrens WMA/Myles Standish State Forest – A Fire Management Plan was completed to facilitate prescribed burning throughout this 1,200 acre complex of state Wildlife Management Areas, Wildlife Conservation Easement, and State Forest lands within a greater landscape of fire-associated plant communities and human development. This plan coordinates fire planning efforts across ownerships and towns.

Montague Plains WMA – A landscape level Fire Management Plan and an associated Prescribed Burn Unit Plan were completed. Invasive plant mapping occurred on 135 acres of the WMA to facilitate and target invasive plant control in FY2018. In addition, a draft Habitat Site Plan was completed for review by multiple researchers carrying out long-term studies on this fire-associated property. Following incorporation of researchers comments, the revised plan will be reviewed and ultimately approved by the Connecticut

Valley District Manager, the Chief of Natural Heritage Environmental Review, the Chief of Natural Heritage Conservation Science, the Habitat Program Supervisor, and the Assistant Director for Operations. In addition, both a draft landscape level Fire Management Plan and individual Prescribed Burn Unit Plans were completed.

Frances Crane WMA - Prescribed burn plans were completed for burn units totaling 331 acres at Frances Crane North, and 111 acres at Frances Crane South. Unit plans are required under the MassWildlife Prescribed Fire policy and are submitted for approval to both DEP Air Quality and Local Fire Chief.

Leyden WMA - Prescribed burn unit plans were completed for 21 acres, and a draft Habitat Site Plan was completed for review by District and BDI staff. Following incorporation of reviewers comments, the revised plan will need to be approved by the Connecticut Valley District Manager, the Chief of Natural Heritage Environmental Review, the Chief of Natural Heritage Conservation Science, the Habitat Program Supervisor, and the Assistant Director for Operations.

Muddy Brook WMA - Prescribed burn plans were completed for two burn units totaling 57 acres within the WMA. Unit plans are required under the MassWildlife PF policy and are submitted for approval to both DEP Air Quality and Local Fire Chief... In addition, a draft Habitat Site Plan was completed for the Patrill Hollow Section of the WMA for review by District and BDI staff. Following incorporation of reviewers comments, the revised plan will need to be approved by the Central District Manager, the Chief of Natural Heritage Environmental Review, the Chief of Natural Heritage Conservation Science, the Habitat Program Supervisor, and the Assistant Director for Operations.

Southwick WMA - A draft Habitat Site Plan was completed for review by District and BDI staff. Following incorporation of reviewer's comments, the revised plan will need to be approved by the Connecticut Valley District Manager, the Chief of Natural Heritage Environmental Review, the Chief of Natural Heritage Conservation Science, the Habitat Program Supervisor, and the Assistant Director for Operations. In addition, Prescribed Burn Unit Plans were prepared for 265 acres of the WMA.

Herm Covey WMA - A draft Habitat Site Plan was com-

pleted for review by District and BDI staff. Following incorporation of reviewers comments, the revised plan will need to be approved by the Connecticut Valley District Manager, the Chief of Natural Heritage Environmental Review, the Chief of Natural Heritage Conservation Science, the Habitat Program Supervisor, and the Assistant Director for Operations.

Wayne F. MacCallum WMA - Invasive plant mapping was completed on 375 acres of the WMA. Portions of these 375 acres will ultimately become part of a public habitat management demonstration area associated with the MassWildlife Field Headquarters (FHQ). The FHQ hosts numerous public meetings annually, and having a habitat management demonstration area readily accessible from the meeting rooms will provide good opportunities for public education and outreach.

Habitat Management Practices

A total of 1,396 acres were treated with one or more management practices by Habitat Program staff in FY2017 (Table 3). Specific practices for individual sites are described below.

Burrage Pond WMA - Invasive plant control for phragmites, purple loosestrife, and gray willow occurred on 100 acres. Invasive plant control for feathertop grass occurred on a nearby 6 acres.

Frances Crane WMA North - Invasive plant control occurred on 63 acres of existing grassland habitat to restore native warm-season grasses. Stump grinding and grading occurred on 36 acres of open pitch pine/oak woodland to establish fuel breaks that will facilitate prescribed burning to promote. In addition, tree clearing occurred on 5 acres to remove hazardous standing dead oak trees within a prescribed burn unit adjacent to a powerline that posed a threat to prescribed fire staff during future burns to promote a dense understory of scrub oak, blueberry, huckleberry and other native shrubs.

Frances Crane WMA South - Grassland habitat enhancement occurred on 26 acres. Management practices included tree clearing from hedgerows in between existing fields of exotic cool season grasses, grading of hedgerows, harrowing of graded hedgerows and adjacent cool season grass fields, and planting of all acres to native warm season grasses. In addition, Invasive plant control occurred on 42 acres of existing

Table 3. FY-2017 Habitat Management Sites

Site Name	Town	Habitat Type	Objective	Acres
Burrage Pond WMA	Halifax	Freshwater Wetland	Restore	106
Dunstable Brook WMA	Tyngsboro	Young Forest	Create	34
Frances Crane WMA North	Falmouth	Grassland	Restore	63
Frances Crane WMA North	Falmouth	Pitch Pine/ Oak Woodland	Restore	41
Frances Crane WMA South	Falmouth	Grassland	Restore	26
Frances Crane WMA South	Falmouth	Pitch Pine/ Oak Woodland	Restore	42
Herman Covey WMA	Belchertown	Shrubland & Grassland	Restore	242
Leyden WMA	Leyden	Lowbush Blueberry Shrubland	Maintain	43
Martin Burns WMA	Newbury	Shrubland	Maintain	35
Merrill Pond WMA	Sutton	Freshwater Marsh	Restore	2
Montague Plains WMA	Montague	Pitch Pine/Oak Woodland	Restore	66
Muddy Brook WMA	Hardwick	Pitch pine/Scrub oak Woodland	Restore	174
Poland Brook WMA	Conway	Young Forest	Create	3
Southwick WMA	Southwick	Grassland	Restore	210
Wayne F. MacCallum WMA	Westborough	Shrubland	Restore	375
Total				1,462

pitch pine/oak woodland to enhance understory scrub oak, blueberry, huckleberry and other native shrubs.

Herm Covey WMA - Invasive plant control occurred on 199 acres of existing shrubland habitat, and harrowing/seeding of native warm season grasses occurred on 43 acres of existing fields that were formally occupied by exotic cool season grasses.

Leyden WMA - Mowing/mulching occurred to maintain 43 acres of lowbush blueberry shrubland habitat

Martin Burns WMA - Excavator-mounted brontosaurus mowing occurred on 35 acres of shrubland habitat to remove standing dead Invasive shrubs such as honeysuckle, autumn olive, and buckthorn that were treated with a foliar herbicide application in FY2017.

Merrill Pond WMA - Invasive plant control for phragmites occurred on 2 acres of important waterfowl habitat within freshwater wetlands above Singletary Pond.

Montague Plains WMA – Thinning of closed canopy pitch pine/oak forest to begin restoration of pitch pine/oak woodland was conducted on 66 acres. Concrete block structure was removed to enable restoration of

sandplain grassland and heathland.

Muddy Brook WMA -Mowing of fuel breaks to support prescribed burning occurred on 58 acres. Tree clearing along wetland slopes occurred on 16 acres to connect shrub-dominated woodlands on both sides of the Muddy Brook wetlands complex. Also, plant control targeting tree re-sprouts and invasive shrubs such as honeysuckle, autumn olive, Japanese barberry, and buckthorn occurred on 100 acres of existing scrub oak shrubland habitat.

Poland Brook WMA – Non-merchantable trees were removed from a three acre portion of a 12 acre blow-down to facilitate public hunting access into a patch of emerging young forest habitat created by a tornado in 2016.

Southwick WMA - Mowing/mulching to establish 15 acres of fuel breaks was completed in FY2017 to facilitate prescribed burning in FY2018.

Wayne F. MacCallum WMA - Invasive plant control occurred on 114 acres of shrubland and forest habitat to facilitate future shrubland restoration efforts.

Wildlife Conservation Easement and Fee Ownership Compliance Monitoring

Compliance monitoring for WCEs involves site visits to timber sales and other forest cutting operations on private lands where DFW owns development and public access rights. In FY2016, Habitat Program staff employed both the agency-wide Land Information Framework to track all WCE monitoring across the state and the outreach protocol to establish and maintain routine contact with WCE fee owners regarding their forest management responsibilities.

In FY2017, monitoring of Forest Management Plans and/or active Forest Cutting operations occurred at five WCE's totaling 338 acres (Table 4). Habitat Program staff advocated for substantial felling of low quality stems, inclusion of >2 ha young forests openings, and retention of downed woody debris and biological legacies where appropriate.

Technical Assistance and Coordination

The Habitat Program provided technical assistance to

DCR by reviewing seven proposed harvesting operations totaling 1,641 acres on state forest lands across Massachusetts (Table 5). MassWildlife Habitat Program staff advocated for inclusion of >2 ha young forest openings, and for consideration of barrens restoration efforts where appropriate.

Other public lands where the DFW Forestry Program provided technical assistance on using harvesting operations to enhance wildlife habitat in FY2016 included the U.S. Army Corp of Engineer Birch Hill Dam Priest Brook plantation (20 acres).

Lastly, Habitat Program staff provided technical assistance to Westfield State University Forest Resources class by conducting a field trip for students to on-going harvests at the Montague Plains WMA in Montague, and to the University of Massachusetts at Amherst Forest Ecology class by conducting a field trip to recently completed harvesting at the Muddy Brook WMA in Hardwick.

Table 4. FY2017 WCE Monitoring

WCE Name	Town	Acres
Athol Watershed	Athol	31
Cole Meadow (Hull Forest Products)	Ashfield	70
Dalton Fire District	Hinsdale	92
LaValley	Bernardston	70
Mica Mill (Hull Forest Products)	Chester	75
Total		338

Table 5. FY2017 DCR Harvest Proposal Reviews

Property	Parcel	Town	Acres
Dubuque State Forest	State Forest Road Lot	Heath/Colrain	500
F. Gilbert Hills State Forest	High Rock Road Lot	Wrentham	37
Florida State forest	South County Road Lot	Florida	90
Otter River State Forest	Whitcomb Hill Lot	Templeton/Winchendon	486
Peru State Forest	Curtain/Garnet Hill Lot	Peru	280
Townsend State Forest	Fessenden Hill lot	Townsend	111
Warwick State Forest	Bass Road lot	Warwick	137
Total			1,641

Private Lands NRCS Habitat Program

Marianne Piche, NRCS Habitat Biologist

NRCS/MassWildlife Partnership: Two Habitat Program staff work in coordination with Natural Resource Conservation Service (NRCS) staff under the Working Lands for Wildlife initiative and the Young Forest Regional Conservation Partnership Program (RCPP) effort to conduct active management for early-successional habitats on private lands.

The Natural Resources Conservation Service (NRCS) provides technical and financial assistance to private landowners and land managers who voluntarily agree to apply conservation practices on their land for the conservation and improvement of natural resources, including habitat for wildlife and fisheries resources. The Massachusetts Division of Fisheries & Wildlife (MassWildlife) is the state agency responsible for the restoration, conservation, and management of the fish and wildlife resources of the Commonwealth and, as such, has a strong interest in maintaining and creating high quality wildlife habitat for species that are in decline in Massachusetts. The actions undertaken with this partnership, in its eighth year of implementation, enable both agencies to more effectively meet their individual and collective obligations and priorities to conserve, protect, and enhance the state's and nation's wildlife and fisheries ecosystems.

Under the Cooperative Agreement, MassWildlife provides NRCS in Massachusetts with the services of a Habitat Biologist, Marianne Piché who is responsible for providing specific wildlife habitat recommendations to NRCS staff for the development of EQIP or WRE applications and the implementation of WHIP, WRP, WRE and/or EQIP contracts that promote the conservation and improvement of habitat for wildlife and fisheries resources. The Habitat Biologist works directly with NRCS staff to plan, implement, and supervise wildlife conservation practices associated with WHIP, WRP, WRE and EQIP, and serves as the liaison between NRCS and the MassWildlife in regards to Working Lands for Wildlife species. Components of the Plan of Work under the Cooperative Agreement and specific activities conducted during Massachusetts state fiscal year 2017 are detailed below.

A reduced amount of activity than conducted in previous years occurred during the reporting period due

to the Cooperative Agreement covering the portion of the federal fiscal year from October 1 through December 7, 2017 not being signed by NRCS Headquarters until December 7 resulting in an inability to work under it during that period of the state fiscal year 2017.

Visited sites associated with EQIP applications with NRCS staff in order to provide written habitat recommendations required for the development of the wildlife component of the conservation plan. 12 EQIP site visits requested by and attended with NRCS staff and resulted in 10 EQIP habitat management proposals submitted to NRCS staff.

Visited four WRE easement application sites with NRCS staff to develop wetland restoration and wildlife habitat recommendations as part of preliminary and/or final Wetlands Reserve Plans of Operations. Three WRE habitat management proposals submitted to NRCS staff.

Conducted two targeted private landowner recruitment activities for New England Cottontail (NEC) and Bog Turtle in focus areas of Massachusetts. Activities included conducting informational meetings and contacting specific landowners of key parcels. NEC Site visits requested by NRCS resulted in 2 NEC habitat Management proposals submitted to NRCS staff. One Bog Turtle site visit was requested by and attended with NRCS staff.

Coordinated 2 multi-agency MA land management team meetings for NEC projects and participated in Technical Committee and Work Group activities. Committee and Work Group activities included annual meetings, conference calls, and Executive Committee meetings. Also reviewed and commented on NEC Conservation Strategy updates.

The NRCS Habitat Biologist provided guidance and consultation during the course of WHIP, WRP, WRE and/or EQIP contract implementation and assist with technical project administration/supervision as needed. She performed a post project implementation visit to determine if the work was completed per the conservation plan. Developed program promotional materials regarding NRCS technical and financial assistance opportunities and present at a Massachusetts Tree Farm Field Day event and a Massachusetts Forest Council meeting presentation. She served as the Massachusetts Division of Fisheries & Wildlife representative on

Turtle Conservation Activities: The Habitat Biologist established focal areas for certain species/habitats mutually determined by MassWildlife/NRCS, identified parcels with potential for management and contact landowners and prepared habitat proposals for landowners interested in conducting management. Species agreed upon were Blanding's Turtle, Wood Turtle, and Spotted Turtle. Activities related to implementing conservation activities for these species involved participating in conference calls, preparing material for, and reviewing a successful proposal to NRCS for to include these turtles as Working Lands species. A Northeast Turtles site visit was requested by and attended with NRCS staff. Additionally, the Habitat Biologist attended a Blanding's and Wood Turtle Conservation Symposium

Jonathan Brooks, Wildlife Population Ecologist

Phase II in the development of a web-based tool has been completed. This tool helps communities and agencies identify and reduce climate change impacts to natural resources and man-made infrastructure. This project provides local decision-makers with: (a) access to the most current understanding of how climate change is likely to impact the important natural resources they value and the man-made infrastructure they depend on; (b) the means to view and understand the vulnerability of these resources to climate change; and (c) a menu of clear adaptation actions which can be implemented at the local level to address these vulnerability factors, making their communities more resilient to climate change impacts.

The Wildlife Population Ecologist continues to model fire behavior for prescribed burn plans and fire management plans. GIS data layers are converted into formats that can be utilized in various fire modeling pro-

The Wildlife Population Ecologist was instrumental in the office-wide conversion of virtual desktops to individual desktop computers. This included removing and installing physical hardware and making sure that all software was installed and running properly.

Bridgett McAlice, Wildlife Biologist

There are several basic requirements that must be met by an individual in order to be issued a PAC permit. Applicants must pass MassWildlife's written PAC examination and pass the Massachusetts Trapper Education Course. PAC agents must also obtain a Trapping License and a trap registration number. Annually, MassWildlife offers a one-day coyote certificate training for PAC agents interested in working with that species. Permits are issued on an annual basis.

In 2017, 242 PAC permits were issued (210 in FY 2016). MassWildlife administered 53 PAC exams during 2017. Of the 242 permits issued, 51 also held a coyote certificate. The annual coyote certification course was offered at the Westborough Field HQ on Feb. 16, 2017.

Falconry

Erik Amati, Wildlife Biologist

Falconry (hunting with raptors) is an activity in Massachusetts that requires a permit from MassWildlife in accordance with 321 CMR 3.04. In order to first obtain a permit to practice falconry an individual must pass a written examination and have the appropriate facilities and equipment for the proper housing, care of, and training a raptor. Qualified applicants begin as an apprentice falconer and have the opportunity to advance to a general falconer and eventually to a master falconer. Each category requires years of experience and further written and field examinations in order to qualify.

General and master falconers may also obtain both raptor salvage and raptor propagation permits. Raptor salvage permits allow for the taking of sick, injured, or dead raptors. Raptor propagation permits allow for the taking, propagation and possession of all native/or exotic raptors except those species or subspecies judged threatened or endangered unless said species is specifically authorized.

Apprentice falconers are required to capture their bird from the wild whereas general and master falconers are permitted to either capture a bird from the wild or purchase a captive-bred bird.

Licensed falconers may possess only certain species of birds. Falconers are required to train their birds to hunt and are subsequently allowed to eventually release any bird captured from the wild in Massachusetts.

In 2017 MassWildlife issued 61 Falconry permits consisting of 18 Master, 29 General, and 14 Apprentice falconry permits with 44 falconers possessing 97 raptors over the course of the year.

Additionally 15 Raptor salvage permits and 8 raptor propagation permits were issued to 17 falconers. This year 3 written Apprentice examinations were administered and 2 facility inspections were conducted. Apprentice permits were issued to 2 new falconers this year.

Wildlife Staff

Westborough Field Headquarters Staff

Michael Huguenin, Assistant Director of Wildlife
Erik Amati, Wildlife Biologist
Jonathan Brooks, Wildlife Population Ecologist
Brian Hawthorne, Habitat Planning Coordinator
H Heusmann, Waterfowl Project Leader
Ben Mazzei, Habitat Biologist
Bridgett McAlice, Wildlife Biologist
Sue McCarthy, Wildlife Biologist
Marianne Piché, Habitat Biologist
John Scanlon, Habitat Program Leader
David Scarpitti, Upland Game Project Leader
David Stainbrook, Deer & Moose Project Leader
Andrew Vitz, State Ornithologist
Thomas Wansleben, Habitat Biologist
Dave Wattles, Black Bear & Furbearer Project Leader



Natural Heritage and Endangered Species Program

Thomas W. French, Ph.D.
Assistant Director, NHESP

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

Many of the duties of the Natural Heritage & Endangered Species Program (NHESP) focus on conservation efforts for species on the Massachusetts List of Endangered, Threatened, and Special Concern Species, also referred to as the Massachusetts Endangered Species Act list, or the “MESA list.” Species on the list are categorized as Endangered (E), Threatened (T), or Species of Special Concern (SC). The MESA list change process involves many steps, and typically takes about a year 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>. NHESP periodically reviews the MESA list to determine if any changes are needed. 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 status of a species on the list (SC ↔ T ↔ E). Needed changes are proposed on a species-by-species basis. During the interval between periodic MESA list reviews, the NHESP collects any list change proposals submitted by the Natural Heritage & Endangered Species Advisory Committee or others, including members of the public, to be evaluated during the next round of list changes. In addition, scientific and common name changes due to updated taxonomy are made as needed.

The most recent review of the MESA list began in October 2013, and the list change process from October 2013 through June 2014 is discussed in the FY14 Annual Report. The process from July 2014 through its completion in January 2015 is discussed in the FY15 Annual report, including a table listing the 21 MESA list changes approved by the Fisheries & Wildlife Board on January 29, 2015. From February 2015 through February 2017, the 21 pending MESA list changes were awaiting approval by the Executive Office of Energy and Environmental Affairs prior to submission to the Secretary of State for publication. The 21 MESA list changes resulting from the list change process between October 2013 and January 2015 were published in 321 CMR 10.90

and took effect on March 10, 2017.

Linking Landscapes for Massachusetts Wildlife

In 2008, MassWildlife and its NHESP entered into an inter-agency 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, 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 FY16, over 400 volunteers participated in these projects. They documented over 3,500 mortalities (repre-

senting 49 species) at 1,161 locations throughout the state, including mortality for nine currently and formerly state listed salamander and turtle species. In FY16, LLMW installed 2 collapsible turtle crossing signs in one of the highest risk sites identified by the Northeast Blanding's Turtle Working Group.

In addition to community engagement through citizen science in FY17, LLMW has installed improved crossing structures and wildlife barriers to enhance public safety and protect endangered species; implemented invasive species control and habitat restoration of scenic uplands and calcareous wetlands that are hotspots for biodiversity; engaged with community organizations; installed nesting structures for cliff swallows, a declining species; installed and monitored nine Peregrine Falcon nest boxes on bridges; and maintained a new interactive website.

2016 Field Season Summary

Birds

Piping Plover; Federally Threatened

In 2016, observers reported breeding pairs of Piping Plovers present at 145 sites; 172 additional sites were surveyed at least once, but no breeding pairs were detected at them. The population decreased 5.5% relative to 2015. The Index Count (statewide census conducted 1-9 June) was 628.5 pairs, and the Adjusted Total Count (estimated total number of breeding pairs statewide for the entire 2016 breeding season) was 649 pairs. A total of 912 chicks were reported fledged in 2016, for an overall productivity of 1.44 fledglings per pair, based on data from 97.5% of pairs.

American Oystercatcher

MassWildlife coordinated annual monitoring and protection efforts for American Oystercatchers conducted by a coastwide network of cooperators. Over 200 sites were surveyed during May and early June 2016. Preliminary results indicate that Massachusetts supported approximately 190 breeding pairs of oystercatchers in 2016.

Terns, Laughing Gulls, and Black Skimmers

Cooperators in Massachusetts surveyed approximately 140 coastal sites in 2016 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 2,066 pairs of Roseate Terns, 17,204 pairs of Common Terns, 3,091 pairs of Least

Terns, 2,751 pairs of Laughing Gulls, 1 pair of Arctic Terns, and 4 pairs of Black Skimmers.

Buzzards Bay Tern Restoration Project

There were 8,301 pairs of Roseate and Common Terns in Buzzards Bay in 2016, a small decrease (-4.4%) from 8,679 pairs in 2015. Collectively, Bird, Ram, and Penikese Is. supported 2,050 "peak season" pairs of Roseate Terns (vs. 1,885 in 2015; +8.8%), the second highest number of Roseate Terns that we have ever recorded nesting in Buzzards Bay. The islands supported 6,251 "peak season" pairs of Common Terns (vs. 6,794; -8.0%).

Bird Island

Common Terns numbered 2,193 pairs, similar to the 2015 level (2,247 pairs; -2.4%). Food resources again appeared to be on the low side for Common Terns and productivity was only fair (0.81 fledglings/nest vs. 0.86). Numbers of Roseate Terns were also similar to last year at 1,153 pairs (vs. 1,127). Food was relatively abundant for Roseate Terns, but predation by a rat and a raccoon depressed productivity: it was still very good at 1.22 fledglings/nest (vs. 0.86).

Bird Island Habitat Restoration

The Bird I. Habitat Restoration Project, a partnership between the U. S. Army Corps of Engineers (USACE) – New England District, the Department of Fish & Game, and the Town of Marion, finally broke ground in December 2015. The contractor, Cashman Dredging and Marine Contracting Co., LLC was able to complete about a third of the revetment before construction operations went on hiatus in April 2016 for the duration of the tern nesting season.

Subsequently, we made modifications to the design of the Bird I. project to enhance the habitat and construct a safer revetment for the terns. These changes included raising the elevation of the north half of the island by 1 foot to reduce overwash, adding a ring of cobble around the island to provide adult terns with a less-vegetated area on which to feed older chicks, and chinking voids in the revetment with stone to prevent entrapments of Common Terns.

Construction on Bird I. resumed in September 2016. The contractor is making steady progress on building the revetment and it is expected to be completed soon. Additional winter tasks include spreading the sandy-gravelly nesting habitat material, installing the cobble ring, and placing the concrete blocks around the perimeter of the nesting area to prevent unfledged chicks from accessing the revetment. In March 2017, the island will be planted with native vegetation that the terns will use for cover. We expect the nest-

ing habitat available to terns to double as a result of this project, allowing for growth of the populations. Additionally, the reduced crowding on the island should reduce the frequency of agonistic interactions among the terns, which will enhance productivity.

Ram Island

Common Tern numbers increased 5.9% to 3,527 pairs (vs. 3,330 in 2015). Productivity was fair (0.90 fledglings/nest vs. 0.69). Roseate Tern numbers increased substantially (+20.5%) to 886 pairs, the highest estimate since 2004 (vs. 735). Food appeared to be abundant for Roseates and productivity was excellent (1.49 fledglings/pair vs. 0.87). No major predation events were recorded on Ram this year.

Penikese Island

This year the colony suffered greatly from predation, mainly by Black-crowned Night Herons. Common Tern numbers dropped 56.4% to 531 pairs (vs. 1,216 in 2015), the lowest number since 2002, and productivity was poor (0.04 fledglings/nest vs. 1.43). Roseate Terns dropped to 11 pairs (vs. 23) and productivity was 0.10 fledglings/nest (vs. 1.12). No Arctic Terns nested.

Common Loon

Prior to the nesting season, MassWildlife staff deployed nesting rafts at Buckley-Dunton Lake (Becket), Cleveland Brook Reservoir (Dalton), Borden Brook Reservoir (Springfield), and Fitchburg Reservoir (Ashby). Rafts also were deployed at the Quabbin and Wachusett Reservoirs by DCR and the Pine Hill Reservoirs by the City of Worcester. Throughout Massachusetts, waterbodies with suitable loon nesting habitat were surveyed to determine if they were being used by loons during the nesting 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 any nests and determine nesting success. Monitoring continued after chicks hatched to determine fledging success. The 2016 nesting season was very productive for loons in Massachusetts. The majority of the loon population in the state nest on the Quabbin (21 territorial pairs) and Wachusett Reservoirs (5 territorial pairs), and these birds are monitored by DCR staff. Nests were documented for 17/21 pairs on the Quabbin, and these nests produced 19 hatchlings, with 16 surviving to fledging. On the Wachusett Reservoir, nests were documented for 4 of the 5 territorial pairs, and these produced 5 hatchlings and 4 fledglings. MassWildlife staff monitored single pairs of loons on 18 waterbodies

primarily located on lakes, ponds, and reservoirs in central Massachusetts. Of these, nesting was documented at 14 sites, producing at least 13 hatchlings and 10 fledglings (Table 1).

Table 1. Total number of nesting loons and their reproductive success in Massachusetts in 2016.

Site	# Territorial Pair	# Nesting Pairs	# Hatchlings	# Presumed fledglings
Quabbin Reservoir	21	17	19	16
Wachusett Reservoir	5	4	5	4
Bickford Pond	1	1	0	0
Buckley Dunton/ Yokum Pond	1	1	0	0
Crystal Lake	1	1	2	2
Fallbrook Reservoir	1	0	0	0
Fitchburg Reservoir	1	1	1	1
Haynes Reservoir	1	1	0	0
Hycrest Pond	1	0	0	0
Mare Meadow Reservoir	1	1	0	0
Meetinghouse Pond	1	1	0	0
Notown Reservoir	1	1	2	1
Paradise Pond	1	0	0	0
Pine Hill Reservoir	1	1	2	1
Springfield Reservoir	1	1	0	0
Stodge Meadow Pond	1	1	1	1
Upper Naukeag Lake	1	1	2	2
West Waushacum	1	0	0	0
Lake Wampanoag	1	1	2	1
Wachusett Lake	1	1	2	2
Paradise Pond	0	0	0	0
Total	44	35	38	31

Bald Eagle

During the summer of 2016, there were 59 known territorial pairs of Bald Eagles in Massachusetts. This is 6 more pairs than in 2015, but includes pairs that relocated and their new nest sites have not yet been located. The highest concentrations of eagles were along the Connecticut River (14 territories) and Quabbin Reservoir (11 territories). New nests were documented in Westminster and Erving. New territorial pairs were documented in Brewster and Pepperell. Of the 59 documented pairs, at least 36 pairs successfully fledged 63 chicks. Of the 63 known chicks that fledged, 44 (70%) were banded by agency staff. In 2013, 2014, and 2015, there were 42, 48, and 53 documented territorial pairs, respectively, which produced 47, 59, and 38 fledged chicks.

This is the 28th year that Bald Eagles have raised young in Massachusetts since their restoration. During these 28 years, at least 646 wild-born chicks are known to have fledged, along with an additional 8 chicks that were captive-born and fostered into wild nests (654 chicks in total).

Nesting Bald Eagle Survey

The 2016 Spring Nesting Eagle Survey took place on April 8, 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. In total, 32 volunteers participated in the count to assist MassWildlife staff on the increasingly difficult effort to monitor the state’s growing numbers of breeding Bald Eagles. The high amount of effort on this single day provides the bulk of information that we gather on the numbers of territorial and nesting Bald Eagles in the state, although information on nesting eagles is gathered opportunistically throughout the year.

Peregrine Falcon

During the 2016 nesting season, 37 nesting pairs of Peregrine Falcons were confirmed. Of the 37 nesting pairs this year, 9 were not monitored closely enough to know their outcome. Of the 28 monitored pairs, 2 pairs did not lay eggs, 4 pairs failed, and 22 pairs successfully fledged at least 56 chicks. 36 chicks were banded [64%] from 15 nests. Four banded and one unbanded chicks are known to have died after fledging, and a sixth chick was found injured, but later released. This is the largest number of chicks fledged in any single year to date. This is the 30th year that Peregrine Falcons have raised young in Massachusetts since their restoration. During these 30 years, at least 591 wild-born chicks are known to have fledged.

Grassland Bird Plan

The Westover Air Reserve Base (WARB) was surveyed for grassland birds in summer 2016 to evaluate how the modified protocol for grassland management on the airfield was impacting state-listed grassland birds. Recently, the WARB initiated a policy to maintain grass height between 7-14 inches throughout nearly the entire airfield. Without taking any additional measures, this policy would have required the airfield to be cut approximately every 2 weeks, which would have resulted in nesting failure for many of the grassland birds at the Base. However, the Massachusetts Division of Fisheries and Wildlife worked with natural resource managers at WARB to identify a plan to minimize mowing during the majority of the nesting period. This plan included the application of herbicide and plant growth inhibitors to reduce the early season growth of cool-season grasses and promote a little bluestem dominated grassland. Little bluestem is a native warm-season grass that naturally wouldn’t require mowing until July and after most nesting occurs. This grassland was surveyed using a meandering transect methodology.

During these surveys the most commonly detected birds (with total numbers in parentheses) were Grasshopper Sparrow (156), Savannah Sparrow (118), Bobolink (104), Upland Sandpiper (86), Eastern Meadowlark (83), Horned Lark (17), and Killdeer (5). Compared to the 2015 survey, totals for most species (including Grasshopper Sparrows and Upland Sandpipers) were slightly lower. These results may be caused by the extensive burning that was conducted in 2015 (~400 acres underwent prescribe burning), but we will continue to monitor at WARB to determine if long-term declines of grassland birds is occurring at this regionally important site. In addition, during the 2016 survey, we documented a single Sandhill Crane foraging on the edge of the airfield and it later flew towards an adjacent wetland along the southeast edge of the base. Sandhill Cranes are exceedingly rare in Massachusetts with only 3 known nesting pairs in the state.

Reptiles and Amphibians

Northern Red-bellied Cooter; Federally Endangered

Continuing a major project that has run continuously for 32 years, MassWildlife and its partners made a dedicated effort to locate and protect Northern Red-bellied Cooter (*Pseudemys rubriventris*) nests at known nesting areas adjacent to Federal Pond in Carver. A record total of 180 nests were identified by John Crane in June of 2016. In September of 2016, a total of 145 headstarted *P. rubriventris* were released to Burrage Pond Wildlife Management Area. Three headstarted *P. rubriventris* were released at Crooked Pond

in the Massasoit National Wildlife Refuge in Plymouth in coordination with biologists from the U.S. Fish and Wildlife Service. Also in 2016, MassWildlife and partners, including the University of Massachusetts Amherst and Antioch University New England, undertook a fourth and final field season of intensive field work to assess the status of important *P. rubriventris* populations, including original occurrences in Plymouth that had not been quantitatively assessed in earlier years as well as several key headstarted populations. Mark-recapture work continued at East Head, Island, Gunners Exchange, Hoyts, Boot, Great South, Ingalls, Sampson, and Federal Ponds, and was expanded to include Wenham Pond, Muddy Pond, Powderhorn Pond, West Ponds, Bloody Pond, Little South Pond, and a network of 30 ponds randomly selected to provide an estimate of the background abundance of the species. Upon the conclusion of this four-year study, we estimate the minimum population size within the Plymouth-Carver region to be greater than 934 cooters, excluding recently (2013-2016) headstarted turtles, a nearly five-fold increase from population estimates in the 1980s, when the species was federally listed as Endangered. Population estimates for individual pond complexes in the Plymouth Area range from 9.5 to 290.6 turtles. We estimate a pond-based occupancy rate in Plymouth and Carver of 0.57, with a species detection rate of 0.8 per pond survey. We have transitioned fully to marking individual *P. rubriventris* with Passive Integrated Transponders (PIT tags), including adults and juveniles found in the wild and headstarted turtles. Several long-lived individual *P. rubriventris* were confirmed during field work, including recapture of female #15, first marked by Dr. Terry Graham in 1969, and male #151, first captured in 1972, establishing the first minimum estimates of potential longevity in the wild for this species at over 45 years.

Bog Turtle

We conducted formal population monitoring in 2016 in partnership with the Nature Conservancy and a network of trained volunteers at the two known extant bog turtle sites. Formal population monitoring was conducted at three sites in 2016. A total of 19 bog turtle captures were documented, more than in the past two years. The captures included two yearling turtles and one unmarked young adult male that had not been observed previously. Habitat management activities occurred at two of our known bog turtle sites. At the northernmost site, beaver deceiver and flow devices were maintained, beavers were trapped, and four cows were fenced into a portion of the fen to improve herbaceous growth and cover. At the southern site, MassWildlife contracted with the Nature Conservancy to undertake canopy thinning and tree removal of tamarack and red maple to improve the structural composition of the fen. At the northern site, three beaver deceiver/flow devices

were maintained by MassWildlife Western District staff and NHESP staff, and beaver were trapped at intervals to reduce flooding pressure on sensitive fen habitats. Significant progress has been made managing water levels and controlling invasive plants. Additionally, MassWildlife partnered with state agencies in Connecticut, New York, and other Northeastern states through a Competitive State Wildlife Grant to conduct distributional surveys, nesting area improvements, and habitat management, and participated in regional conservation planning decisions in 2016. Also in 2016, MassWildlife biologists participated in three regional trainings and formal surveys on the Massachusetts-New York border to improve search image and detection rates and to evaluate habitat suitability. MassWildlife biologists also participated in the annual meeting of the Hudson-Housatonic Bog Turtle Recovery Unit meeting and participated in regional conference calls for the Hudson-Housatonic Recovery Unit and for a regionwide (northern population) Competitive State Wildlife Grant.

Blanding's Turtle

MassWildlife, together with partnering state agencies in Maine, New Hampshire, New York, and Pennsylvania, in 2016 initiated Phase II of a regional conservation planning effort for Blanding's turtle supported by a second Competitive State Wildlife Grant. This initiative provides funding for Blanding's Turtle conservation projects to benefit priority populations throughout eastern Massachusetts. Public-private collaborations are guided by site-level management plans developed with funds from the first Blanding's Turtle Competitive SWG grant awarded in 2011. Conservation and monitoring activities include standardized population assessments and radio tracking adult females in order to identify and protect nests. Work in Essex County included maintaining nesting habitat away from busy roads and an industrial park where Blanding's turtles have nested every year since at least 2002. This marks the beginning of a three-year dedicated effort to implement key aspects of a regional Blanding's Turtle conservation plan finalized in 2014. As part of this effort, NHESP staff are working with Northeast District staff and other key partners to restore Blanding's Turtle nesting areas in Middlesex and Essex Counties. In October of 2016, MassWildlife hosted a rangewide symposium on the conservation of Blanding's Turtles. More than 80 researchers attended from all three provinces with native populations and all but one range state. MassWildlife also participated in a regional anti-poaching work group to provide guidance and technical expertise to law enforcement partners.

Wood Turtle

MassWildlife continued to work with seven partner state

agencies, the University of Massachusetts Amherst, and many non-state partners to develop a conservation plan for Wood Turtles in the Northeastern United States, funded by a Competitive State Wildlife Grant. MassWildlife is the host agency for this multi-year initiative. As part of this effort, we completed a regionwide genetics study, which demonstrated that Wood Turtle populations in southeastern Massachusetts and adjacent Rhode Island are among the most genetically distinct in the northeastern States. Additionally, the genetics study provided the basis for establishing population units within a region-wide Conservation Area Network of priority streams. MassWildlife biologists and Lori Johnson conducted surveys for Wood Turtles across the Commonwealth, part of an standardized survey effort. As part of this regional conservation planning effort, we conducted technical assistance and outreach to key landowners in the Connecticut Valley, Chicopee River watershed, and Merrimack Valley to improve habitat management for Wood Turtles. In October of 2016, MassWildlife hosted a rangewide symposium on the conservation of Wood Turtles.

Timber Rattlesnake

As of this report, Massachusetts rattlesnake populations have dwindled to five isolated and declining populations. In 2016, MassWildlife continued to lead and manage a multi-state effort of Northeastern and Midwestern states, funded by the Competitive State Wildlife Grants program, to assess the population-level effects of an emerging and poorly understood pathogen, *Ophidiomyces ophiodicola* (Snake Fungal Disease or “SFD”). Additionally, MassWildlife initiated formal coordination with New Hampshire Fish and Game, Vermont Fish and Wildlife, and Connecticut Department of Energy & Environmental Protection (the three other New England states with extant rattlesnake populations) to develop and implement a coordinated conservation effort for New England rattlesnake populations and formalize a genetic management plan for the species (funded by the Regional Conservation Needs or RCN program). MassWildlife continued to coordinate necessary conservation actions, such as trail closures and signage and outreach, through regional working groups.

Eastern Spadefoot

We continued implementation of Year 1 of a 5-year, statewide monitoring plan for Eastern Spadefoot during July–November 2016. Though no new sites were documented since the spring, monitors observed peak feeding activity in September and October at one site with good access and collected valuable information about possible population size, distribution, and wintering phenology. During August 2016, we reconstructed a prospective, artificial breeding pool for Eastern Spadefoot in Sunderland; the pool was observed

holding water following heavy rains in November.

Spring 2017 finally marked the end of a multiyear drought for breeding by the species. During March–June, we began implementation of Year 2 of the statewide monitoring plan. With the help of veteran monitors, we documented breeding events in/at Westfield, Plum Island, Wayland, Rehoboth, Taunton, Westport, Sandy Neck, and Martha’s Vineyard. The Wayland site was a new addition to the plan in 2017, and an observation of tadpoles confirmed the continued persistence of a long-rumored local population. Breeding at the Westfield site was substantial enough to support translocations of eggs to the Southwick WMA as part of the species introduction project there¹. The Westfield breeding pool dried prematurely, so thousands of tadpoles were collected prior to perishing. Most were transferred directly to the constructed Southwick WMA pools, with approximately 1,035 held in captivity for “head-starting” to metamorphosis. Approximately 305 metamorphs were released back to the Westfield site, and approximately 535 transforming tadpoles and 173 metamorphs were released at the Southwick WMA. We documented successful metamorphosis of translocated tadpoles at 2 of 3 pools and assumed successful metamorphosis at the 3rd. Constructed pools at both the Southwick WMA and the Sunderland site supported successful reproduction by American Toads and Gray Treefrogs.

1 See MassWildlife Report Introduction of Eastern Spadefoot to the Southwick Wildlife Management Area: 2015–2017 Progress Report for full details.

Marbled Salamander

During September – October 2016, we conducted approximately 52 surveys (51 dry-pool substrate searches for adults, 1 visual/dip-net survey for larvae) at potential breeding wetlands to discover new breeding sites and/or update relatively old records of Marbled Salamander. Surveys yielded observations of the species at 10 wetlands (all via substrate searches), resulting in discovery of 1 new population and 5 new breeding sites (plus updated records for 5 previously known breeding sites).

Jefferson Salamander / Blue-spotted Salamander Complex

We implemented Year 3 of a recent genetic and morphological investigation into the distribution of the *Ambystoma jeffersonianum* salamander complex in Massachusetts. During March–April 2017, we conducted dozens of trapping and egg-mass surveys, discovering 7 new breeding sites and updating 12 existing records of the species complex. We collected 1–34 tissue samples of Blue-spotted/Jefferson salamanders from each of 16 sites distributed among southwestern, central, northeastern, and southeastern regions

of the state. Three of the sites represent newly discovered populations, with two very likely to be “pure” populations of Blue-spotted Salamander (rare in the Northeast). We have now collected a total of 595 tissue samples among 35 sites over the course of the study. The samples are being analyzed along with approximately 400 others collected among 15 sites in 2009. The results are expected to provide a major update to what is known about the geographic distributions and genetic lineages of the various members of the salamander complex in Massachusetts, helping to highlight priority populations and areas for conservation.

Tiger Beetles

Northeastern Beach Tiger Beetle (*Cicindela dorsalis 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. Annual monitoring of the population of this species on Martha’s Vineyard estimated a total of 4,128 individuals in 2016, which is of average size as compared to recent years.

Puritan Tiger Beetle (*Cicindela puritana*) Cooperative Recovery Initiative

Massachusetts Natural Heritage & Endangered Species Program participation in the Cooperative Recovery Initiative (CRI) for the state Endangered, federally Threatened Puritan Tiger Beetle was continued. This project is led by the U.S. Fish & Wildlife Service (USFWS), and was at the end of its two year funding cycle late in 2016. The USFWS report on the results of the previous two years’ work, and the funding proposal for the upcoming two years, were reviewed. A meeting was held at the Division of Fisheries & Wildlife’s field headquarters during which project leaders from the USFWS presented results from the previous two years, and plans for the next two years were discussed. A new two-year funding cycle began in 2017, with plans including captive propagation of beetles at the Silvio O. Conte National Fish & Wildlife Refuge in Sunderland, Massachusetts. Captive-bred larvae will be released to bolster population numbers at a reintroduced population in Connecticut and at Rainbow Beach in Northampton, Massachusetts.

Moths and Butterflies

“Dune Species” Project

A study of two moths, both Species of Special Concern in Massachusetts, was conducted in cooperation with Paul Goldstein at the National Museum of Natural History. The study was initiated in 2012 and completed in 2016. The two

species, the Dune Noctuid Moth (*Sympistis riparia*) and the Coastal Heathland Cutworm (*Abagrotis nefascia*), are both found in maritime dune habitat, where they often co-occur. The previously unknown life histories of both species are described, and taxonomic issues with eastern North American populations of *Abagrotis nefascia* are resolved, in the following paper completed in late 2016 and published in early 2017:

Goldstein, P.Z., and M.W. Nelson. 2017. Two psammophilic noctuids newly associated with beach plum, *Prunus maritima* (Rosaceae): The Dune Noctuid (*Sympistis riparia*) and Coastal Heathland Cutworm (*Abagrotis benjamini*) in northeastern North America (Lepidoptera, Noctuidae). *Zookeys* 661: 61-89.

Hessel’s Hairstreak Butterfly (*Callophrys hesseli*) Surveys
Field surveys for Hessel’s Hairstreak were contracted out to Mark Mello of the Lloyd Center for the Environment (Dartmouth, Massachusetts), and supplemented by NHESP staff (Mike Nelson). A total of 19 sites, each with no records in 15 or more years, were surveyed with the goal of redocumenting the presence of Hessel’s Hairstreak. Hessel’s Hairstreak was found at only 3 of the 19 sites, despite relatively intensive searches using proven methods. While it is possible that Hessel’s Hairstreak no longer occurs at some of the sites surveyed, a more likely explanation is that this species is simply too difficult to observe at any single site without a multi-year effort (on average). Hessel’s Hairstreak butterflies spend most of their time in the tree canopy where they cannot be seen, descending only occasionally (and only during sunny weather) to nectar at flowers. Additionally, insects experience natural population fluctuations of one to three orders of magnitude over a period as short as a few years. If a population at a site is an order of magnitude or two smaller than other years, Hessel’s Hairstreak will be especially difficult to observe. It is worth noting that among all members of the Massachusetts Butterfly Club (over 150 observers), only a single observation of Hessel’s Hairstreak was reported in Massachusetts in 2015, and not a single observation of this species was reported in 2016. This suggests that Hessel’s Hairstreak may be at low population numbers at multiple sites in Massachusetts in recent years.

Plants

Rare Plant Inventory

During the FY17 field season, the State Botanist and Plant Conservation Biologist searched for (or discovered) and reported 141 rare plant occurrences. The botanists reviewed 506 rare plant observations. There were updates to 288 rare plant populations and 71 new rare plant populations mapped. Eight of the observations were rejected as too lit-

tle data was submitted for verification (such as no photo and insufficient description), while 9 were kept as leads for the botanists to look for in the coming field seasons.

Special Projects

The following actions were accomplished for the three federally-listed plants:

Sandplain Gerardia (*Agalinis acuta*); Federally Endangered, State Endangered: Population censuses or sampling procedures were conducted at eight sites, four locations on Martha's Vineyard and four on Cape Cod. The plants were in bloom early on the Vineyard in mid-August, but didn't start to bloom until early September on the Cape. One of the indigenous populations on Cape Cod has not recovered from being mown in 2014 and the drought in 2015, and only one plant was observed there in September 2016. The restoration population at Frances Crane WMA count was 4742 plants, likely the result of a severe drought during the growing season. The population of this annual plant at the four sites on Martha's Vineyard was 35,295, up over 24 times the previous year, potentially due to a mowing change at one restoration site. At the four sites on Cape Cod, the numbers were 5553 in total, down about a half from the previous year.

Small Whorled Pogonia (*Isotria medeoloides*); Federally Threatened, State Endangered: One new population of 10 plants of this species was found and surveyed in the town of Manchester. Another new population was found in the town of Montague, approximately 20 kilometers west southwest of the nearest population, in Warwick. This had only one plant. The Warwick population was surveyed and had 4 plants. The Ravenswood population (new in 2015) was surveyed and was down from 48 to 34 plants in August of 2016. The Mt. Ann Reservation population was surveyed and found to have 3 plants, about the same as in recent years.

Northeastern Bulrush (*Scirpus ancistrochaetus*); Federally Endangered: A survey of the population in Warwick, Franklin County, was conducted, resulting in a count of 94 mature plants, 85 of which had set fruit, down considerably from the previous year, no doubt in response to the severe drought of 2016. The population in Montague was not surveyed.

General Habitat Management Projects

DFW Botanists work in cooperation with the DCR at Mount Tom State Reservation to control pale swallowwort within the habitats of state-threatened plant species, in a hickory-hop hornbeam woodland, known to be important hab-

itat for Shining Wedgegrass (*Sphenopholis nitida*; T) and Lily-leaf Twayblade (*Liparis liliifolia*; T). On another area of Mount Tom, the old ski slopes, owned by USF&W, we continue to control swallowwort to protect another rare plant population, that of Glaucous Sedge (*Carex glaucoidea*; E).

Invasive Plant Projects

Mile-a-minute vine (*Persicaria perfoliata*) is a relatively new invasive plant in Massachusetts, first documented in 2006. The Massachusetts Invasive Plant Advisory Group has designated this invader an early detection and rapid response species, a priority for management actions. NHESP, in cooperation with The Trustees of Reservations, the DCR, The Department of Agricultural Resources, and the USFWS's Silvio O. Conte National Wildlife Refuge controlled populations of the plant for a fifth year in Erving, Bridgewater, Foxborough and Greenfield. A bio-control weevil has been introduced but does not appear to have slowed the growth or spread of this invasive species.

Hardy Kiwi (*Actinidia arguta*) has been an aggressive invasive species in Lenox MA, causing significant damage to forest canopy and carpeting the forest floor preventing the growth of other plant species. NHESP botanists worked with the Town of Lenox and staff from Massachusetts Audubon to first map the extensive colonies of this invasive and then assist the Town in controlling Hardy Kiwi in Kennedy Park and at Massachusetts Audubon's Pleasant Valley Wildlife Sanctuary.

Other Botanical Notes

State Botanist Robert Wernerehl worked with two interns, Hannah Gershon and Tucker Meredith, during the summer of 2016 searching out rare plant occurrences and submitting the rare plant observations. They assisted Dr. Wernerehl is relocating a species that was almost State Historic (not observed for 25 years anywhere in the state), *Myriophyllum pinnatum*.

Aquatic Species

Aquatic Species Distribution and Status Assessments

In FY 17, NHESP's Aquatic Ecologist conducted surveys for odonates and freshwater mussels in MassWildlife's Central and Connecticut Valley Districts. Surveys included updating or recording new observations of:

Odonates

Boyeria grafiana – State Special Concern Ocellated Darner presence updated at 1 site, 1 new site confirmed.

Enallagma pictum – State Threatened Scarlet Bluet updated

at 1 site.

Enallagma recurvatum – State Threatened Pine Barrens Bluelet updated at 1 site.

Gomphus abbreviatus – State Special Concern Spine-crowned Clubtail updated at 1 site, and 3 new sites. Evaluation of this species' exuviae suggests that further work needed to distinguish from *G. adelphus*.

Ophiogomphus aspersus – State Special Concern Brook Snaketail updated at 1 site, and 1 new site confirmed representing a new population.

Neurocordulia obsoleta – State Special Concern UMBER Shadowdragon 1 new population was confirmed.

Neurocordulia yamaskanensis – State Special Concern Stygian Shadowdragon updated at 2 known sites, 4 new sites confirmed.

Williamsonia fletcheri – State Threatened Ebony Boghaunter updated at 3 sites.

Mussels

Alasmidonta heterodon – Federally endangered Dwarf Wedgemussel presence was updated at 3 sites.

Alasmidonta varicosa – State Endangered Brook Floater presence was updated at 6 sites from three populations. Mark-recapture monitoring was conducted at 2 sites following a dam removal on the Nissitissit River in 2015. Habitat analyses were conducted in cooperation with UMass Cooperative Fish & Wildlife Research Unit (UMass) and the Connecticut River Watershed Council (CRWC) at 6 sites to evaluate habitat needs of Brook Floater.

Strophitus undulatus – State Special Concern Creeper presence was updated at 15 sites (2 new occurrences) in 6 different rivers.

Ligumia nasuta – State Special Concern Eastern Pondmussel presence was updated at 3 sites in 3 different waterbodies. One of which was a soon to be historic location under MESA.

Alasmidonta undulata - State SGCN Triangle Floater presence was updated at 15 sites in 5 different rivers.

Margaritifera margaritifera – State SGCN Eastern Pearlshell presence was updated at 10 sites (1 new population) in 4 different rivers. Quantitative population assessments were conducted at one site in cooperation with UMass. Mark-recapture monitoring was conducted at 2 sites following a

dam removal on the Nissitissit River in 2015.

Lampsilis radiata – State SGCN Eastern Lampmussel presence was updated at 6 sites in 4 different rivers.

Special Projects

NHESP's Aquatic Ecologist was the lead author, and Mass-Wildlife the lead agency, on a nationally Competitive State Wildlife Grant titled Brook Floater Range Wide Restoration Initiative. Five partner states were awarded the grant, and worked as a larger collaboration with USFWS, UMass and USGS Northeast Climate Science Center. Grant funding will facilitate investigations relating to propagation methods, habitat and population assessments and coordinated conservation planning across the range for *Alasmidonta varicosa*. All further work on this grant will be reported directly through that initiative.

NHESP's Aquatic Ecologist collaborated with UMass, USFWS, and the CRWC on a statewide competitive grant from the Massachusetts Environmental Trust (MET) on Statewide Restoration of the Brook Floater. The CRWC was awarded \$40,000 to support the initiative and invited to apply for year-2 funds (2017). NHESP's Aquatic Ecologist is serving in a technical advisory capacity and assisting in the direction of field surveys. Initial surveys of population and habitat conditions in Massachusetts Brook Floater populations were conducted in 2016. The objectives of the grant complement those of the Brook Floater C-SWG and will further our understanding of habitat needs of this species and other SGCN in the Commonwealth.

NHESP's Aquatic Ecologist continues to collaborate on research targeting the feasibility of freshwater mussel propagation, to define methods for population augmentation and reintroduction. Since 2015, NHESP's Aquatic Ecologist has served in a technical advisory capacity to UMass and the USFWS at the Cronin Aquatic Resources Center to:

Continue preliminary investigations into feasibility of culture using SGCN species *Lampsilis radiata*.

Assisted in broodstock collection and management for propagation development for Federally Endangered *Alasmidonta heterodon*.

Assisted in broodstock collection and management for propagation development for State Endangered *Alasmidonta varicosa*.

Secured MESA mitigation funding for research of propagation opportunities for State Endangered *Lampsilis cariosa*, and assisted in project design and development.

NHESP's Aquatic Ecologist co-organized a 1 day regional symposium on freshwater mussel ecology and conservation, held at the USFWS Northeast Regional Office in Hadley, MA. Over 30 mussel researchers, managers and surveyors from the region were in attendance, and dozens more tuned in to the webinar.

Regulatory Review

The following table summarizes the environmental reviews conducted during FY 17:

Review Type	Count
CMP - Application Received	19
Forest Cutting Plan	133
MESA Info. Request/Data Releases	318
MEPA Reviews	69
MESA Project Reviews	797
Notices of Intent	664
Scientific Collection Permits	87
Other	129
Total	2,216

Data Management and Data Products

In FY 17, NHESP processed a total of 272 new rare species, natural community, and certified vernal pool records, and updated 915 existing records. The data processed were in the following categories:

FY 17 Totals	New Records	Updates to Existing Records
Vertebrates	56	543
Invertebrates	34	77
Plants	71	288
Communities	0	0
CVPs	111	7
Total	272	915

**The NHESP Community Ecologist left the Program 6/30/2016 and no work has been done on the Natural Communities in our database since that time.

Land Protection

In FY 17, MassWildlife spent about \$5.7 million to protect 3,468 acres of land across the state. Several of this year's acquisitions were of particular relevance to protection of

rare species and exemplary natural communities, as noted below.

Northeast District

Along the Squannacook River in Townsend, MassWildlife acquired a conservation restriction on 41.5 acres, with about 3,570 feet of frontage on the river and habitat for Wood Turtles (Special Concern) and Brook Snaketail dragonflies (Special Concern). In Townsend, 38 acres were added to the Townsend Hill WMA, protecting habitat for Blanding's Turtles (Threatened).

Southeast District

In Wareham, MassWildlife added 85 acres to the Maple Springs WMA, extending the permanent protection of the globally rare Pitch Pine/Scrub Oak natural community, which supports numerous MESA-listed species. In Carver, protection of 511 acres created the Atwood Reservoir WMA, protecting habitat for two rare plants, one Endangered and one Threatened.

Central District

In Hardwick, 36 acres were added to the Muddy Brook WMA, allowing habitat restoration of an inland barrens complex to expand.

Valley District

Eighty-three acres were added to the Southwick WMA, where habitat restoration efforts are planned to allow expansion of the Grasshopper Sparrow (Threatened) population there.

Western District

In Williamstown, protection of 364 acres along the New York border extends protection of a BioMap2 Forest Core. Natural Heritage and Endangered Species Program Advisory Committee.

Full members are: Kathleen Anderson (Chair), Mark Mello (Vice Chair), Thomas Rawinski (Secretary), Gwilym Jones, Joseph Larson, Wayne Petersen, and Jennifer Ryan.

Associate members are: William Brumback, Andy Finton, Timothy Flanagan, Mark Pokras, Kevin Powers, Karen Searcy (part year), Dave Small, and Bryan Windmiller.

Presentations from Agency Staff

History of the Advisory Committee Discussion (Tom French,

NHESP Assistant Director & Gwilym Jones, NHES Advisory Committee Member)	The Effects of the Road Network and Thermal Constraints on Moose Movement and Habitat Selection in MA (Dave Wattles, DFW Black Bear & Furbearer Biologist)
Summary of the Blue Hills Deer Hunt (David Stainbrook, DFW Deer & Moose Biologist)	Hunter Ed Program Overview (Susan Langlois, DFW Hunter Education Program Administrator)
Frameworks for Freshwater Turtle Conservation in Massachusetts (Mike Jones, NHESP State Herpetologist)	Recent Federal Listing Decisions and Implications for States (Brent Powers, NHESP NRCS Review Biologist)
Discussion of Translocations and Reintroductions (Eve Schluter, NHESP Chief of Regulatory Review and Jon Regosin, NHESP Chief of Conservation Science)	Using Mobile Devices for GIS and Field Data Collection (Jon Regosin, NHESP Chief of Conservation Science)

Natural Heritage and Endangered Species Program Staff

Thomas W. French, Ph.D., Assistant Director
 Tara Boswell, GIS Manager
 Elaine Brewer, Outreach Specialist (part year)
 Chris Buelow, Restoration Ecologist
 Karen Dolan, Finance and Projects Administrator
 Karro Frost, Conservation Planning Botanist
 Lauren Glorioso, Endangered Species Review Biologist
 Lynn Harper, Habitat Protection Specialist
 Peter Hazelton, Ph.D., Aquatic Ecologist
 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
 Michael Lachance, Conservation Data Specialist (part year)
 Jesse Leddick, Endangered Species Review Biologist
 Jennifer Longsdorf, NHESP Program Coordinator
 Lisa MacGillivray, Habitat Mapping Biologist/Data Specialist
 Sarah Maier, Natural Heritage Database Manager
 Misty-Anne Marold, Senior Endangered Species Review Biologist
 Daisy Medeiros, Endangered Species Review Assistant (part year)
 Carolyn Mostello, Coastal Waterbird Biologist
 Michael Nelson, Invertebrate Zoologist
 David Paulson, Senior Endangered Species Review Biologist
 Brent Powers, NRCS Review Biologist
 Jonathan Regosin, Ph.D., Chief of Conservation Science
 Eve Schlüter, Ph.D., Chief of Regulatory Review
 Amanda Veinotte, NHESP Administrative Coordinator
 Bob Wernerehl, Ph.D., State Botanist

Information & Education

Marion E. Larson
Chief, Information and Education

Overview

The Information and Education (I&E) Section has the responsibility and challenge of keeping sportsmen, conservation groups, municipal officials, environmental consultants, naturalists and other constituents apprised of regulations, laws, and recreational opportunities related to wildlife. It also provides basic information about and science-based explanations of wildlife-related issues, in order to enhance public understanding of wildlife management and compliance with laws and regulations. The Section also maintains an active program of educational and promotional outreach, to instill and foster public appreciation for fish and wildlife and related conservation and recreation.

Personnel

Emily Griffin, I & E Specialist left MassWildlife in April 2017 to attend graduate school leaves for graduate school. Her absence will be especially felt by the R3 Coordinator and Angler Education Coordinator as she was of vital assistance to those programs. The Section wishes her well in her new endeavor.

Elaine Brewer started in May as the NHESP Outreach Specialist, a new position for the respective Sections. She transferred from the Division of Marine Fisheries where she has served as their Information and Education Coordinator for the past 5 years. With extensive professional experience in education, outreach, communications, and social media, photography and art, she is well equipped to publicize the great work of the NHESP. Elaine earned her MS in Marine Biology from the Nova Southeastern University Oceanographic Center and received a BA in Biology from Boston University. Elaine is active with the New England Ocean Science Education Collaborative, Massachusetts Marine Educators, and National Marine Educators Association.

Agency Re-Branding Implementation

In the latter half of FY 16, with a contracted graph-

ic-design firm and Section staff the Division underwent a re-branding process with the purpose of increasing public awareness and recognition of MassWildlife and its activities. By the end of that fiscal year agency chose the consistent look and feel for the agency across all publications, communications, websites, clothing and other products. In FY 17, the implementation of this re-branding effort continued, with I&E staff redesigning and reprinting Living With Wildlife fliers, trifold brochures, Bat Guide, Track Cards, Freshwater Fish ID poster among others. Letterhead, masthead, permit applications and other agency “stationary” was also redesigned electronically.

Communications

Emily Stolarski, Communications Specialist

Website

Some major work was completed during FY16 – some related to new MassWildlife programs or initiatives, other work was sparked by the desire to improve the user experience and give the public better access to information. We anticipate an initial statewide effort to re-organize agency websites, beginning some time in FY2017.

What follows is a list of major projects from the past fiscal year.

A new trout stocking report, allowing anglers to use a sortable list or a map, was posted online at Mass.gov/trout. The report is now updated daily to positive reviews by users.

A section on mountain lions in Massachusetts was posted online using content from a recent Massachusetts Wildlife magazine article. Posting on the web allowed a more thorough visual explanation of the “hoaxes and misidentification” section. It quickly became a high traffic set of pages.

A fishes of Massachusetts guide was developed and

included illustrations and descriptions of all Massachusetts fish species. Information on MA state records and endangered species status was included.

Production began on Wildlife Management Area write-ups and Pond Map write-ups. Once posted, these WMA write-ups will be available to the public through the Wildlife Lands Viewer. The Pond Map write-ups will accompany new bathymetric maps – an already very popular product on the website. I & E, Fisheries, Wildlife and District staff are collaborating on this effort.

Other significant new postings: Youth Deer Hunt Day, 2015 State Wildlife Action Plan and supporting documents, A History of MassWildlife: 1866-2012.

Recommendations for text updates and minor reorganization within the MassFishHunt licensing system were also submitted to Active Outdoors. Text was developed in cooperation with the Hunter Education Program and was tailored to new hunters.

Working with MassWildlife's R3 Coordinator and Outreach and Marketing Coordinator, work was done to redesign hunting-related pages with the new hunter in mind.

MassWildlife E-newsletter and Advisories

Nicole McSweeney, Outreach and Marketing Coordinator, and Communications Coordinator Emily Stolarski collaborate to publish the monthly e-newsletter called "MassWildlife Monthly." Twelve issues of the electronic newsletter were published this fiscal year around the first of the month. Over the past year, the number of subscribers receiving the newsletter grew substantially; in July 2016, 15,773 received the newsletter and by June 2017, that number had risen to 22,930. A new feature on MassFishHunt (the licenses sales system) allowing hunters, anglers, and trappers to check off that they would like to receive the newsletter, as well as new sign-ups at events like the Open House, was the major factor in this increase in subscribers. The newsletter is sent using Constant Contact, an email marketing service. On average, 39% of subscribers open the MassWildlife Monthly email, which is considered an "above industry average" open rate, compared to other businesses and organizations using Constant Contact (18%). Advisories alerting subscribers and license holders of new regulations, special events, public meetings

and hearings, etc., were also sent out through Constant Contact.

Agency Emails

A total of 2,068 agency email messages were managed by Biologist Bridgett McAlice, who is assigned to the Wildlife Section. Summary of emails by month FY 17: July 2016 – 281 emails, August – 373, Sept – 180, Oct – 172, Nov – 167, Dec – 124, Jan 2017 – 181, Feb – 296, Mar – 174, Apr – 207, May – 195, Jun – 167.

Media Inquiries

As per current protocol, media inquiries are routed through the Executive Office of Energy and Environmental Affairs (EEA) press office. Media inquiries are then passed on to DFW staff for a response. In some cases, EEA provided the information directly (or with assistance from DFW) to the media, or the inquiry is handled through the Department of Fish and Game (DFG). This year the I & E Chief and other communications staff met several times and participated in calls with a Public Relations consultant who was on retainer for the Division. Staff implemented some of the consultant's recommendations which resulted in increased media engagement with the agency.

In FY 17, the agency received 254 (118 in FY16) media inquiries from 87 (61 in FY 16) different media outlets. Of the 254 inquiries, the vast majority of inquiries still come from newspapers with 131 inquiries (73 in FY16); 69 inquiries came from television (FY 16—26) ; 27 from radio(6 in FY16); 5 from magazines; and two unidentified outlets.

Media Utilization

In addition to the MassWildlife e-newsletter, the agency was able to disseminate important information with the help of 13 Massachusetts groups and organizations (e.g., Worcester County League of Sportsmen's Clubs and the Massachusetts Land Trust Coalition). These groups distributed information provided by MassWildlife's I&E Section through electronic and paper newsletters and other member updates. Many groups utilized our information several times during the fiscal year. Plymouth County League of Sportsmens Clubs hosts all of our e-newsletters on their website. A number of these groups are also sharing some of our agen-

cy Facebook postings which is generating interest.

Print Media Coverage

As in past years, DFW utilized a newspaper-clipping service to collect all articles in Massachusetts newspapers that mention the Division by name. Newspaper circulation numbers are continuing to decline with the rise in Internet searches for news, but there are still many people who glean their information from the news. In FY 17, articles mentioning MassWildlife totaled 2,036 with an average of 170 articles per month. These articles reached 37,250,656 people and are valued at \$4,312,248.

Outreach and Marketing

Nicole McSweeney, Outreach and Marketing Specialist

Social Media

In FY 17, 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; promote agency events, programs, job openings, and donation opportunities; listen to what constituents are saying; and engage with the public by responding to their comments and questions. By the end of FY 17, the MassWildlife Facebook page gained over 20, 200 followers (up from 12,500 followers in FY 16 and 5,700 in FY 15). MassWildlife has been researching other social media platforms and how they could help MassWildlife further spread its mission. MassWildlife plans to launch an Instagram account this fall.

Videos

I&E staff continue to create and edit video content for the Division. These videos document field work, events, and research conducted by staff. These videos have been utilized on social media, on a display in the MassWildlife Field Headquarters lobby, and by the traditional media. New videos created this year include topics like American Kestrel banding, Bald Eagle banding, rehabilitated Bald Eagle release, vernal pool construction in Sunderland, trout stocking, bat research, and pike stocking. The agency also tested live video on Facebook, showing the Jamaica Pond stocking event

live as well as the MassWildlife Open House. The public has provided overwhelmingly positive feedback to these videos, as it gives people a behind the scenes look at what the agency does.

Fairs and Trade Shows

In FY 17, MassWildlife exhibited at two fairs: the Marshfield and Franklin County (Greenfield) fairs; and three trade shows: the New England Fishing and Outdoor Expo (Boxborough), the Springfield Sportsmen's Show (West Springfield), and the Boston Flower Show. Field Headquarters I&E staff and District staff continued the tradition of selling licenses at the two sportsmen's shows; staff also answered sportsmen's hunting- and fishing-related questions and handed out publications. At the county shows and the Boston Flower Show, MassWildlife exhibits a display of pelts from most of the state's native furbearers so visitors can touch, handle, compare and ask questions about them. General fishing, wildlife, and outdoor recreation questions are also answered, and publications are distributed.

Promotion and Outreach Events

General staff presentations and events
Staff from across the agency lead and otherwise participate in public events as workloads and time permit. In FY 17, MassWildlife staff participated in 72 public events including informational talks to towns, conservation groups, sportsmen's clubs, and schools; habitat site walks; conferences and public meetings. MassWildlife staff also took part in 58 non-public events such as committee meetings, university guest lectures, and inter-agency planning groups. I&E staff consulted with Division staff involved in outreach events, provided display equipment and literature for specific audiences, developed targeted display materials such as posters and handouts, and/or helped to staff the agency's display at these events.

Examples of FY 17 outreach events include: Montague Plains WMA, Muddy Brook WMA, Frances Crane WMA, Quashnet Woods State Reservation/WMA; MACC Annual Environmental Conference; Massachusetts Land Trust Coalition Conference; along with numerous guest lectures and programs related to fish and wildlife conservation and management and MassWildlife programs.

Unfortunately, the Massachusetts Outdoor Expo was

canceled a week before the planned date of September 25, 2016 as the FAWNS group was unable to secure liability insurance for the fall event of 2016. The Senior Planner who has been the Event Planning Executive worked to get the word out and was on-site to turn away any potential participants of which there were only 15-20 carloads of people. Plans are going forward for a 2017 event. In April of 2017 insurance was secured for an event scheduled for September of 2017.

150th Celebration Continued

MassWildlife's 150th anniversary events continued in FY18 and included the last three speaker series events: Into the Night: Exploring Moths and Other Nocturnal Insects, Prescribed Fire: Maintaining and Restoring Wildlife Habitat throughout MA, and MassWildlife Hatchery History. MassWildlife also held an open house at the Sandwich Fish Hatchery. The event drew about 200 people and featured a self-guided tour and historical hatchery displays.

MassWildlife's Open House – June 10, 2017

The town of Westborough marked its 300th anniversary in 2017 and celebrated with a large festival on June 10th. In support of the town, MassWildlife held an Open House to coincide with the event. MassWildlife worked with the town and the Westborough Rotary Club to coordinate publicity and transportation for the days' events. The Open House drew about 2,000 visitors over the course of the day. Free lunch was provided to guests by the Massachusetts Outdoor Heritage Foundation. Ninety-six MassWildlife staff worked at the event including 7 seasonal employees.

Invitations and publicity included special invitations sent to state representatives and officials, the Fisheries and Wildlife Board, and MassWildlife retirees. Event

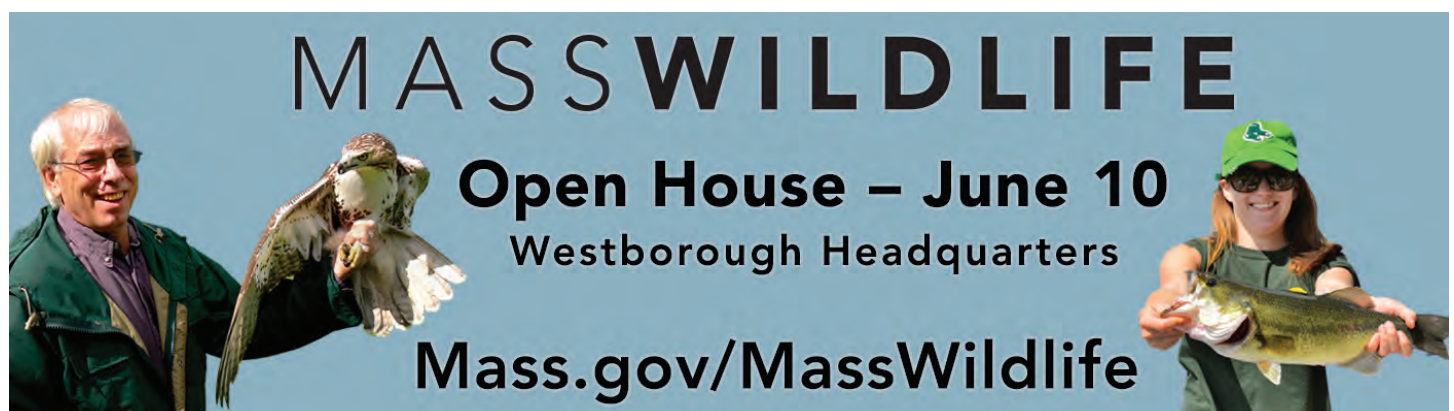
announcements were published in the Community Advocate newspaper; flyers were posted in Westborough businesses, and in local public schools. Announcements were also posted in the MassWildlife Monthly newsletter, in the Worcester Arts Calendar, Worcester Telegram & Gazette, and various family calendars. A billboard ad was also posted on Route 9.

Open House activities were similar to the 2016 event with the addition of a family fishing event at Westborough Reservoir, live owls and raptors, shooting range provided by the Massachusetts Chapter of the National Wild Turkey Federation, fly tying provided by Fly Fishers International, an expanded display for the Natural Heritage and Endangered Species Program, hunting dog demonstrations, more capacity at the archery range, a kayak raffle provided by BassPro, and a humpback whale skull.

Other Events

MassWildlife hosted and participated in several other notable events in FY 17 in which the I&E section was involved in organizing, publicity, and on-the-ground logistics.

Northeast Wildlife Trackers Conference, October -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. Through the conference, they aim to develop long-term connections and strategies for inspiring wildlife habitat protection by bringing together a range of issues and experiences connected to wildlife. As a representative on the conference planning committee, Pam Landry has been hosting the annual conference at



DFW Field Headquarters held in October for the past three years. The conference attracts 100 attendees from throughout New England, New York, Canada, and South Africa who benefit from a keynote presentation, speakers, and concurrent sessions. The day following the conference participants put their knowledge to the test by attending field sessions held around the Quabbin area. This year there were 100 participants.

Earth Week Trout Stocking Events, April – A new event to improve awareness of fishing opportunities was piloted to host Earth Week Trout Stocking events for interested or prospective anglers. Earth Week coincides with April school vacation. An informal event involving people watching and helping a stocking crew at a designated water body was planned in each district during the week and publicized through local media outlets, town recreation departments, local land trusts, tourism websites, on the agency website and Facebook page and in the MassWildlife Monthly newsletter. **Publicity of these events encouraged family participation.** **Attendance Summary**—150 people with a large percentage of adults attended the events. Attendees also included 4 media outlets, a legislative aide, a group of home schoolers and the Miss Western Massachusetts Outstanding Teen who is planning to study marine biology. Fisheries and District Managers were enthusiastic about the events and want to do this in upcoming years.

MassWildlife/Trout Unlimited Fisheries Forum—March --On March 16, 2017 MassWildlife hosted a Fisheries Forum with members of Trout Unlimited to showcase the resources that MassWildlife contributes to cold-water fisheries management and habitat protection, highlight past cooperative efforts between MassWildlife and Trout Unlimited, and discuss areas in which to partner in the future. Approximately 120 people were in attendance.

Bird Island Celebration, Marion, June—MassWildlife and other state officials gathered to celebrate the completion of endangered tern habitat restoration and island stabilization. Bird Island hosts critical nesting habitat for approximately 1,100 nesting pairs of state- and federally-endangered Roseate Terns and 2,500 nesting pairs of state-endangered Common Terns. For over a decade, MassWildlife has been working with the U. S. Army Corps of Engineers (USACE) and the Town of Marion to stabilize the island, increase tern nesting

habitat, and protect the historic lighthouse.

Publications

Field Guide to Amphibians and Reptiles

Due to the popularity of two special Massachusetts Wildlife magazine issues, Field Guide to Massachusetts Reptiles and Field Guide to Massachusetts Amphibians, it was decided that the agency would create a combined field guide. Features including a spiral binding and UV protective coating will provide allow for greater usability in the outdoors. Massachusetts' four species of sea turtle will also be included in the new field guide. Magazine Editor, Peter Mirick, completed the most of the work on the new book with assistance from MassWildlife Photographer Bill Byrne. After Mirick's retirement in February 2016, the Communications Coordinator took over layout responsibilities. Though most of the work was done on the book in FY 16, it was finalized and printed in November, 2016. Sadly, Peter Mirick died in late December, but did have the opportunity to see and sign some copies of the book. The book is available for sale with proceeds going to the Natural Heritage and Endangered Species Fund.

Bat Guide – In preparation for a more concerted bat monitoring effort and for the agency open house, the Homeowner's Guide to Bats was revised, updated for distribution to the public.

Outdoor Recreation Map – The Department of Conservation and Recreation and MassWildlife collaborated on this map once again as this was rated a top priority for DCR. The working group expressed interest in also collaborating in the future on an electronic version that would be housed on Mass.gov website. Maps were revamped only with land update information, printed and delivered by the end of the fiscal year to DCR and the Hunter Education Program.

Massachusetts Wildlife Magazine
Troy Gipps, Editor
Bill Byrne, Senior Photographer
Marion Larson—Executive Editor

MassWildlife's most visible publication is Massachusetts Wildlife, a 40-page, full-color, quarterly magazine with a currently growing base of approximately 20,000 subscribers and a standard publication printing of 25,000 copies that provides surplus for handouts and

promotions at programs, shows, and fairs. Editor and Publications Manager Troy Gipps, Senior Photographer Bill Byrne, and I & E Chief Marion Larson along with other I&E staff, produced four issues of Massachusetts Wildlife (Number 3, 2016 – Number 2, 2017) 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 particular subjects for many years to come, this year’s offerings included:

Issue Number 3, 2016—featured articles on the Gypsy Moth Outbreak of 2016; Accessing the Hidden History of Massachusetts Fisheries by Editor Troy Gipps, which described the creation and use of a new automated system developed by MassWildlife Aquatic Biologist Jason Stolarski that now enables our staff to quickly access over 100 years of fisheries history to inform management decisions; Youth Voices from the Deer Woods, which showcased hunting stories written by the three winners of our statewide youth writing contest; and an Ornithology Update written by MassWildlife State Ornithologist Andrew Vitz that described the successful breeding of Sandhill Cranes, King Rails, and Merlins in Massachusetts in 2016.

Issue Number 4, 2016—featured articles on MassWildlife’s Piping Plover Statewide Habitat Conservation Plan; the new state record White Perch caught in Wachusett Reservoir, and the Wellfleet Bay viruses effect on Common Eider populations.

Issue Number 1, 2017—this Special Issue was devoted to the State Wildlife Action Plan (SWAP). It defined the SWAP and featured five articles that focused on the following habitat types: Small Streams, Large Un-fragmented Landscape Mosaics, Young Forests and Shrublands, Coastal Plain Ponds, and Pitch Pine-Oak Upland Forest. The issue concluded with an article on Climate Change. All content for this issue was produced by MassWildlife staff working on the Field Headquarters in Westborough.

Issue Number 2, 2017—this issue included an article on the seabirds of Stellwagen Bank National Marine Sanctuary; Deer Winter Survival by MassWildlife Moose and Deer Project Leader David Stainbrook; late-season waterfowl hunting by MassWildlife Editor and Publi-

cations Manager Troy Gipps; and Crappie Variety Pack which described a new technique for the use of leggy flies for early spring Black Crappie.

Magazine Subscription Efforts:

The beginning of the fiscal year July 1, 2016 showed 20,142 subscribers for the magazine. By June 30, 2017 there were 20,092 magazine subscribers.

Surplus magazine issues are made available for free at sporting shows, fairs, meetings and other public events in which the agency participates.

During FY 2017, Massachusetts Wildlife magazine was promoted through direct mailing efforts managed by Infonet Systems. During FY 2017, five mailings were sent out for renewals and new subscriptions. Total cost of these mailings was \$6,899 resulting in revenue of \$38,293. Utilizing the MassFishHunt system and coordinating with the Office of Law Enforcement, targeted mailings included a segment of hunting and fishing license holders with a cost of \$10,723 generating \$15,226.

A gift subscription renewal effort resulted in a mailing to over 9,212 subscribers who have given gifts at a cost of \$3,288 resulting in revenue of \$28,769. Another mailing at a cost of \$1,627 went out to just over 4,599 subscribers who had not given gift subscriptions in the past with a revenue result of \$2,068.

Due to inquiries and the convenience factor of purchasing subscriptions online and with a credit card, discussions about making subscriptions available through the MassFishHunt licensing system have been ongoing with the license vendor. It is hoped that sometime in the next fiscal year some method of subscription sales will be available.

The Guide to Hunting, Freshwater Fishing, and Trapping

The 2017 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, 60-page booklet includes a digest presentation of the fishing- and hunting-related laws and regulations and other information of interest to sportsmen. A publications

order form was provided for the first time which has been successful. Publications Manager Troy Gipps, I & E Chief Marion Larson and Senior Photographer Bill Byrne contributed much of their respective time to the production of the Guide. 196,000 copies were printed, representing another 5% drop in copies from last year due to left overs at the end of the year. This is the third year in a row that guide printing numbers were reduced (FY16 205,000). An electronic website of the Guide has been provided by the publisher as part of the contract and this site has been visited often.

Photography

Bill Byrne, Senior Photographer

Two primary photographic goals were achieved in FY 16, that of providing suitable images for the 2016 Guide summary of fishing, hunting and trapping regulations, and on a much larger scale, providing processed images for the publication of four issues of Massachusetts Wildlife magazine.

For each issue there is a variety of image sources, some by contributing authors, some by MassWildlife staff with special projects, and many by photographer Bill Byrne. All images must be digitally processed to conform to high standards of color contrast, sharpness and dimensions to help insure the best reproduction. Then there are multiple rounds of color proofs and a final press check at the printing vendor to insure the best quality issue goes to our readers. While recovering from a medical procedure, the Senior Photographer was able to conduct a color proof check with the magazine editor in March, going above and beyond the call of duty.

Four issues of Massachusetts Wildlife magazine were published. Many articles required extensive field work, or working with submitted photos from authors. All images required careful preparations for publishing. Each issue then required multiple rounds of color proofing, followed by attending the first press run. Throughout FY 17 there many ongoing events that were photographed: Junior Duck Stamp competition awards, Conservation Camp awards and the Open House event held in conjunction with the Town of Westborough's 300th Anniversary. Photography activity for this event attended by almost 2000 people was split between the Senior Photographer and Magazine Editor. While the Senior Photographer was on medical

leave after surgery, he coached the Magazine Editor on shooting the Mass. Sportfishing Awards Program in April in his absence.

In addition several other photo projects involved images in and around the Blue Hills Reservation for future use regarding the controlled deer hunt, photos of the pollinator planting at Westborough for a future article covering the inter agency cooperation with MassDOT on seeding highway projects and wildlife management areas with seed mixes appropriate for native pollinators. The Senior Photographer was very appreciative of the DCR's generosity in providing a facility to stay overnight on site.

Requests for images by staff for publications, presentations and species accounts were fulfilled not only by the Senior Photographer, other I & E staff (I & E Chief, Outreach Coordinator, Communications Coordinator and I & E Specialist) have also made themselves familiar with the files to utilize photos for the agency social media and newsletter needs, program needs and media inquiries.

In addition, Editor Troy Gipps took images of MassWildlife and MassDOT staff conducting a freshwater mussel survey on the Millers River in Orange ahead of a bridge reconstruction project, dive training by DMF for MassWildlife staff at Lake Quinsigamond in Shrewsbury and photographed the 2017 Freshwater Sportfishing Award Program's annual award ceremony. Troy Gipps also assisted Senior Photographer Bill Byrne in shooting photographs of the 2017 Annual Open House held at MassWildlife's Field Headquarters in Westborough. The images will be used for a variety of purposes, social media, program promotions, website, magazine and other needs.

Education Programs

Staff members of the I&E Section offer programs to civic, school, community, conservation, and sportsmen's groups on a variety of wildlife-related topics throughout the year, for both youth and adult audiences. Through our wildlife education programs (general wildlife, wildlife in the backyard, wildlife in the schoolyard, endangered species, tracking, living with wildlife, wildlife and habitats), public appearances at conferences, and workshops, we reach out to urban youth, scouts, early childhood educators and administrators,

Department of Youth Services secure-treatment residents, pre-service teachers, undergraduate and graduate college students, formal and non-formal educators, and other adult audiences. In FY16, general wildlife education programs were attended by 674 people.

Formal or School-based Education Programs Pam Landry, Education Coordinator

Educational programs by Education Coordinator Pam Landry focus on groups of educators, students, and youth gatherings, but were also highlighted at other public events.

Project WILD & Aquatic WILD

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. It is based on the premise that young people and educators have a vital interest in learning about our natural world. 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. Through the use of balanced curriculum materials and professional training workshops, Project WILD accomplishes its goal of developing awareness, knowledge, skills, and commitment. This results in the making of informed decisions, responsible behavior, and constructive action concerning wildlife and the environment.

Growing Up WILD: Exploring Nature with Young Children

This early-childhood (ages 3-7 years) education program 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 is a tool for helping fish and wildlife agencies meet their conservation goals by recognizing that children start developing attitudes towards wildlife and nature at an early age, providing knowledge and skills to early childhood educators so they may teach about nature, providing suggestions for outdoor nature-based recreation, providing conservation suggestions for each activity, providing activities that families can do together, and laying the foundation for acquiring increased scientific knowledge and

problem-solving skills. There was a continued strong focus on connecting Growing Up WILD to Science, Technology, Engineering, & Math (STEM).

Seventeen Project WILD & Growing Up WILD facilitators, contributing 492 volunteer hours, offered 17 workshops that reached a total of 304 pre-K-Grade 12 educators from across the Commonwealth. A multiplier (75) used by the National Project WILD office would suggest that the 304 educators reached would ultimately educate 22,800 youth per year. Workshop participants included undergraduate and graduate college students, formal and non-formal educators, nature center natural history guides, state park interpreters, homeschooling parents, librarians, Montessori teachers, Student Conservation Alliance volunteers, scout leaders, and summer camp staff.

Early-childhood educators attending workshops represented staff from: family child care and child care centers, Massachusetts Association for the Education of Young Children, Head Start and Early Head Start, Department of Early Education and Care, Montessori schools, YMCAs, state and community colleges, Self-Help/Community Partnership for Children, the AmeriCorps Student Conservation Alliance, children and science museums, and child care resource and referral agencies.

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 include: landscape investigation, schoolyard biodiversity, field investigation, fostering outdoor observation skills, using technology in field investigations, applying systems thinking, and much more. Material was distributed to educators when applicable or they could download resources at www.fishwildlife.org (focus area, conservation education, tool kit).

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

Students in grades K-12 from across the Commonwealth submitted 336 pieces of artwork to this “Conservation through the Arts” program. Entries were received from public, private, and home schooled students; scouts; individuals; and private art studios. The judging, by a panel of five professional wildlife artists, took place at the Division of Fisheries & Wildlife Field Headquarters, Westboro. The acrylic painting of a Canada Goose by Lilac Shi, Apple-Leaf Studio, was selected as Best of Show and represented Massachusetts at the National Competition. Nearly 200 people (student artists, families, judges, supporters and teachers) attended the awards ceremony held at DFW Field Headquarters. Combinations of the top 100 pieces of art were part of a statewide traveling exhibit appearing at ten venues. Curriculum for students, educators, home school, and non-formal groups designed to spark youth interest in habitat conservation through science, art, math and technology was made available to student artists & educators upon request.

In Massachusetts, the Junior Duck Stamp Program is sponsored by DFW and U.S. Fish and Wildlife Service, with support from the Massachusetts Sportsmen’s Council.

Massachusetts Envirothon

The DFW’s continued involvement in this natural resource program, which reaches over 500 urban and rural high school students representing over 50 communities annually, continues through the efforts of Wildlife Education Specialist Pam Landry, who 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 (Agricultural Soil & Water Conservation), and attends the competition. Several other Division staff played roles in this important program by volunteering in various capacities on the competition day in May. The Chief attended quarterly meetings of the new Massachusetts Envirothon Council. Its purpose is to provide support for the event operation in coordination with the Mass. Commission on Soil, Water and Related Resources.

In advance of the 2017 Envirothon, MassWildlife host-

ed a Coach’s Workshop in October 2016 at the Field Headquarters, which was attended by 17 coaches from across the state. Despite cold and rainy weather, coaches were enthusiastic. Fisheries and Wildlife Board member Brandi Van Roo was the Wildlife Topic coordinator. The 2017 Envirothon was held in May at Mass Audubon’s Drumlin Farm, Lincoln.

Recruitment, Retention and Re-Activation (R3)

Astrid Huseby, Hunting Recruitment and Retention Re-activation (R3) Coordinator

The R3 Coordinator is charged with designing and coordinating an overall plan to promote hunting in Massachusetts by enhancing current programs, as well as through the development and implementation of new programs through a Hunting and Angling R3 Plan for Massachusetts.

Spring Fishing Communications Campaign

Partnering with the Recreational Boating and Fishing Foundation (RBFF), MassWildlife developed and implemented an Outreach and Communication Plan for Fishing. The strategic foundation for this plan utilized insights from an evaluation performed by Southwick Associates to analyze and profile license buyers in Massachusetts. This project tested digital strategies including banner and video advertisements, paid Google search advertisements, and paid Facebook advertisements during the spring to target and recruit new Massachusetts anglers. MassWildlife also received a competitive State R3 Grant from RBFF to send postcards and emails to retain and reactivate lapsed anglers in Massachusetts. Paid Google search advertisements, as well as postcards and emails, were effective in selling fishing licenses and will be tested further in future efforts. In general, social media, banners, videos, and paid search were successful at generating awareness of fishing and received over 11.8 million impressions. Associate Director Kris McCarthy and Outreach and Marketing Coordinator Nicole McSweeney have been invited to present the results of this effort at RBFF’s 2017 State Marketing Conference in December 2017.

Youth Skills and Recruitment Programs

National Archery in the Schools Program in Massachusetts

This program offers international-style target archery training with a national 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 DFW 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. This means all students have an opportunity to try archery, including many who may not otherwise show an interest in the sport. The NASP curriculum is designed for students in grades 4-12, and includes social studies, mathematics, and physical education. The DFW provides a 1-day Basic Archery Instructor training for physical education teachers within schools/districts that plan to participate in NASP. In addition, DFW coordinates the ordering and delivery of program equipment for the schools. In order to receive training, schools must obtain the NASP equipment kit, at a cost of about \$3,000 and includes 11 Matthew Genesis bows, 122 arrows, 5 targets, 1 arrow curtain, and 1 tool/repair kit. During FY 17, eleven new schools received teacher training in NASP with a total of 105 schools participating in the program;. Some schools provided their own funding; others used the new loaner kits that were created this fiscal year.

Young Adult Pheasant Program

The Massachusetts Young Adult Pheasant Hunt Program was developed by DFW 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.

Table 2. FY 2017 Youth Pheasant Hunt Participating Clubs

Club	Number of Participating Youth
Carver	21
Essex	10
Falmouth	12
Lee	10
Norco	16
Walpole	12
Worthington	8
TOTAL	89

Youth Turkey Hunt Program

This program was developed by DFW 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.

In FY 17, a 1-day mentored Youth Turkey Hunt was held on April 22, 2017, the Saturday preceding the opening of the spring season. A total of 97 new students (sponsored by 14 clubs) completed the pre-hunt training and participated in the field exercise and the hunt. One hundred and eighty-three previous-year Youth Turkey Hunt Program participants returned to obtain a youth turkey permit in the 2017 event and did not need to repeat the pre-hunt training and field exercise.

The following sportsmen's clubs participated in the program, in cooperation with the NWTF state chapter (Table 3).

Table 3. FY 2017 Youth Turkey Hunt Participating Clubs

Club	Number of Participating Youth
Barre	18
Carver	6
Cheshire	3
Conway	15
Essex Sportsmens Association	7
Falmouth	4
Fitchburg	3
Lee	1
Marlborough	5
Nimrod	4
Norco	12
North Brookfield	4
Stockbridge	6
Worthington	9
Total # New Youth Hunters	97
Returning Youth Hunters	183
TOTAL	280

Learn to Hunt Program

The Learn to Hunt Turkeys and Deer Program were designed for new hunter education graduates who want more information/experience before feeling comfortable enough to hunt.

Learn to Hunt Turkey Program: The learn to hunt turkey program was started in 2015 with one 3-day mentored turkey hunt and two single day workshops, we have slightly adjusted the classes each year depending on the survey results. In FY17 we had:

- 1 single day workshop with 21 participants
- 1 two-day program with mentored hunt with 13 participants
- Two half-day turkey clinics for a total of 67 participants

Learn to Hunt Deer Program: The learn to hunt deer program was started in 2015 with one 3-day deer program and two single day workshops, we have slightly adjusted the classes each year depending on the survey results. In FY17 we had:

- One three-day program with 23 participants
- Two single day workshops, one in Marlborough with 25 participants and one in Auburn with 21 participants.

Skills Programs

Angler Education Program

Jim Lagacy, Angler Education Program Coordinator
The Angler Education Program is an education/outreach program within the Education Section of Mass-Wildlife. It is the main component of the Aquatic Resource Education Program. The other component is Aquatic Project WILD, which the Wildlife Education Specialist oversees. 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.

The Angler Education Program is in part a volunteer-run operation. Currently, there are 98 volunteer instructors on the roster. Sixty instructors or 61% were active during FY 17. Each year, the program gains and loses volunteer instructors, and depending on the year, there can be anywhere from 100 to 150 instructors on the roster. All instructors complete a volunteer application and are checked through the Criminal Offender Record Information (CORI) system. They are given pertinent information about MassWildlife and the Angler Education Program, and then begin apprenticing at program events. Instructors are recruited by press releases, our many fishing programs, fairs, sportsmen's shows, positive publicity, and word of mouth.

I & E Specialist Emily Callahan Griffin assisted with festivals and clinics and fishing equipment repair and offering clinics on her own. Senior Gary Zima was somewhat active with the program at this time, working at several clinics and other festivals. Dan Perez was hired as a Seasonal Angler Education Program Assistant who was kept very busy with clinics and festivals. He also worked on a Spanish language version of the Angler Education Manual.

Family Fishing Events

Our weekend one-day 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 17 we ran or helped to run a total of 35 family fishing events. Total estimated participation was 3,428 people.

Fishing Clinics

Our fishing clinics, while short in duration (2 hours), are a very popular program component. These clinics are typically co-sponsored by town recreation departments, sporting clubs, Boy and Girl Scout troops, and or other state or federal agencies that we partner with. These are generally two to three hours long, involving a short lecture on 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. During FY 17 a total of 66 fishing clinics were conducted with approximately 1,524 people (mostly children) in attendance.

Fishing Classes

A few fishing classes are held each year, typically specialty fishing classes like fly tying, or our pilot adult only “learn to fish” classes. A few of the classes were held at the Field HQ. For FY 17, there were 10 classes conducted: 4 fly tying classes, 1 rod building class, 2 adult “learn to fish” classes, 2 in-school (Auburn HS) Physical Education Fishing Program classes, and 1 basic fresh water fishing class with the Hardwick Elementary School. Total number of participants for FY 17 was 240.

Fishing Tackle Loaner Program

The Angler Education Program keeps and maintains fishing equipment onsite for loan to various groups throughout the state. For FY 17 the AEP loaned equipment on 30 separate occasions, with 1041 pieces of equipment loaned. Our loaner equipment includes basic spincasting rods, spinning rods, salt water rods, as well as fly rods and fly tying equipment and even ice fishing gear. Our equipment was loaned to various groups and agencies, including the Massachusetts Department of Conservation and Recreation (DCR), the

U.S. Army Corp of Engineers, the U.S. Fish and Wildlife Service, various sportsmen’s clubs, scout troops, church groups, and private citizens. Along with the fishing gear, we also make available the necessary terminal tackle and various fishing education program handouts. I & E Specialist Emily Griffin was very helpful with equipment maintenance.

Cooperative Programs

Trout Stocking Programs - These programs are performed in the spring (April and May) with various school groups around the state; and they are more promotional than educational. We occasionally link them to fishing clinics and in-class presentations, but for the most part the schools show up, are given a short lecture about the agency and our fish stocking programs, after which they help DFW staff stock a given pond, lake, or river. For FY 17, 10 spring trout stocking programs were conducted with roughly 345 people in attendance.

Massachusetts Junior Conservation Camp – The Angler Education Program has always lent a hand to this camp, teaching both the fishing and the fisheries sections, as well as contributing fishing equipment, education materials, and extra manpower. For FY 17, we taught 12 sessions: 6 sessions of basic fishing and 6 sessions of fisheries management to 119 students attending camp.

Massachusetts Envirothon –The Angler Education Program has been involved with Envirothon in various capacities over the years. We currently assist the event at the water learning station, and help to format the tests for the various other stations prior to the event. For FY 17, the Envirothon was held at Drumlin Farms in Lincoln, where approximately 35 teams competed.

Becoming an Outdoors Woman Program

Astrid Huseby, Coordinator

Becoming an Outdoorswoman (BOW) is a program designed for women ages 18 and older, providing basic outdoor skills sessions. Once again, BOW partnered with the Massachusetts state chapter of the NWTF with the Women in the Outdoors Event in July 2016 in which ~140 women ages 13 and up attended. Mass-Wildlife staff offered Bird Identification and Fishing as part of the program and sponsored the event meals.

Table 4. BOW workshops held in FY 17.

Date	Title of Program and Location	Number of Participants
July 2015	Women in the Outdoors-Wild Turkey Federation MA Chapter Event	140
October, 2016	Deer Hunting Seminar, Devens	19
December, 2016	Deer Hunt, Devens	19
April, 2017	Turkey Hunt Seminar, Devens	18
May, 2017	Turkey Hunt, Devens	9
Total Participation		205

Massachusetts Junior Conservation Camp

In August 2016, the Conservation Camp held its 2-week session at a new location, Boy Scout Camp Moses in Russell. Facilities at this location are an improvement from the past location. Approximately 120 campers attended. As in the past, MassWildlife staff assisted by 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. The I & E Chief attended meetings of the Massachusetts Junior Conservation Camp Board serving as member of the Board of Directors. She coordinated the scheduling of classes MassWildlife, DCR and Environmental Police staff and some evening programs for camp. She offered a History of Wildlife program on one of those evenings. Library/Archives

Activities associated with library and archival materials are overseen by Jim Cardoza, who is on part time contract. The electronic library database went on-line in

FY17 and is being used by staff to locate and sign out materials. There is now a link to the library catalog and sign-out system on the staff computer desktops. Hard copies of the general library instructions and sign-out process are posted in the library and also at the inside end of the library journal shelving in the basement. Approximately 30 Bankers boxes of so-called "gray literature" consisting of reprints, bulletins, unpublished reports, and similar materials were the focus of much of the work during FY17. The volume of this material was reduced by about 50% by discarding or offering to other staff those items which were duplicative or unnecessary. The remaining items were catalogued and have been filed in filing cabinets in the FHQ basement. These documents are catalogued individually and can be signed out electronically. The Library continues to receive some small number of donated books, journals, theses or gray literature. These items are periodically entered into the electronic system. During FY17, the Cardoza processed all the artifacts and related items which had been stored at the State Archives and have labeled and catalogued them in the "archives" database constructed by Rob Morley, similar in design and concept to the library database. There are four to five boxes of museum items which were not located when the others were retrieved. The supervisor at the State Archives has been notified and will look out for these during the on-going renovation and expansion of the State Archives facility. Sorting and cataloguing of those "archival" (i.e., paper documents or files) which were personally packed up during the move from the former "Overlook" building. This is a somewhat tedious process as it sometimes requires sorting and cataloguing individual documents as well as files containing multiple documents on the same subject or matter. Some materials (e.g., pond or lake related documents) have been transferred to individual sections to aggregate them with existing files. There are many other files and boxes with a variety of materials which were packed by other individuals which are just getting attention. A "MassWildlife Archives" sticker has been attached to each document or folder and these are entered into the electronic database. Documents are generally classified documents or folders as "archives" and artifacts as "museum". It is likely that archival material can be signed out but artifacts (due to value or rarity) would have to be accessed through the Chief of Information & Education or designee. The Archivist continues to assist the various staff who have historical questions, seek copies of articles, books, or other publications not

held by MassWildlife, or who desire access to existing library or archival material which they cannot find.

Chief Activities--The I & E Chief attended EEA trainings on Risk Management and Conflict of Interest Training for Managers. Working with staff she attended meetings relating to R3 Working Group, Blue Hills Deer Hunt, coordinated the Rattlesnake Review meeting logistics, met with trail representatives with the Massachusetts Regional Planning Trail group and the new state website preview. She also held several meetings and calls on Strategic Communications with a PR consultant. Representing the Division, she continued to

attend quarterly meetings of the Massachusetts State Commission for Conservation of Soil, Water & Related Resources (State Commission). She also participated in reviewing grant program applications submitted by Conservation Districts for the MA Association of Conservation Districts. She attended 2 meetings on the Secretaries Advisory Group of Environmental Education and has been participating as a Board of Director member with the New England Outdoor Writer's Association.

Information & Education Staff

Marion E. Larson, Chief, Information & Education

Emily Stolarski, Communications Specialist

Nicole McSweeney, Outreach and Marketing Coordinator

Gary Zima, Senior Planner

Troy Gipps, Editor and Publications Manager

Bill Byrne, Senior Photographer

David Gabriel, Graphic Designer

Pam Landry, Education Coordinator

Astrid Huseby, Hunting Recruitment and Retention Reactivation (R3) Coordinator

Jim Lagacy, Angler Education Program Coordinator

Emily Griffin, I & E Specialist (partial year)



Hunter Education

Susan Langlois
Administrator

Overview

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 Mass-Wildlife and courses are taught by agency 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 to the participants.

Courses

Courses were offered in four disciplines across the state in FY17. A total of 4,757 students participated in the Hunter Education Program in FY 17. Participation levels are consistent with the five-year average of 4,742 students. Students are asked to volunteer information on age, gender, and ethnic background on their registration forms. The following is a summary of course offerings and statistics on student participation in FY2017

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 which 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.

One hundred and eight courses were offered. A total of 4,025 students participated, 3686 successfully completed the course. Students are asked to volunteer information on age, gender and ethnic background. Of those responding, 1006 students were minors (under 18 years of age), 275 were minorities and 823 of the respondents were female.

Trapper Education

Trapper Education is mandatory in Massachusetts for Problem Animal Control (PAC) agents and first-time trappers in order to apply for a trap registration number. This course includes both classroom work and field training. Students learn the proper use of traps and how to set them, the identification of furbearing animals and their habitats, trapping laws and ethics, and landowner relations.

Four courses were offered, with a total of 198 participants. One hundred and sixty eight participants successfully completed the course. Ten minors (under 18 years of age), 10 minorities and 20 women participated.

Bow Hunter Education

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.

Twelve courses were conducted. A total of 388 students participated and 381 successfully completed the course. Sixty-seven minors (under 18 years of age), 15 minorities and 58 women participated.

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.

Eight courses were conducted (two in Pittsfield and six in Westminister). A total of 146 students attended and 134 successfully completed the course. Two minorities, 22 minors (under 18 years of age) and 35 women participated.

Shooting Range Development and Enhancement

It is MassWildlife's objective to provide access for the public to range facilities for hunter education and shooting sports purposes by assisting shooting club range development and improvement activities. The Division seeks to amend participation in this funding opportunity by collaborating with third-party entities to increase shooting opportunities and offer advanced (skill-based) hunter education courses for the public across Massachusetts.

Hunter Education Program Staff

Susan Langlois, Program Administrator
Kim Basso, Administrative Assistant
Timothy Bradbury, Hunter Education Specialist
Steve Foster, Program Logistics
Todd Olanyk, Volunteer Coordinator
Kaylee Resha, Hunter Education Specialist
Jesse St. Andre, Hunter Education Specialist
Matthew Stover, Hunter Education Specialist



District Reports

Patricia Huckery, Northeast Wildlife District Supervisor
Jason Zimmer, Southeast Wildlife District Supervisor
Bill Davis, Central Wildlife District Supervisor
Ralph Taylor, Connecticut Valley Wildlife District Supervisor
Andrew Madden, Western Wildlife District Supervisor

Overview

Most people who meet the DFW 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 management, enhancing recreational opportunities, and addressing the wildlife issues pertinent to their regions.

District personnel sell hunting, fishing, and trapping licenses and stamps and selected permits; and they distribute licenses; Hunting, Freshwater Fishing, and Trapping Guides; stamps; and other materials related to the sale of hunting, fishing, and trapping licenses to vendors throughout their District. They assist officers from the Office of Law Enforcement (OLE) to ensure public adherence to wildlife laws and regulations and they assist the staff of the Wildlife Lands Section in prioritizing lands to be acquired by locating titles, landowners, and boundaries, and making other arrangements necessary for the acquisition of lands for wildlife.

Staff from all of the Districts conducted these administrative activities. They also participated in a wide variety of survey and monitoring programs initiated by the DFW's biological staff based at the Westborough Field Headquarters. Among the survey projects conducted by District staff were the Bald Eagle Breeding Survey, waterfowl inventory, banding/collaring of Geese, and stream and pond surveys. District personnel also conduct census counts of Wild Turkey, Mourning Doves, Woodcock, Ruffed Grouse, and quail.

District staff members enhance recreational opportunities throughout the state by stocking Brown Trout, Eastern Brook Trout, Rainbow Trout, Tiger Trout, and Broodstock Salmon into waters scheduled to receive them. Prior to releasing trout, they monitor the water quality of the designated lakes and streams. They release pheasants on Wildlife Management Areas (WMAs) and in open covers (suitable habitat on public land). They monitor and maintain the WMAs in their region by cutting brush, mowing, trimming trails, assisting with forest cutting operations, planting shrubs, and maintaining roads and parking areas. They, erect signs and

gates, and make other arrangements related to the protection and management of the agency's lands, buildings, and vehicles. They also build and maintain nesting boxes for Wood Ducks, Eastern Bluebirds, and bats, and establish cooperative agreements with farmers who raise crops on DFW land. District staff members also operate check stations, where hunters register deer, bear, turkeys, and furbearers taken during designated hunting and trapping seasons.

District Managers 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 staffers deal with a large number of beaver complaints, deer damage complaints, bear damage complaints, questions about coyotes, and other issues dealing with the impact of wildlife on human activities, and vice versa. In addition to the activities that are common to all of the Districts, there are projects that involve only some of the Districts which are detailed in their respective reports.

Northeast Wildlife District

Administration

Personnel-- Wildlife Technician David Critchlow left the agency due to back injuries and Wildlife Technician Robert Desrosiers retire after over 30 years of service. David's position was filled by Tim Mathews, a capable technician who transferred from the Sandwich Hatchery. Joshua Gahagan was hired first as a seasonal Wildlife Technician and later hired as Wildlife Technician II. He has valuable equipment operation and ornithological skills. Two position vacancies are the Wildlife Biologist and 4th Wildlife Technician.

A lighting project was completed at the District offices with installation of energy efficient fixtures and bulbs. NED staff participated in MassWildlife's Open House at Westborough Field Headquarters. They assisted with the Eagle Room (rebuilding the life-size eagle nest), Welcoming

Desk, and generally floated to wherever help was needed. Wildlife Technician Gahagan and District Manager Huckery answered the call for native snakes for the Open House herptile room. They supplied garter, Northern water and milk snakes.

Hearings for the 25-house affordable housing development called Byfield Estates continued. This project is proposed adjacent to Martin Burns Wildlife Management Area (WMA) in the town of Newbury. District Manager Huckery attends the Newbury Zoning Board of Appeals hearings to provide comment and protect MassWildlife's interests.

Staff field-checked boundary survey work conducted by contractors off Seven Star Road at Crane Pond WMA in Groveland. This survey resolves boundary issues with one of several federal taking contested parcels delineated by MassWildlife's title attorney.

A beaver dam blow-out occurred in May 2017 at Martin Burns WMA ripping out a 30 foot swath of the abandoned railroad ROW. Foul play was suspected due to the presence of an off highway vehicle trail near the dam. National Grid acted quickly to repair the damage.

The Knopp's Pond Lake Association in Groton requested a port-o-potty at MassWildlife's access ramp which was approved after visiting the site and selecting an appropriate and safe location. Staff assisted with Flint Pond Dam repair by meeting with the neighbor over whose land an access easement is required. A local scout installed a new kiosk at the Flint Pond WMA boat ramp.

A substantial erosion problem occurred at Delaney WMA over the winter causing a sedimentation plume to form in Delaney Pond. Erosion control fencing was installed to stem further problems. Working with the Stow Conservation Commission a short and long-term plan was completed which involved filling gullies with rip-rap and rebuilding the pond shoreline. The MA Department of Conservation & Recreation provided a large equipment operator to distribute the rip-rap, for which we were grateful.

The District Manager conducted a site visit with the Licensee responsible for landscape maintenance at the former Turner Dam site in Pepperell on the Nissitissit River WMA. The License Agreement was reviewed with the Licensee to ensure compliance with conditions.

A site visit was conducted for the proposed Squannicook Rail Trail in Groton and Townsend where the abandoned railroad directly abuts the Squannicook River WMA. Staff directed the applicants away from the Bertozzi Parking Area, which was built for sportsmen and women, and towards

other possible parking areas along the ROW more suitable for bike path users.

A reckless driver ran into one of the J.B. Little gates at Crane Pond WMA in Groveland and caused serious damage to the gate, and their vehicle. The Highway Superintendent from Groveland quickly repaired the gate for us.

Wildlife Conservation Easement (WCE) monitoring visits were conducted at Great Swamp Brook WCE, Fitchburg Rod & Gun WCE/Townsend, Shirley Rob & Gun WCE, Squannicook River WCE/Jarvala, Gamlin Springs WCE, and South Fitchburg Rod & Gun/Ashby WCE. District Wildlife Technician Drudi investigated reports that anglers were being turned away from Upper Wrights Pond at the Ashby WCE. He found that public parking signs were not in place, as required.

Stewardship Biologist Jones identified survey and boundary projects for Chief of Wildlife Lands Craig MacDonnell. A few of the trespasses handled include a lawn overage in Tyngsborough at Elbow Meadow WMA, a barn at Nashua River Access Area, and livestock fenced on Squannacook River WMA. File documents were provided to MassWildlife legal counsel regarding the Nashua River Access trespass. Staff attended a Boston meeting regarding a significant trespass case in Rowley on the William Forward Wildlife Management Area. Two document requests were answered regarding a Rowley trespass case and the Walking Trails Policy.

The NAWCA Kent's Island Salt Marsh Restoration project received a MEPA Record of Decision from Secretary Matthew Beacon. State permit filings are being prepared.

As a regular part of land acquisition, new core parcel selections were conducted with assistance from Natural Heritage & Endangered Species staff. The District Manager's land acquisition activities included reviewing parcels for their ecological and recreational significance on properties throughout the district and attending Lands Committee meetings. A new Wildlife Management Area was started in Ipswich called the Castle Neck River WMA. This purchase came about as part of the "Great Marsh II" NAWCA grant. Staff repaired equipment, readied tractors, sharpened tools, and maintained trucks. They delivered Massachusetts Guides to all outlets, and oversaw the addition of new branding decals for all District vehicles.

Training: Staff participated in LART training, attended the Natural Heritage & Endangered Species Program's Blanding's Turtle and Spotted Turtle Symposiums, and a Stewardship Team Boundary Marking Training. Three staff received chainsaw training. Deer aging class was attended by all. District Clerk Ostertag and District Manager Huckery attended

CommBuys procurement training held at the Westborough Field Headquarters.

Meetings: The District Manager attended Essex and Norfolk County Sportsmen's League meetings, District Manager and Senior Staff meetings, as well as Mt. Watatic Advisory Committee meetings. A Great Marsh Resiliency Meeting was attended, as well as The Trustees of Reservations "Climate Vulnerability Assessment" presentation in Boston. Several staff attended wood turtle presentation by NHESP's Dr. Mike Jones hosted by the Nashua River Watershed Association's and the MA Land Trust Coalition Annual Conference.

Research and Conservation

Wildlife

It was another tough year for banding American Black Ducks with open water in Plum Island Sound keeping ducks away from the traps. The ducks prefer native foods over kernel corn, so unless the Sound is iced over, there is no reason for a duck to enter a trap. Duck traps were set at two sites; one in Newburyport, one in Newbury. They banded 4 American Black Ducks, 5 American Black Duck-Mallard hybrids, and 5 Mallards. District staff participated in the Canada goose banding project, developing the necessary number of banding sites throughout the District, and assisting with the banding effort. The Wood Duck project was again hindered by warm winter weather and lack of ice.

All District staff assisted Habitat Program Leader John Scanlon with a forestry assessment at Dunstable Brook WMA in Dunstable and Tyngsborough, in preparation for a Forest Cutting Plan. The Northeast District Crew learned how to evaluate forest composition and density. Stewardship Biologist Jones developed a list of priority habitat projects for presentation to MassWildlife's Habitat staff. Most notable is a multi-species habitat project at Squannacook River WMA. The Choate Island Shrubland Restoration Project was completed by The Trustees of Reservations as part of MassWildlife's "Great Marsh II" North American Wetlands Conservation Act (NAWCA) grant. Twenty-eight acres of shrubland were restored as habitat for nesting American Black Ducks, other waterfowl, shrubland birds, and migratory birds. MA Audubon Society completed pepperweed treatment in Great Marsh, also as part of the NAWCA grant.

District staff logged many hours at John C. Philips Wildlife Sanctuary marking boundaries and replacing signs, as well as mapping all trails. This work was completed in preparation for reviewing the Bay Circuit Trail under the new Walking Trails Policy. The trails information will also inform wildlife conservation actions at the Sanctuary. Boundary signs were checked and replaced as needed at Ashby WMA.

Staff participated in a Nashua River Watershed Association project to restore/replant riverfront areas with native shrubs and trees. We joined over 25 volunteers at a selected Squannacook River WMA site and helped with placement of stakes and flags to visibly delineate the restored area. Restoration of the riverfront area will benefit both aquatic and other riverine wildlife species. Daily contractor work was overseen. A bidder's conference was attended for the proposed shrubland habitat work at Martin Burns WMA, and staff daily checked-in with contractors. Farmer Hoyt's haying License Agreement was up for renewal at William Forward WMA. Stewardship Biologist Jones handled site visits and developing agreement conditions accordingly.

Fisheries

During the summer, staff conducted stream surveys on 53 brooks and rivers in at least 3 major watersheds including the Squannacook, Nissitissit and Parker Rivers. Survey efforts were hampered by drought conditions where many streams did not have enough water to allow for fish sampling. The Parker River watershed was remarkably dry. Staff assisted with fish monitoring at the Nissitissit River WMA as a required condition for removal of Turner Dam. Surprisingly, there were no recorded fish kills.

The town of Tyngsborough's Flint Pond Association proposed chemical treatment of the pond to control a proliferation of aquatic plants which was reviewed by District staff. The treatment should improve fisheries habitat, and well as angler access.

Upper Wrights Pond was temporarily removed from the trout stocking list until public access for anglers is rectified with WCE-holder South Fitchburg Rod & Gun Club. A site visit and meeting were conducted to further MassWildlife's interests here.

Unfortunately, Lake Pearl in Wrentham was removed from the trout stocking list due to new town administrative changes that violated MassWildlife's Trout Stocking Policy. District staff attended site visits and participated in discussions with the Town Administrator to try to reach an amenable solution to achieving reasonable non-resident angler access. Despite MassWildlife efforts, the Selectmen voted to increase fees for non-resident anglers above and beyond those charged to resident anglers, and did not provide adequate shoreline access.

District Clerk Sue Ostertag and Fisheries Biologist Sheedy attended a meeting regarding MassWildlife's on-line trout stocking report.

Natural Heritage and Endangered Species

Bald Eagle nest surveys were conducted in April at known nest sites in Tyngsborough, Amesbury, Methuen, Haverhill, Newbury, Waltham, and Framingham. Staff checked potential nests reported at the Nashua River, Mystic River, Nagog Pond and Spot Pond reports. They were able to confirm a pair of Bald Eagles just starting to set-up a nest on the Nashua River. For the first time in at least 5 years, the Amesbury nest was not successful due to weather damage to the nest. Two chicks from the Waltham nest were banded with assistance from the climbing crew out of the Southeast District. Sadly, these 2 chicks did not fledge, with Tufts Veterinary Clinic determining cause of death as liver flukes for one of them. Northeast District Wildlife Technicians assisted with banding of the UMass/Lowell peregrine chicks.

District staff participated in three months of Blanding's Turtle trapping according to protocols outlined in the State Wildlife Grant. State-listed turtle records from this study and the Squannicook River WMA were entered into the Natural Heritage & Endangered Species Program (NHESP) Vernal Pool Rare Species online database. Staff assisted NHESP in delineating possible turtle nesting sites on WMAs for the state-threatened Blanding's Turtles. Invading weeds were pulled and cut at the Upper Parker River WMA nesting area created in 2015 for Blanding's Turtles.

Staff assisted NHESP botanist Karro Frost in updating database records for state-listed Long's Bulrush at the Martin Burns Wildlife Conservation Easement (WCE) within Common Pasture in Newbury. This training prepared Stewardship Biologist Jones and District Manager Huckery for future surveys at possible sites within Crane Pond and Martin Burns WMAs. District staff was trained to identify state-listed aquatic plants within the Nissitissit River WMA in Pepperell. Following marsh bird survey training by State Ornithologist Drew Vitz for District technicians, Wildlife Technician Gahagan conducted surveys at Pantry Brook and Crane Pond WMAs. As part of the Turner Dam removal project on the Nissitissit River in Pepperell, staff assisted with monitoring state-listed freshwater mussels.

Enhancement of Outdoor Recreation

In November 2016 the annual paraplegic hunt was held at Fort Devens and ably coordinated and overseen by Fisheries Biologist Sheedy. Five hunters enjoyed their time at Fort Devens and harvested 1 deer. A new deer biological check station was added at Falter Farm and Slaughterhouse in Ashby. Twelve deer check stations operated within the District.

District staff met with Engineer Tony Stella from the Office of Fishing and Boating Access (OFBA) to look at the White's Pond access ramp in Concord. The end of the ramp

has eroded and left a sharp drop that interferes with trout stocking. OFBA will work with the town of Concord to repair the damage. A new angler access and canoe launch at the Sudbury River Access Area was reviewed by District Manager Huckery with Doug Cameron from OFBA. An ideal location was found which will provide excellent river access for disabled anglers. Funds for this access are derived from Nyanza Superfund Natural Resource Damages.

Despite the rain, staff handled the Earth Day fish stocking event at Hopkinton Reservoir with an enthusiastic crowd. Mechanical troubles with the 2016 stocking truck impeded trout stocking efforts. Combined spring and fall trout numbered 111,940. In the fall, anglers saw 12,500 14-inch Rainbow Trout released into 2 rivers and 18 lakes and ponds, followed in the spring by 99,440 Rainbow, Brown, and Brook Trout in 42 ponds, 7 major rivers, and 66 brooks and minor rivers.

Five-thousand pheasants were released into five WMAs and 11 open covers. There was no loss in the number of pheasant covers. No Special Pheasant Stocking Permit were issued for Martin Burns WMA. The Danvers Fish and Game Club ran a successful Youth Pheasant Hunt at Martin Burns WMA, with 9 youngsters participating and Walpole Rod and Gun Club held their hunt at Charles River WMA. DFW conducted a Youth Hunt Seminar sponsored by the Danvers Fish and Game Club. Controlled pheasant hunts were held at Martin Burns WMA and a controlled waterfowl hunt was offered at Delaney WMA with 7 participants. MA Environmental Police officers again assisted with stocking pheasants at Kent's Island since the bridge is in poor condition and inaccessible by stocking trucks.

Three clubs were issued field trial permits for Delaney WMA. Range permit requests for Martin Burns WMA continue to increase with 592 issued (582 FY16).

Outreach and Education

The usual Northeast District outreach and education efforts were reduced due to the Wildlife Biologist and Wildlife Technician vacancies. The District Manager attended the Carlisle Conservation Breakfast in February to discuss trending wildlife subjects. Conservation breakfasts were attended with colleagues from Groton, Pepperell, and Townsend. Current and emerging issues regarding wildlife were discussed, as well as other pertinent conservation matters. The 2nd annual Vernal Pool Walk was held by MassWildlife on The Throne in Groton with many children attending. The 3rd Annual Groton Conservation Summit was attended by District staff to highlight important conservation projects.

A great deal of wildlife education happens every day in the

District during each wildlife-conflict call. The Northeast District public is sometimes naïve about wildlife, so the staff guides them to a better understanding of each animal through listening and conversation, teaching people how to help themselves, directing people to the MassWildlife website for the “Living with Wildlife” series of educational materials, or connecting them to appropriate local authorities who can assist them further.

Technical Assistance

District Manager Huckery joined Westborough Field Headquarters staff at Boston City Hall to participate in a Canada Goose panel addressing concerns about too many geese, including excess goose feces. This was followed by participation in volunteer training on how to oil eggs.

It was a busy year for coyotes. Following, are a few of the calls received by the District. A call for help came in from the Essex Animal Control Officer regarding several dog attacks suspected to be coyotes. A site visit was conducted to the sites where the incidents were reported. Staff talked to dog owners and walked the areas where coyotes were often seen to assess possible reasons for the reported dog attacks. Bird and deer feeders were found. It was discovered that dog owners were leaving their dogs out at night subjecting them to a higher likelihood of interacting with coyotes. For the second year in a row, coyotes were in the news in the city of Gloucester. A small dog that was taken by a coyote had been tied to the side porch at night which made it vulnerable to predation. District Manager Huckery, Assistant Director of Wildlife Mike Huguenin and Furbearer Biologist Dave Wattles led a well-attended coyote talk at Gloucester City Hall. Based on the investigation, it was determined that the suspect coyote was not acting aggressively, but was exhibiting normal predatory and foraging behavior. In this presentation, harassment techniques were explained should people encounter coyotes. The scale of coyote behaviors from normal to aggressive were discussed, so that residents would know when to contact enforcement and/or MassWildlife. A coyote was reported to be attacking dogs at conservation land in Concord. Staff conducted a site visit with Concord’s Natural Resource Officer and an interested neighbor. There was no evidence of incidental feeding and, due to the time of year, it was determined that that it was likely a female protecting pups. Accordingly Concord officials put up signs notifying the public.

District staff dedicates many hours patiently listening to and helping the public with questions about wildlife they see around their houses and in their yards. The information from these calls is recorded on electronic report forms submitted to Westborough Field Headquarters.

Southeast Wildlife District

Administration

There were two personnel changes in the Southeast District in FY17. Daniel Fortier was promoted into the vacant Technician III position, resulting from Steve Wright’s promotion in late FY16. Connor Fleming was hired into the vacant Technician II position, resulting from Dan Fortier’s promotion.

The Southeast District Manager and the District Biologists provided input to the DFW Lands Committee on potential land acquisition projects, focusing on wildlife habitat and recreational opportunities. The District Stewardship Biologist and Wildlife Technicians monitored Conservation Easements throughout the District.

License agreements were issued by the Southeast District for agricultural and other special uses on WMAs. The District currently manages 21 agreements. These agreements benefit wildlife by maintaining open habitats, often in places that would otherwise not be actively managed due to staff, equipment, and time constraints, or by arranging for cooperative management that benefits wildlife habitat or wildlife-dependent outdoor recreation.

The District Manager and Dan Fortier, District Tech III, were intimately involved in the preparation, review and final approval of the agency’s new Prescribed Fire Handbook and Policy.

Southeast District staff attended and/or completed a variety of different training programs in FY 17, including ongoing Land Information System and associated iPad use training, a Trapping Matters workshop, the annual Wildland Firefighter refresher training, Wildland Firefighter Chainsaw training, several Wildland Fire training courses at Joint Base Cape Cod in September, the annual deer aging and management workshop at our Field HQ, Forestry training regarding how to read and interpret Forestry Management Plans, the MA Land Trust Coalition 2017 Mass Land Conservation Conference, a Wellfleet Bay Eider Virus workshop at Tufts School of Veterinary Medicine, Avian Influenza Response training and physical exams and marshbird survey protocol training.

Research and Conservation

Wildlife

Southeast District staff completed breeding surveys for ruffed grouse, mourning dove and various waterfowl species as assigned by Wildlife Section biologists. District staff also conducted annual winter American black duck trapping and banding, successfully banding a total of 512 ducks throughout Plymouth, Bristol, and Barnstable counties. The

District also assisted Westborough staff in completing duck banding at the New Bedford Reservoir using DFW's airboat. Nesting boxes for wood ducks and Eastern bluebirds were monitored, maintained and replaced on DFW lands and other public and private lands. District staff participated and assisted with Westborough staff in trapping and banding Canada geese in Barnstable county, Plymouth county and Bristol county, meeting the desired quotas. District staff also conducted pre-season summer mallard banding at a number of sites, banding 26 ducks. Staff also conducted mourning dove trapping and banding and were able to band a total of 56 doves.

Southeast District staff assisted with common eider banding in southeastern Massachusetts, along with H Heusmann and other Westborough staff. Eiders were surveyed for and banded on offshore islands including Penikese, Naushon and several other islands in the Elizabeth Islands chain.

The District assisted with ongoing New England Cottontail research and survey efforts, conducting pellet collection surveys throughout parts of southern Plymouth and Bristol Counties and on Cape Cod. NEC trapping efforts were successful again in FY17, with District staff capturing 5 rabbits that were transported to the Roger Williams Zoo and the Queens Zoo to participate in a captive breeding program. District staff also assisted with a contractor that was licensed to use trained dogs to search for NEC pellets on several wildlife management areas and at Camp Edwards.

The District completed a number of habitat management and improvement projects in FY17 including mowing of 292 acres of grassland/field habitat at Frances A. Crane WMA, mowing and maintenance of fire breaks at multiple WMAs, mowing and tree/shrub cutting along miles of dikes and dike roads at Burrage Pond and Hartley Reservoir WMA, planting of little bluestem and other native grass/forb species at several WMAs and planning and/or oversight of ongoing former cranberry bog restoration projects at Red Brook, Burrage, Mill Brook Bogs and Taunton River WMAs. The District also assisted with the planning, permitting and completion of prescribed fires on Joint Base Cape Cod, Frances A. Crane WMA and Southwick WMA.

The District continued to be heavily involved in the planning, monitoring and public educational aspects of several ongoing, major habitat restoration projects in Southeastern Massachusetts. District staff assisted in the planning stages of each project and conducted public site walks, answered public inquiries on the projects, met with and monitored contractors in the field, monitored vegetation in the project areas and conducted necessary surveys for wildlife species throughout the duration of the projects. Projects that the District were involved with this FY included the Cooks Pond WMA coastal plain pond restoration project, Red Brook

stream and wetland restoration project, Frances A. Crane WMA grassland and pitch pine – scrub oak woodlands restoration project, Burrage Pond WMA emergent wetlands restoration project and pitch pine – scrub oak woodlands restoration projects at the Southeast Pine Barrens WMA and Camp Cachalot WCE.

District staff also investigated numerous reports of wildlife that were sick, injured or dead as a result of a variety of causes and took appropriate actions. The Staff also uses these interactions with the public to educate them on wildlife biology and management. Several staff members on the LART Team responded to deer stuck in enclosures in Wareham and Fall River. In both cases, deer were successfully hazed out of the enclosed areas and into suitable forested habitat nearby. They worked closely with the Massachusetts Environmental Police and local law enforcement officials to ensure the deer could safely cross busy roadways.

District staff also operated a number of game check stations during deer and turkey season, collecting biological data used in management of these important game species. As in past few years, District staff entered all biological deer and turkey data collected into the MassFishHunt online system, allowing for our biologists to review and analyze the data more efficiently. Staff also conducted numerous deer browse impact surveys on a variety of public lands across the District to assist our deer biologist in assessing deer densities across the region and focus efforts to improve hunting/management access accordingly.

Southeast District staff conducted multiple field visits to assist with fuel model mapping at Camp Cachalot WCE, Southeast Pine Barrens WMA, Maple Springs WMA and Myles Standish State Forest Cooperative WMA that will enable prescribed burn plans to be developed for those properties. Staff also worked to build out the District's new prescribed fire trailer so that it can be used to house all of our prescribed fire PPE, tools and equipment.

Fisheries

Pond and stream surveys, using electro-fishing, gill netting, rod/reel survey and other techniques, were completed in a number of southeastern Massachusetts waterbodies in FY17 in consultation with the Fisheries Section in Westborough including the Taunton River, Sampsons Pond and Angeline Brook, among others. Passive integrated transponder tagging research on brook trout continued in Red Brook, Quashnet River, Childs River and Coonamessett River. Further, in coordination with the North and South River Watershed Association and Sea Run Brook Trout Coalition, District staff assisted with the electrofishing and PIT tagging of brook trout in Third Herring Brook to support monitoring

of the population following ongoing dam removals and habitat restoration projects in that stream system.

The District continued our excellent relationship with the Sandwich Fish Hatchery, 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 in order to better manage these systems, warn of dangers or issues, and provide a baseline set of data. He also cooperated with Trout Unlimited on a variety of projects, including the PIT tagging research.

As was also the case in FY16, District staff had to continually monitor flows at Red Brook WMA throughout the spring, ensuring there were no problems with fish passage through Red Brook and into White Island Pond. John Garifoli, Tech II, completed necessary repairs to the top of the fish ladder at White Island Pond, repairing the flume board slots and replacing boards to address leaks. The larger, ongoing restoration project is now in the process of identifying suitable funding opportunities and the District is actively working with the Division of Ecological Restoration to move the project forward.

Technical assistance was provided to Massachusetts Institute of Technology to support pond mapping at Fresh Pond. Sampling assistance was again provided to Division of Marine Fisheries (DMF) in sampling American Shad in the South River and Indian Head River.

Technical assistance and field visits were also provided for a potential dam removal on the Jones River in Kingston, the potential removal of a dam on the Weweantic River, and ongoing alum treatments and concerns regarding water flow and algae blooms in Monponsett Pond.

Technical assistance was also provided to USGS researchers studying groundwater/surface water interactions and brook trout habitat in the Quashnet River. Technical assistance was also provided to the Falmouth Rod and Gun Club on the Childs River restoration project.

The fisheries manager attended meetings of the Sea Run Brook Trout Coalition and the Southern New England chapter of the American Fisheries Society.

Land Stewardship

The District Stewardship Biologist completed annual monitoring visits and reports on 29 of the 33 Wildlife Conservation Easements (WCE), with Westborough staff completing

the remaining 4 visits and reports in accordance with established protocols/schedules. In addition, the Stewardship Biologist met with many of the underlying fee landowners to discuss issues and continue to establish positive working relationships.

Boundary marking efforts continued in FY17, with both in-house and contracted boundary marking work being completed on many properties including Hockomock Swamp WMA, Noquochoke WMA, Meetinghouse Swamp WMA, Peterson Swamp WMA, Red Brook WMA, Burrage Pond WMA, Frances A. Crane WMA, Maple Springs WMA, Copicut WMA, Dartmoor Farm WMA, Assawompsett Pond Complex WCE, Lake Nippenicket WCE and Santuit Pond WCE. Formal professional surveys were also completed on portions of the Taunton River WMA and Frances A. Crane WMA to specifically assist in addressing concerns regarding suspected illegal encroachments.

To that point, the boundary/survey work and WCE monitoring visits resulted in the identification of over 26 new encroachments. The Stewardship Biologist fully documented each encroachment with photos, GPS data collection and formal reports. Significant encroachments included a major wetland clearing violation at Peterson Swamp WMA, a shed on our Noquochoke WMA, land clearing and illegal dumping at Frances A. Crane WMA, storage of trailers, illegal placement and operation of bee hives on the Hockomock Swamp WMA, equipment and other items at the Taunton River WMA, illegal target shooting range on the Acushnet River WCE, illegal storage of a bobcat and trailer on the Stump Brook WCE, illegal storage of oyster grant equipment at the Gosnold WMA and backyard expansion/clearing on the Santuit Pond WCE. Contact was made with all landowners and all but three of the encroachments were remedied and the property restored. The three remaining encroachments are in the process of being addressed with the landowners or pending additional research and title work.

District staff successfully worked with the Massachusetts Environmental Police to resolve a camping/parking situation at the Frances A. Crane WMA, where an individual was illegally parking a truck and camper on the WMA and essentially living there.

Parking areas and roadways/trails were maintained at a number of WMAs and Access sites including a significant restoration of the access roadway at the Old Sandwich Game Farm WMA, which involved delivery and spreading of several loads of material, grading and York rake work. A major roadway restoration/repair project also began at the Rocky Gutter WMA. The District Stewardship Biologist prepared wetlands permit filings and obtained a permit to fill in two large sinkholes on the eastern end of Rocky Gutter

Street that have posed a significant access issue for the public. This work is planned for early FY18.

Gates and/or boulders were installed to block illegal access points at the Camp Cachalot WCE, Red Brook WMA, Rocky Gutter WMA and the Old Sandwich Game Farm WMA. Signage was installed, maintained and/or replaced at the majority of WMAs and some WCEs in the District in FY17.

The District Manager and Stewardship Biologist addressed ongoing issues associated with improper/illegal use of the Popponesset Beach Access area by non-anglers. This site is cooperatively managed with OFBA and the Popponesset Beach Association, and it has been difficult to prevent general beach goers and partying at the site.

The District Manager continued to play a leading role on the agency's proposed new WMA regulation associated with dogs and other domesticated on WMAs.

Invasive species control projects were planned and completed at the Burrage Pond WMA and Frances A. Crane WMA. Further, District staff coordinated with Westborough staff to plan and prepare for a hydrological analysis of Burrage Pond WMA to assist in management of water levels to enhance wetland habitats. Staff also worked with the Department of Conservation and Recreation to plan and complete fire road clearing and maintenance at the Hyannis Ponds WMA.

The Hyannis Ponds WMA also has two other ongoing issues that required significant expenditure of District time including the proposed bike path and ongoing monitoring of coastal plain pond habitats in light of concerns regarding nearby water withdrawals.

The Stewardship Biologist utilized remote camera systems to assist in addressing illegal activity on several WMAs in FY17 including illegal trash dumping at Red Brook WMA, illegal use of a parking area at Burrage Pond WMA and illegal OHV activity at the Taunton River WMA. Access to the live photo feed was provided to the Massachusetts Environmental Police to aid in enforcement actions.

District staff continued to update WMA and WCE narratives to be uploaded to the MassWildlife Lands Viewer to help the public locate and learn about our lands. District staff also assisted in the review of the Blue Hills Resource Management Plan and met with Bay Circuit Trail representatives associated with bringing them into compliance with our new trails policy.

Natural Heritage and Endangered Species

The District cooperated with the Natural Heritage & Endan-

gered Species Program (NHESP) staff on a variety of projects this fiscal year. District staff continued with our increased involvement in coastal shorebird monitoring and management, participating in planning meetings and training sessions, monitoring various plover, tern and American oystercatcher sites, installing and maintaining symbolic fencing and signs and interacting with the public and beach managers on a variety of issues related to shorebird management. Coastal shorebirds were monitored by District staff at Long Island and the South Shore Marshes WMA in Fairhaven, Brandt Island Causeway, Strawberry Point and Angelica Point in Mattapoisett, Fox Island WMA in Wellfleet and Planting Island in Marion.

Southeast District staff were again involved in a concentrated effort to conduct field surveys for a variety of species listed under the Massachusetts Endangered Species Act (MESA), whose actual field records have become so old that they were at risk of being dropped from regulatory protection and mapping. District staff attended marsh bird survey training, as well as continuing development of a comprehensive field guide for coastal plain pond plants species to aid in field surveys. Marsh bird surveys were completed at a total of 10 sites including Burrage Pond WMA, West Island State Reservation and various Town conservation lands and private holdings. Coastal Plain Pond and other rare plant surveys were completed at nine sites including Bartlett Pond, Cooks Pond, Gunner's Exchange/Hoyt's Pond, Little Long Pond, Ellis Pond, Grassy Pond Plymouth, Poor Meadow Brook, South Triangle Pond and Triangle Pond. Staff also assisted with annual Agalinis surveys at the Frances A. Crane WMA. The District Biologist completed an annual nightjar and whip-poor-will survey on Cape Cod.

District staff participated in the annual spring bald eagle census, covering portions of Plymouth, Bristol and Barnstable County. District staff also monitored known eagle nesting locations and investigated reports of potential new nesting sites. We had a total of eight active eagle nests in FY17, including two newly identified nests, one on the Taunton River in Dighton and one on the North River in Scituate. The two new nests failed, but all other nests were successful. The District continued to receive consistent reports of adult eagles near Mashpee-Wakeby Pond on the Cape and at Sampsons Pond in Carver, but have yet to discover nests in these locations. District staff also monitored our five known peregrine nesting sites in Fall River, New Bedford, Brockton, Taunton and Sandwich/Bourne and assisted NHESP staff with banding efforts. Kestrel nesting boxes were installed and/or monitored and maintained at Burrage Pond, Frances A. Crane, Maple Springs and Erwin Wilder WMAs.

The District continued supporting the tern project in FY17, assisting with a wide variety of projects over the course of

the year including storing and transporting boats and equipment, the annual tern surveys and habitat improvement projects. District staff assisted with clearing of vegetation on Ram Island in May and also constructed a new cover for the cistern on Penikese Island.

Southeast District supported the annual Northern red-bellied cooter release in May at Burrage Pond WMA and became significantly involved in ongoing Blanding's turtle research and management. District staff coordinated with Mike Jones and Jon Regosin to implement an intensive survey effort at a Blandings turtle population in the Hockomock Swamp WMA. This effort included many days of trapping and field surveys, which resulted in a single adult female being trapped and radio-tagged. District staff continued to collect telemetry location and movement data on this individual and hope to add more individuals to the study in FY18. Staff also assisted with ongoing cooter surveys and research at several ponds including Hoyt's, Gunners Exchange and East Head Reservoir, as well as completing a Northern diamondback terrapin survey at a site in Bourne, successfully confirming the species at the site.

Enhancement of Outdoor Recreation

District staff stocked its fall 2016 allocation of 12,500 trout into 25 ponds and stocked its spring 2017 allocation of 83,540 trout into 52 ponds and 27 streams. The staff provided birds for another safe and successful upland game bird hunting season, stocking just over 7,900 pheasant and 3,500 quail on six WMAs and over 12 open covers throughout the District. 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, and assisted with the operation of the hunts at both clubs.

The District operated and managed controlled-access hunting opportunities for white-tailed deer, wild turkey, and coyotes on the Massachusetts Military Reservation (MMR). These efforts provided hundreds of sportsmen with the opportunity to hunt on roughly 9,500 acres of open territory on the MMR. A total of 45 deer and 13 turkeys were taken during the regular 2016 deer and regular 2017 turkey seasons on the MMR, respectively. Further, the District worked closely with base personnel to offer the Division's annual paraplegic deer hunt, with three participants all seeing deer. The District also worked with MMR staff to again provide very successful youth deer and turkey hunting programs at the MMR. District staff also supported the implementation of the Blue Hills Reservation Deer Management Plan by assisting with the second segment of the controlled

deer hunt.

The District Manager issued permits for a total of 45 special winter game bird hunts, 12 at the Erwin Wilder WMA and 33 at the Frances A. Crane WMA. A total of 156 pheasant and 1,143 bobwhite quail were stocked during these hunts. A variety of field dog trials were reviewed and permitted by the District Manager, including six upland bird dog trials at Frances A. Crane WMA.

The District continued to maintain and improve roads, trails, parking areas and fields on our wildlife management areas and access areas to provide for safe and effective access to our properties for all forms of passive outdoor recreation. The majority of fields and access trails at both the Myles Standish State Forest WMA and Frances A. Crane WMA were mowed and/or maintained by hand cutting.

Southeast District staff assisted in updating pond maps by conducting visits to several ponds and collecting bathymetry data. District staff also worked to improve access to our Burrage Pond WMA by contracting a tree company to clear adjacent to an access road that we had lost and obtaining formal plans created by the Office of Fishing and Boating Access, which were approved by the Town, to restore the former roadway and parking area.

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. The Division's annual Guide to Hunting, Fishing & Trapping was delivered to all license vendors, State Parks and a variety of other locations throughout the District.

Southeast District personnel prepared and staffed displays at the Marshfield Fair, Standish Sportsmen's Association Sportsman Show, Thornton Burgess Society Animal Day, the Town of Sandwich 150th anniversary event, the Waquoit Bay National Estuarine Research Reserve Watershed Block Party, the Falmouth Rod and Gun Club's Youth Day and several other environmental career days and youth events. Educational or informational talks were given across the District. Steve Wright gave a presentation on coyotes in Westport, attended several Envirothon groups trainings and gave general wildlife presentations, attended several school career days to talk about his job as a wildlife biologist and gave a wood duck nest box building demonstration to a youth group at Wankinquoah Rod & Gun Club.. Steve Hurley gave fisheries management and/or brook trout talks at the River Herring Network meeting, at the Wankinquoah Rod & Gun

Club, at the SE Massachusetts Chapter of Trout Unlimited, at the Squanittissit Trout Unlimited Meeting and several other Trout Unlimited events/meetings. Steve Hurley also attended the MassWildlife/Trout Unlimited Workshop at our Field HQ, the Massachusetts Military Reservation poster session, and the TTOR Lyman Reserve Open House.

The District Manager gave two talks on the American bald eagle, one at the Raynham Senior Center and the other at the South Shore Natural Science Center as part of their winter lecture series. The Manager also attended several elementary schools career days to talk about his job, as well as giving several general wildlife talks. Several District staff attended and assisted with the agency's annual open house at our Field HQ, participating in the National Archery in the Schools section, fisheries section and providing general support.

District staff assisted with the National Archery in the Schools Program (NASP) by delivering and retrieving course materials and equipment to and from schools in southeastern Massachusetts that participate in the program.

Southeast District staff also attended and presented at the Scituate Science Spectacular and the Southeastern MA Chapter of the Ruffed Grouse Society Annual Meeting. The District Fisheries Manager participated in the new 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.

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. Numerous site visits were made to meet with concerned citizens and information was provided to either quell their concerns or empower them to take steps to reduce the probability of conflicts such as proper yard maintenance, harassment and pet husbandry.

Most notable among wildlife calls in FY17 was the continued increase in nuisance or problem wild turkey calls. Southeast District staff responded to many turkey calls including Swansea, Attleboro, Fairhaven, Falmouth, Plym-

outh and Bourne. Most of the situations involved groups of turkeys in residential or other highly developed areas that were either posing significant traffic hazards or that had individuals (often 2-3 year old males) that had become very aggressive towards people. In nearly every case, we also found evidence of direct feeding of turkeys in the general vicinity of the reported problems. In a few of the cases, the agency determined that the human safety risk (either traffic or personal safety) had progressed to the point where individuals had to be removed and euthanized. In all cases, District staff made a concerted effort to educate the public and business owners in the area on the problems associated with habituating birds by feeding.

Southeast District staff also responded to several reports of aggressive hawks in FY17. These reports included both red-tailed and red-shouldered hawks and involved incidents where the hawks had nested in close proximity to homes and were aggressive and attacking people, including small children. In all but one case, site visits and meetings with landowners resulted in the affected individuals agreeing to wait out the nesting/fledging period. In several cases, District staff agreed to return and remove the nest and 1-2 supporting limbs to hopefully deter future nesting close to the home. In one case, District staff, in consultation with Tom French and Norm Smith at the Blue Hills Trailside Museum, climbed to the nest and removed fledglings that were then relocated to other active nests in the District and the nest was removed, as those birds had been extremely aggressive towards children at a nearby bus stop on a daily basis.

District staff responded to two nuisance beaver situations in FY17. Landowners were advised of the laws, including MGL 131/37, and the situations were eventually resolved by removing the beavers.

The District had staff that served as the DFW 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 Southeastern Massachusetts Bioreserve Management Team, the Cape Cod Rabies Task Force, the Mashpee National Wildlife Refuge Management Team and the Comprehensive Conservation Plan (CCP) Planning teams for Mashpee, Monomoy, Nantucket, Massasoit and No Man's Land Island National Wildlife Refuges. The Fisheries Biologist was actively involved in monitoring the Massachusetts Military Reserve (MMR) cleanup activities as a member of the Plume Containment Team.

The District Manager attended monthly meetings of the Barnstable, Bristol, and Plymouth county leagues of sportsmen, providing them with information on DFW activities and answering fish and wildlife questions.

Central Wildlife District

Administration

The position vacated by the retirement of Technician III Bob Chapin was reclassified to a Technician II and filled by Ian Sypek. Three District Technicians participated in a prescribed fire training refresher course and fitness test held in Westboro. District staff attended a "Trapping Matters" workshop in Westborough. Stewardship Biologists participated in LIS training and discussed their duties with members of the Senior Staff.

Research and Conservation

Wildlife

District personnel oversaw the operation of 11 Deer check stations, 9 Turkey check stations, 8 Eastern Coyote check stations and 3 Black Bear check stations. Electronic game checking was used at the District office for turkey, deer and furbearers.

Ruffed Grouse, American Woodcock, and Mourning Dove censuses were completed. Waterfowl Breeding Plot surveys were also conducted.

Canada Goose leg banding was conducted in Central District with Waterfowl Project Leader H Heusmann. 150 geese were banded at 13 sites. 122 Wood Duck nesting boxes were checked and 36 new boxes erected at 31 wetland sites. Donations of metal poles and wood duck boxes were accepted from sportsmen and the public. Rough cut lumber for wood duck box construction was milled at a DCR sawmill at the Otter River State Forest.

Beaver, Otter, Coyote, Fisher, Bobcat and Fox pelts were tagged and recorded or checked online.

Turkey brood reports were submitted during the three month study period. Scheduling and stocking of 12,888 Ring-necked Pheasant was completed and 5,432 seven week old pheasants were distributed to 20 sportsmen's clubs and two correctional institutions for rearing. Pheasants were released on 17 Wildlife Management Areas (WMAs), 3 DCR properties and participating club properties. Bolton Flats and Winimusset WMAs were available for the winter pheasant hunting opportunity in Central District. Two applications were received for Bolton Flats.

Radio telemetry studies were continued focusing on tracking 3 collared black bear. Two den sites were visited during the winter season. Six research barrel trapping sites were

maintained with two male bears captured, immobilized, ear tagged, and released. A reported bear attack on a horse in Petersham was investigated where it was determined that a protruding gate latch was responsible for the horse's injuries.

Nuisance animal reports were addressed and recorded. Animal Reports were submitted electronically. Technical assistance was provided and site visits conducted where necessary. The majority of reports related to coyote, bear, fisher, bobcat and fox. Reports of suspected illegal activity were forwarded to the Environmental Police.

Several moose/vehicle collisions were documented and data collected from specimens which could be salvaged. Large animal responses were undertaken by District staff for moose, deer or bear in cooperation with the Environmental Police. Large animal responses were made in Fitchburg (2), Worcester (2) and on Route 146 in Uxbridge.

Seventeen WMAs were maintained with efforts directed at fields, roads, parking lots, gates, dumping and OHV deterrents. An ongoing dumping matter being addressed with the Environmental Police at the Five Mile River Access Area was continued by the East Brookfield District Court.

A cinder block storage building at the Winimusset WMA was tested for asbestos (negative), demolished by District staff and disposed of in a rented 30 yard dumpster.

Planning efforts continued to create habitat management demonstration plots at the MacCallum WMA.

Illegally placed commercial bee hives were found at the Bolton Flats WMA and investigated by the Environmental Police.

The District participated in the MassWildlife Open House at the Cronin Building in Westborough which was held jointly with town of Westboro's 300th anniversary celebration.

Planning, permitting and engineering efforts were conducted at the Merrill Ponds WMA in Sutton in preparation for work to remove the Putnam Pond Dam and modify the Welsh Pond dam. The work is being done in conjunction with consulting engineers from Tighe & Bond.

Emergency work was authorized by the Hubbardston Conservation Commission at the Williamsville Pond dam. The top three courses of boards that span the concrete spillway were compromised by high water and vandalism and subsequently removed by a contractor identified by the Office of Dam Safety.

The water level continued to be maintained at the Cusky Pond dam in New Braintree following guidance provided by consulting engineers from Tighe & Bond.

District staff addressed beaver flooding issues at the Burn-shirt River dam in Phillipston and at a flooded roadway at the Bolton Flats WMA by using a combination of 10-day emergency permits and conventional trapping during the open season.

License Agreements were maintained with 18 central Massachusetts farmers, primarily for hay and corn. Agricultural fields were renewed by farmers currently holding License Agreements but no fields were available for open bid.

Six boat ramps were visited and trash removed. Assistance was provided to the Office of Fishing and Boating Access as requested.

A timber harvest and habitat management plan continued at the Muddy Brook WMA in Hardwick to promote pitch pine barrens habitat. A gravel berm was graded by District staff to promote New Jersey tea plant and its associated invertebrate community and work was begun on a snake hibernaculum to benefit the North American racer.

Planning for a major habitat management project at the Birch Hill WMA was begun in cooperation with DCR and U.S. Army Corps of Engineers.

A habitat management project at the Pine Hill section of the Bolton Flats WMA was continued.

An encroachment issue at the Thayer Pond WMA was resolved by the abutter who removed a driveway, retaining wall and drain pipes from the WMA.

District staff participated in marshbird survey training with State Ornithologist Drew Vitz.

Fisheries

Central District staff surveyed 41 sites on streams to assess fish populations and water conditions focusing on the Millers, Blackstone, Nashua, Quinebaug and Assabet river drainages. Baseline water quality data on acidity/alkalinity, conductivity and temperature were recorded.

Pond surveys, using the District electrofishing boat, were conducted at Congamond Lake in Southwick, Long Pond, Rutland, Crocker Pond, Westminster and Muddy Brook Pond in Hardwick.

Hatchery raised trout were stocked in 36 ponds and lakes as

well as 23 rivers and 27 streams in Central District. Stocking participants included Cub Scouts, school groups, Youth groups, New England Fly-tyers, Trout Unlimited and local sporting clubs.

Landlocked salmon were stocked to supplement the existing population in the Wachusett Reservoir.

Water flow devices were monitored on unnamed tributaries that flow into the Whitman River in Westminster in response to a proposed layover MBTA station at the Westminster Business Park.

Wekepeke Brook in Lancaster was monitored following the removal of the Bartlett Pond dam. Native eastern brook trout were documented for the second successive year in the restored section of the brook.

Slack Brook in Leominster was monitored in cooperation with the Army Corps of Engineers for documenting the impact of a retaining wall on native brook trout.

The District continued to monitor Cooledge Brook in Berlin and Northborough for the presence of native brook trout.

Lake trout sampling was conducted at Quabbin and Wachusett Reservoirs to collect data for age and growth studies. Public access sites were investigated with representatives from the Office of Fishing and Boating Access.

Fisheries Biologist Jason Stolarski addressed the Worcester County League about the status of warm water fisheries in Worcester County.

Natural Heritage and Endangered Species

District personnel assisted in the Bald Eagle Breeding Survey that was held in April. The Breeding Survey replaces the Midwinter Bald Eagle Survey. Resident nesting eagles were documented at Wachusett Reservoir, Pine Hill Reservoir, Quaboag Pond, Lake Shirley, Wachusett Lake, Webster Lake, Riverdale Pond and a beaver impoundment in Royalston. A new nest was confirmed at Lake Quinsigamond in Shrewsbury. The bald eagle nesting territory at Wachusett Reservoir in Boylston produced two chicks. The Quaboag Pond eagle pair produced one chick. The Lake Shirley territory produced two chicks. The pair at Pine Hill Reservoir in Paxton failed. The successful eagle nesting at Webster Lake produced one chick. There were three successful eagle nests on the east side of Quabbin Reservoir in Petersham that produced one, one, and two chicks respectively. The nest in Royalston was rebuilt and the pair produced one chick. The Northbridge nest at Riverdale Pond produced one chick. The new nest at Lake Quinsigamond produced

two chicks, one of which was recovered in a weakened condition and taken to the veterinary school at Tufts in Grafton by the Environmental Police. It was recovering at Tufts at the end of the fiscal year. Kurt Palmateer of the McLaughlin Trout Hatchery climbed all nests where banding was undertaken.

Active osprey nests were documented at two sites in Sturbridge, both on cell towers. The known nests in Westborough, Auburn, Sterling, Grafton and Oxford were also active. The Westborough pair continued to use a nest pole installed by District staff. The nest on a cell tower in Templeton was active and produced two chicks. A nest pole installed by the Worcester Water Department at Quinapoxet Reservoir was unoccupied. A nest cam was maintained by the town of Oxford at the nest at Greenbriar Park. One chick out competed its siblings for the available food and fledged successfully. A new nesting pair was documented using an electrical transmission tower adjacent to Fisherville Pond in Grafton. Peregrine falcons were present in downtown Worcester and failed due to unknown causes after at least one chick was known to hatch. They again favored a ledge on the Bancroft Apartment building. District staff removed all pea stone originally placed on the ledge in an effort to coax the birds to the box on the People's United Bank Building. A new nesting pair was confirmed at a church in Leominster.

Bluebird, American kestrel, and other cavity nesting bird boxes were constructed and erected on WMAs. The bluebird nest box trail and sign were maintained at the High Ridge WMA. Kestrel boxes were monitored at Wachusett Reservoir, Bolton Flats WMA, MacCallum WMA, High Ridge WMA and Moose Hill WMA as part of a program coordinated by State Ornithologist Drew Vitz.

The District assisted with the annual effort to mark and sort head-started Northern red-bellied cooters.

Land Protection

The District participated in Lands Committee and Parcel Ranking meetings. A summary of lands protected by fee acquisition or Conservation Easement is found in the Realty section of the Annual Report. An event was held to recognize the Wildlife Conservation Easement purchased by MassWildlife over 100 acres of land owned by the Worcester County League of Sportsmen's Clubs in New Braintree.

Outreach and Education

The Tags 'n Trout program was sponsored at the Mill River in Blackstone. Trout stocking reports were filed daily for posting on the state Internet trout page. Hunting, fishing and trapping licenses, and antlerless deer, bear and tur-

key permits were sold at the District headquarters through the MassFishHunt online system. The District assisted with preparations for the statewide Envirothon.

The District met with various trails groups and committees to implement the Board approved Walking Trails Policy. The District met with Land Agent Phil Truesdell to investigate preferred trail location at the Fish Brook WMA, over which the Board approved Tully Trail passes.

Meetings were held with the Sutton Historical Society and Singletary Sportsmen's Club to discuss ongoing work at dams on the Merrill Ponds WMA.

The District met with the Leicester Conservation Commission and a representative of the Leicester Snowmobile Club to address a timber trespass committed by the Club at the Moose Hill WMA. The Club acquired plants from New England Wetlands Plants in Amherst and planted them on the WMA under the guidance of District staff as mitigation for the violation. The District attended a Rattlesnake Review Committee meeting in Athol.

The District met with newly appointed Chairman of the Fisheries and Wildlife Board Dr. Joseph Larson.

The District assisted Chief of Wildlife Lands Craig MacDonnell with a meeting held with Massachusetts Conservation Agents and hosted a walking tour of the MacCallum WMA to discuss how town held conservation lands can be managed for habitat diversity.

The District participated in a two day chainsaw training workshop in Westboro.

Technical Assistance

The District Manager and staff interacted with other state and federal agencies, NGOs and other groups including DCR, DCR/DWSP, DEP, USFWS, USFWS Law Enforcement, and the 10 monthly meetings of the Worcester County League of Sportsmen's Clubs.

The 300 seedling chestnut orchard was maintained at the District in cooperation with the American Chestnut Foundation and DCR. Staff from TACF identified and flagged blighted trees at the orchard which the District subsequently removed and burned with a permit from the town of West Boylston.

The chestnut seed orchard at the MacCallum WMA in Westborough was expanded with assistance with clearing and fencing provided by the District. Surveillance cameras were used on multiple WMAs and images of illegal activity were

forwarded to the Environmental Police for investigation.

Connecticut Valley Wildlife District

Administration

Long time District Clerk Barbara Bourque, retired after 27 years of service to the Commonwealth. She gained and imparted considerable knowledge about wildlife resources and Division activities throughout her time with the agency. Many customers look forward to engaging with Barbara when coming in to buy licenses or check in animals. Many have expressed dismay at her retirement. After two years Tom Wansleben transferred from the District Stewardship position to a Habitat Biologist with the Habitat Management Section.

Softening that impact has been the hiring of our new District Clerk, Anne-Marie Bartus, in May. Anne-Marie previously worked for the State Police Association of Massachusetts. Anne-Marie has a background in computer science and has a wonderful personality as the primary interface with the public.

Staff obtained a Commercial Pesticide Applicator License which is required to use herbicides for invasive species control on WMA's.

All electronic issued licenses, permits, and tags are sold and tracked through the MassFishHunt System as of this year. 2,983 Quabbin One Day Fishing licenses were issued at the three boat launch areas totaling \$14,915.00

1 Field Trial Permit was issued.

5 people participated in the Ludlow Duck Hunt

36 Swift River Wilderness Camping Permits were issued.

The District Manager continues to serve as a CORE team member for the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge), helping to define its Comprehensive Conservation Plan (CCP). The Final/EIS was completed and rolled out in December of 2016. The District Manager also serves as a member of the Mount Tom Partnership, along with The Trustees of Reservations, the Conte Refuge, the Holyoke Boys and Girls Club, and the DCR.

Demolition of the Ramblers Club House at Montague Plains WMA

After more than 27 years we were successful in reclaiming that portion of the Montague Plains WMA of the Mohawk Ramblers Motorcycle Club Building. This building dates

back to the 1950's prior to Northeast Utilities purchasing the property. NU continued the lease the previous owner gave the Mohawk Ramblers INC. That lease was renewed for 10 years just before MassWildlife purchased the property. When we received the property we honored that lease. When the lease ended the club came to us requesting a 5-year continuation which was allowed with the caveat that they would vacate at the end of that lease. After much work with the District Manager, the Director and the Chief of Wildlife Lands the Mohawk Ramblers left the building on December 31, 2016. The demolition of the building was complete by the end of the fiscal year, June 30 2017. Since then it has been making the transition to scrub oak and pitch pine through the Habitat Management Section. The District Manager spent many hours preparing impact assessments of the proposed Kinder Morgan Pipeline which would have crossed through the northern portion of the district. This would have had negative impacts to Wildlife Management Areas and Wildlife Conservation Easements. These properties were purchased to protect wildlife in perpetuity.

Research and Conservation

Wildlife

Valley District staff completed Ruffed Grouse drumming routes and the Wild Turkey brood survey. The ruffed grouse drumming route on the Prescott Peninsula produced the most drums (15) compared to 0, 2, and 3 drums on the other three routes. Staff banded Canada Geese at eight sites. Ninety Wood Duck nesting boxes were checked and maintained at 23 sites. Bird and kestrel nesting boxes were maintained at several WMAs as well. Staff monitored the survival and reproduction of 23 radio-collared black bears (18 females and 5 males) during the reporting period. Two adult collared females were hit and killed by vehicles trying to cross Rt. 91 in Whately, MA. One adult collared female was shot and killed raiding a pig pen. One collared male was harvested during the hunting season. Another adult male lost his collar due to him tearing the collar belting apart; this bear is presumed to still be alive. One adult female's collar was destroyed by a bullet after being shot during a chicken coop raid; this female is presumed still alive as well. Another adult female slipped her collar. Females were checked in their dens during February and March to determine reproductive success and first-year cub survival. GPS collars were affixed to bears to monitor locations every 45 minutes. This is a cooperative study with the University of Massachusetts at Amherst (UMass/Amherst). The District assisted trapping 10 bears (7 males, 3 females) during the spring and summer of 2017 to increase the sample of GPS radio-collared females.

The District office is staffed to check all harvested game species. In addition, the Valley has eight deer, seven turkey, three bear, and three furbearer checkstations throughout the District. Staff also manned four biological deer check stations during the first week of the shotgun deer hunting season and aided in harvested deer data entry.

The District Wildlife Biologist installed three remote cameras at Montague WMA to monitor illegal trash dumping. These cameras uploaded pictures to a website maintained by the District Manager. This website was made available to the OLE, who used the photos to pattern illegal use and issue several citations. Also, seven large 18"x24" signs warning "Cameras in Use, Trash Dumping Prohibited" were erected to help deter illegal dumping. Staff reported illegally dumped trash, beer cans, and the remains of an unreported harvested deer to OLE; OLE issued a citation to violator. Five gates were installed at Montague Plains WMA by the District to help deter illegal trash dumping and OHVs. The gates and the open vistas created by the wildlife habitat improvement cuts have successively reduced illegal trash dumping. The upland habitat program improved over 250 acres of habitat at Montague Plains WMA by thinning a pitch pine dominated forest and maintaining an open grassland/shrubland understory.

All WMAs were posted with rules and regulations. These signs are posted at public access entrance points at 35 WMAs throughout the District. Boundary marking took place on newly acquired land parcels at Montague Plains, Poland Brook, and Southwick WMA. The snowless and mild winter of 2016/17 allowed easy access for the District staff to prune and release 20 apple trees at Leyden WMA. The small trees that were cut to release the apples were stacked into brush piles for rabbit habitat. Approximately 110 acres of fields were mowed at five WMAs (Southwick, Southampton, Herm Covey, Poland Brook, and Leyden). One and one quarter miles of access trails to four duck blinds were cleared for the annual Ludlow WMA controlled duck hunt.

Fisheries

In the summer of 2016 sampling season, district staff identified 45 streams from the district priority list, out of these, 21 streams were electrofished and 24 were dry or otherwise not sampled due to drought conditions. In addition to normal small stream electrofishing, district staff worked with project leaders from the Westborough Field Headquarters to successfully survey a variety of larger river systems. Large scale sampling efforts were conducted on the Deerfield and Millers Rivers with up to nine backpack units, taking advantage of the low wadable water levels induced by the drought. In addition, a deeper section of the Deerfield River was cooperatively sampled in Western district utiliz-

ing two electrofishing shock boats. Several smaller systems, including the North River and Sawmill River were also sampled with Westborough and district staff.

Shortly after the end of the fall stocking season, district attention shifted toward the Quabbin Lake Trout netting project. This project has been completed with district participation for many years, however starting in 2016 the project was led by the Valley District fisheries biologist. In 2016 sampling ran between October 25 and November 16. Six nights of sampling were conducted with crews staffed by districts, hatcheries as well as field headquarters. A variety of fish species were caught in short-set gillnets and released. 250 new Lake Trout were PIT tagged, and 35 existing tags were recaptured from previous years. Length, weight, sex and tag number is recorded and then the fish are released unharmed. Data will be used to understand Lake Trout population dynamics and growth patterns.

Summer sampling season began just a few days after the end of the spring stocking season, however the time period of this report only covered a few of these events. Similar to 2016, District staff worked closely with Westborough project leaders to sample some larger systems. The highlight of this was a very thorough sampling of the Swift River, utilizing both boat and backpack units. At the end of the boat electrofishing survey, staff captured an impressive 17-pound Brown Trout, which was recorded and successfully released. This particular fish, as well as the survey on the whole, received considerable public attention due to a posting on the agency Facebook page.

Land Stewardship

Boundary marking has increased substantially the past two years with staff and several contractors researching and marking in the field. Well-marked boundaries not only help the public know where the perimeters of WMA property lines are, but they prevent encroachments and assure the public that MassWildlife is taking care of our land. This includes all or portions of the following properties; Honeypot WMA, Palmer WMA, Mt Esther WMA, East Mountain WMA, Westfield WMA, Southampton WMA, Mt. Tom WMA, Green River WMA, Satan's Kingdom WMA, Herman Covey WMA, and Lake Warner WMA. District staff also installed Safety Zone signs at various WMAs to ensure safety of nearby abutters.

Annual monitoring visits and reports were conducted on 35 Wildlife Conservation Easements (WCE) in the district. Monitoring ensures that these private lands remain open for public access and that the terms of the easement are being upheld. It also provides opportunities for staff to discuss habitat management improvements with the landown-

er. Staff reviewed a forest cutting plans, one of which was in violation of the terms of the WCE's terms. The issue was brought to the attention of the forester and landowner.

As the district continues to increase boundary marking on its WMA's there is an ever growing number of violations that are discovered. At least 9 violations were documented on eight different WMAs. These included OHV use, dumping and debris storage, shed and land clearing encroachments, timber trespass, and illegal cattle grazing. District staff has worked with abutters to remediate the encroachments with most of these cases being brought back into compliance, but others are still under investigation or have been referred to the Massachusetts Environmental Police.

Staff conducted surveys for MESA listed plant and animal species on district WMA's to help update older records for the Natural Heritage and Endangered Species Program. Surveys were conducted for three bird, four plant, three fish, two invertebrate, and one reptile species in the District.

Natural Heritage and Endangered Species

The Valley District is monitoring 24 breeding Bald Eagle territories and banded eaglets in trees that could be safely climbed in the Valley District. District staff assisted in the spring eagle nesting survey, throughout the District.

Staff banded Peregrine Falcon chicks at the UMass/Amherst Library. Staff also constructed peregrine nesting boxes for NHESP staff to place at bridges throughout the District.

Enhancement of Outdoor Recreation

Staff stocked 10,000 pheasants on 32 town covers and 10 WMA covers prior to and during the 6-week pheasant hunting season. Six sportsmen's clubs within the Valley District participated in the Club Pheasant Program; District staff distributed 1,496 seven week-old pheasants to these clubs in July.

District Staff administered a controlled waterfowl hunt at Ludlow WMA. Six hunters applied for permits and participated in the hunt.

Fall 2016 trout stocking began on October 3 and ran until October 18. In this time frame one stocking truck was used to stock 33 waterbodies throughout the district, totaling 19,600 fish, or 18,913 pounds. The vast majority of these fish were 14 inch Rainbow Trout from the McLaughlin hatchery; however a small number of 9 inch Brown Trout from the Bitzer hatchery were also stocked.

Spring 2017 trout stocking season began on March 8 and

ran until May 25, with an additional single day stocking for the Swift River on June 30. This season we stocked 96,090 trout, (78,322 pounds) across 100 waterbodies in 47 towns. Stocked trout were from twelve different species/size combinations raised by McLaughlin, Bitzer, Sunderland, Reed and Sandwich hatcheries. 28,420 Brown Trout, 19,230 Brook Trout, 48,000 Rainbow Trout, and 440 Tiger Trout were stocked across district waters.

Similar to last year, three fishing derbies were supported by the Valley District this fiscal year: Piper Mill Pond (West Springfield), Dufresne Pond (Granby), and at the USFWS Open House (Hadley).

Outreach and Education

The District Manager gave a presentation regarding "The Bears of Massachusetts" for the Amherst Rotary Club on May 11, 2017. District Staff set up the DFW display at the Franklin County Fair, staffed it over the fair's four days of operation with help from FHQ staff, and provided river fish shocked at the Oxbow on the Connecticut River for the Fish and Game building's display tanks. District staff also provided a presence at the Springfield Sportsmen's Show in West Springfield, selling licenses, stamps, and permits and answering questions from visiting sportsmen.

During the spring trout stocking season, the district participated in several special stocking events with local towns, schools and neighborhood groups. The Eagle Brook School, of Deerfield, visited for a spring fieldtrip to the McLaughlin Hatchery and to help stock the Swift River's Y-Pool with district staff. Students learned about water ecology and had a chance to release some large Rainbow Trout into the Swift River. A small informal stocking event took place with kids and their parents at Hamilton Reservoir in Holland. The time and location of the stocking were posted online and in print a few weeks prior to the event, and the public was encouraged to attend. Attendees helped district staff stock three species of trout into the reservoir. This was the first year of this program and similar events took place in other districts. Another small stocking event took place at Dragon Brook in Shelburne during the local school's spring break. Children and their parents helped stock Brook Trout and were given a brief presentation about our stocking program and fisheries in general. Similar to years in the past, the fisheries biologist and technicians worked closely with Professor Dave Christensen from Westfield State University. We led his class on field demonstrations of backpack and boat electrofishing, as well as providing a guest lecturer at the university. Staff also taught the Wildlife Management class and Field To Table cooking class for campers at the Massachusetts Junior Conservation Camp. The District Manager attended regular meetings of the Hampden County Sports-

men's Council, the Hampshire County League of Sportsmen, and the Franklin County League of Sportsmen, where he gave presentations of interest to these groups. The District Manager and the District Biologists participated in various meetings with federal, state, and local agencies and land trusts, focusing primarily on land acquisition, management, and informational talks.

Technical Assistance

District staff fielded hundreds of calls requesting technical assistance for wildlife and fisheries concerns. Also, the needs of walk-in visitors were addressed, often including nuisance-animal complaints and requests for information. District personnel were often called upon to provide technical assistance to other agencies or user groups. Numerous injured hawks and owls were transported to rehabilitators. Additional field responses included assistance sought on behalf of deer, moose, and bear. One large scale fish kill was reported to the district office. Cranberry Pond in Sunderland experienced a large trout die-off in late July 2016, and a fish kill investigation was conducted by district staff.

Western Wildlife District

Administration

The Western District had no staffing changes in FY17.

The District Manager provided input to the Lands Committee on potential land acquisition projects, focusing on wildlife habitat and recreational opportunities.

License agreements were issued by the District for agricultural leases on WMAs. The District currently manages 15 agreements. These agreements benefit wildlife by maintaining open habitats, often in places where active management would otherwise be precluded due to staff, equipment, and time constraints.

Staff participated in professional development and training including: Wildland Fire, SCUBA Dive Team Training, Chainsaw Safety, Avian Influenza Sampling, and Large Animal Response.

The District Manager and Fisheries Biologist attended a symposium on lake and pond management hosted by the Lake and Pond Associations of Western Mass (LAPA West).

The Western District responded to many large animal response situations in FY17 including moose, bear and deer throughout the District. Noteworthy among the cases were 5 instances of dramatically undersized yearling bears found in areas near public roads or houses. These bears were well

below standard weight and behind in development. Two of the bears were captured, rehabilitated then released, while the others were either left in place or euthanized.

Research and Conservation

Wildlife

Annual surveys for Woodcock, Ruffed Grouse, and waterfowl were conducted in cooperation with Wildlife Section biologists at FHQ. Staff also cleaned, constructed, and installed nest boxes for Wood Duck, Bluebird, and Kestrel.

Western District personnel provided support for Wildlife Project Leaders through game check stations, kill-card data entry, goose banding, and habitat work. Efforts to identify potential and historic New England Cottontail sites included collection samples throughout the District in January and February 2017.

The District continued habitat projects on Wildlife Management Areas. We cleared 5 acres of brush and invasive plants at the Maple Hill WMA with the District skid-steer and mulching head. The area was restored to grassy habitat which will be allowed to transition to a combination of young forest, field, and shrubland. District staff also used chainsaws, pruning saws and the skid-steer with mulching head to restore 2 acres and release apple trees on the Peru WMA.

District technicians maintained open-field habitat on 220 acres through summer mowing. These activities require a substantial investment of hours and equipment but are necessary to maintain biodiversity and recreational opportunity on DFW lands.

District staff provided support for project leaders on Common Loon assessments and nesting. Loon rafts were set on Cleveland Reservoir in Hinsdale and Buckley-Dunton Lake in Becket. Neither raft was successful in FY17. Loon nesting surveys were conducted on a number of waters in the District.

In cooperation with the Wildlife Section, the Western District initiated a bear trapping program for deployment of GPS tracking collars. The efforts were very successful, with 19 bears trapped from six locations. Six females were collared. The District plans to continue these efforts in FY18.

Fisheries

Between July and October 2016, 74 fisheries surveys were conducted on 52 waterbodies in the Western District. More than 18,800 fish and 29 species were identified during the

2016 stream and river surveys. As a result of the surveys conducted, 22 new Coldwater Fisheries Resources were identified.

An extensive sampling effort was made on the Deerfield River in mid-September. The Field Headquarters' Fisheries crew and a crew from the Connecticut Valley District assisted Western District with surveying multiple sites on the river. Survey sites spanned from just below Fife Brook dam extending downstream to the Route 2 bridge in Buckland, with 15 surveys conducted at 8 locations along the river.

The District Fisheries Biologist and technicians continued to monitor for the presence of *Didymosphenia geminata* (a.k.a. Didymo) in two river systems in the Western District. They also assisted in inventory of freshwater mussels in the Farmington River.

District personnel provided support for the Fisheries Section by providing technical information, consulting on environmental review, responding to fish kills, and participating in meetings. The district fisheries staff maintained informational signage on the 3 designated Catch and Release areas in the Western District.

Land Stewardship

The Stewardship Biologist is responsible for coordinating efforts on boundary marking, encroachments, access, Conservation Easement 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 49 miles of boundaries were marked in FY17, in combined efforts between district staff and contractors. Property surveys were conducted on two Western District WMAs. The Stewardship Biologist coordinated 51 visits to Conservation Easements, including 38 official monitoring visits. The Biologist reviewed 4 forest management plans for operations on Conservation Easements. He also worked with 5 abutting property owners to help prevent accidental timber harvest on Wildlife Management Areas.

District Staff maintained parking areas at 12 WMAs, created a new parking area at the Eugene Moran WMA, and installed gates in two locations.

Natural Heritage and Endangered Species

District biologists provided support in the form of local knowledge and biological input to the NHESP on environmental reviews and listed-species issues. District staff participated in the Bald Eagle Nesting Survey, and banded birds at the Lake Buel nest.

District staff also conducted winter surveys for hibernating

bats in three mines and 3 caves. These surveys are a continuation of a long running effort to track use in Massachusetts hibernacula, particularly important given the presence of White-Nosed Syndrome in the Commonwealth.

District Biologists and Wildlife Technicians partnered with NHESP to manage and enhance habitat for endangered bog turtles by conducting surveys, clearing habitat, maintaining water levels, and assisting in the management of beneficial grazing.

Endangered Timber Rattlesnakes were an important focus for the District in FY17. Staff assisted in strategic planning, monitoring of den sites, and addressing stewardship concerns on WMAs with Rattlesnake habitat.

Enhancement of Outdoor Recreation

Enhancement of outdoor recreation is a core function of the District office. Trout were stocked into 24 lakes and ponds and 56 streams and rivers to enhance recreational fishing. Where possible, we partnered with school groups or other interested organizations such as Trout Unlimited on stocking sites.

Staff maintained open areas on five WMAs where pheasants are stocked. District staff released 4,000 pheasants onto 14 areas (including WMAs and local covers). These areas represent the best available opportunities for pheasant hunting and cover all regions of the District. Pheasant chicks were provided to the Lee and Ashfield sportsmen's clubs. District Wildlife Technicians constructed and installed signs and maintained parking areas and access for the public. Three boat access sites managed by the DFW were maintained by District Wildlife Technicians.

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 District Manager began coordinating efforts for a project to improve access to Three Mile Pond for waterfowl hunters and anglers. The project is funded by Ducks Unlimited, Massachusetts Outdoor Heritage Foundation, and the Massachusetts Office of Fishing and Boating Access. It is scheduled for completion in FY18.

Outreach and Education

District field staff interacts with the public on a daily basis, providing information and sharing enthusiasm for outdoor activities. In addition, Western District staff also participated in more formal events focused on educating the public about the agency and the environment, including the

Springfield Sportsmen's Show. We continued to develop relationships with the schools adjacent to our headquarters in Dalton, making informational presentations to both middle and high school students and participating in the high school volunteer program and career day. The District Manager attended monthly meetings and provided updates to the Berkshire County League of Sportsmen and to the Hampshire County League of Sportsmen's Clubs when the meetings occurred in the Western District. He provided educational presentations at 2 regional high schools, Ameri-corps/SCA, and the Sheffield Land Trust Winter Lecture Series. The District Stewardship Biologist staffed a table at the Berkshire Natural History Conference and attended the Massachusetts Land Trust Conference. The Fisheries Biologist worked with Wahconah Regional High School on numerous occasions demonstrating trout stocking and fisheries survey techniques. Both the Fisheries Biologist and Wildlife Biologist presented at the Massachusetts Junior Conservation Camp.

Technical Assistance

The District Clerk fielded hundreds of calls requesting technical assistance. District personnel responded to these inquiries with professionalism and expertise. The Clerk also addressed the needs of walk-in visitors and issued permits and licenses to hundreds of sportsmen. In addition to advising members of the public, District personnel were often called upon to provide technical assistance to other agencies or user groups.

Black bear management continued to be a major activity for District staff during the spring and summer months. Calls requesting assistance, information, or simply reporting activities were an almost daily occurrence. District personnel responded with a tiered approach ranging from over the phone advice to site visits and active response. The District Manager represented the agency at meetings involving resource conservation in the region. He continued as the alternate state representative to the Westfield Wild and Scenic River Committee.

District Personnel

Northeast Wildlife District

Patricia Huckery, District Manager
Joshua Gahagan, Wildlife Technician
Travis Drudi, Wildlife Technician
Anne Gagnon, Land Agent
Tim Mathews, Wildlife Technician
Sue Ostertag, Clerk
John Sheedy, Fisheries Manager

Southeast Wildlife District

Jason E. Zimmer, District Manager
Aaron Best, Wildlife Technician
Jeff Breton, Wildlife Technician
Daniel Fortier, Wildlife Technician
John Garofoli, Wildlife Technician
Steve Hurley, Fisheries Manager
Joan Pierce, Land Agent
Debra Silva, Clerk
Steve Wright, Wildlife Manager

Central Wildlife District

Bill Davis, District Manager
John Bonafini, Wildlife Technician
Mark Brideau, Fisheries Biologist
Scott Kemp, Stewardship Biologist
Ethan LaPlante, Wildlife Technician
Mike Morelly, Wildlife Biologist
Debra Manty, Clerk
Jessi Manty, Wildlife Technician
James McCarthy, Land Agent (DFG)
Ian Sypek, Wildlife Technician
Bruce Walker, Wildlife Technician

Connecticut Valley Wildlife District

Ralph Taylor, District Manager
Brian Keleher, Fisheries Manager
David Fuller, Wildlife Manager
Alex Krofta, Stewardship Biologist
Barbara Bourque, Clerk
Christina Petersen, Land Agent
Kevin Pelosky, Wildlife Technician
Walter Tynan, Wildlife Technician
Christopher Connors, Wildlife Technician
Shasta Slade, Wildlife Technician

Western Wildlife District

Andrew Madden, District Manager
Derek McDermott, Wildlife Technician
Ray Bressette, Wildlife Technician
Tammy Ciesla, Wildlife Technician
Nancy Dewkett, Wildlife Technician
Nathan Buckhout, Wildlife Manager
Debra Lipa, Clerk
Peter Milanesi, Land Agent
Jacob Morris-Siegel, Land Stewardship Biologist
Leanda Fontaine Gagnon, Fisheries Manager

Wildlife Lands

Acquisition and Realty Stewardship

Craig A. MacDonnell
Chief of Wildlife Lands

Overview

The Realty Section had a very strong and far-reaching fiscal year 2017 (FY17) in terms of its twin goals of acquisition and stewardship. As summarized below, FY17 saw the conservation of thousands of acres of land, many miles of boundary maintenance, numerous important survey projects, and broad-scale easement monitoring.

Land Acquisition

The mission of the Land Protection Program, a joint effort of the Department of Fish and Game (DFG) and the Division of Fisheries and Wildlife (MassWildlife), is to protect the ecological integrity of the Commonwealth and provide wildlife-related recreational opportunities to the public. Each year the Land Protection Program seeks to expand existing wildlife lands, enhance public access to lands and waters open to sporting activity, and protect key habitats. Most of the funding for land acquisition is from bond capital, with the remaining portion provided by the Wildlands Stamp Fund, a five-dollar fee added to the sale of every hunting, fishing, and trapping license.

Fiscal Year 2017 was an aggressive year for land protection, with land agents completing 53 projects conserving 4,233 acres of valuable wildlife habitat at a cost of \$5.6 million. The majority of lands and easements were purchased using Land Stamp and bond funds, although over 750 acres were conserved via donation.

Wildlife Management Areas (WMA) and Wildlife Conservation Easements (WCE) are open to fishing, hunting, trapping, wildlife observation, and other passive wildlife-related recreation. These wildlife lands, from the Berkshires to the Cape and Islands, include river corridors, wetlands, forested and grassy uplands, habitat for state-listed endangered and threatened species, and high quality parcels of other important habitats.

In the Western District, nine acquisitions were completed in FY17 protecting a total of 1,115 acres at a cost of \$1,281,000, including a 364-acre addition to Misery Mountain WMA in Williamstown and 298 acres along Tower Brook in Chesterfield. In addition, five of the nine Western District acquisition projects protected key in-holdings within the Peru, Chalet, Long Mountain and Ram Hill WMAs. Eliminating these in-holdings enhance protection of the WMA, broaden access, and reduce steward cost.

Twelve projects were concluded in the Connecticut Valley District protecting 1,070 acres at a cost of \$1,561,551. The key acquisition was the 84 acres added to the 170-acre Southwick WMA. Plans are to continue grassland restoration on these newly acquired acres, which will support more pairs of Grasshopper Sparrows and other grassland birds, as well as Eastern Box Turtle. Mitigation funds contributed to this purchase.

Central District staff completed seven acquisitions protecting 384 acres at a cost of \$563,500. In particular, the Gardner to Winchendon Landscape Partnership Grant project provided DFG with the opportunity to create its first fee-holding block at the 19th Hill Wildlife Management Area. DFG was able to partner with the City of Gardner, Town of Winchendon and non-profit organizations to negotiate the protection of over 612 acres, 293.5 of which will be permanently protected by DFG and open to the public for passive recreation including hunting. An additional 319 acres will be preserved and managed by the municipalities. Extensive areas of ecologically significant wetland and upland habitats have now been secured for the benefit of the Commonwealth and at a major cost savings thanks to the availability of state grant funds.

In the Northeast District, land staff completed 14 projects conserving 357 acres of land at a cost of \$1,647,975, two of which deserve mention here. In Ipswich roughly 55 acres were acquired along Castle

Neck Creek, a tidally-influenced river, on the Essex border and added to Great Marsh North WMA. The majority of this purchase was funded by a North American Wetlands Conservation Act grant. The Town of Ipswich and Essex County Greenbelt acquired an abutting 70 acres creating an even larger block of protected land.

Nine land conservation projects were executed in the Southeast District involving a total of 1,715 acres at a cost of \$1,485,000. In the Southeast District a total of 919 acres were acquired in fee, and another 549 acres of conservation were achieved via two gifts of conservation restrictions. FY17 will be remembered as a great year for completing projects that were many years in the making. For example, a project adding 81 acres Taunton River frontage to the Taunton River WMA began over seven years ago. Likewise, a gift of a conservation restriction over the 486-acre Copicut Woods in the Southeast Massachusetts BioReserve closed a project chapter that dates all the way back to 2000. FY17 also saw the acquisition of the 510-acre Atwood Reservoir property in Carver, which was the most significant project of the year from a public access and natural resource perspective.

The 4,233 acres conserved across the Commonwealth in FY17- bring the total acreage to over 212,000 acres, which is over 326 square miles of permanently protected wildlife habitat. These lands were conserved with your help and are for your enjoyment. Start planning your next outdoor adventure, visit www.mass.gov/masswildlife/wildlife-lands to view maps of wildlife lands.

Stewardship

The Realty Section was very ably staffed by Phil Truesdell, Realty Coordinator, and Elizabeth Newland, CR Stewardship Coordinator, regarding the very important business of stewardship.

Boundaries

MassWildlife engaged the services of six experienced contractors in FY17 for the purpose of confirming over 100 miles of property boundaries at various WMAs and WCEs in each of the five Wildlife Districts. All of the Districts reported excellent progress on this much-needed project, with some variation in accomplishment depending on location and parcel configuration. Boundaries on larger parcels with less intricate boundaries typically were easier to confirm. District staff, assisted as necessary by Realty staff from Field Headquarters, provided our contractors with maps and deeds together with basic orientation. Our contractors performed a diverse set of tasks depending on district preference, including researching deeds, locating boundaries in the field, creating GPS track-logs, blazing and painting trees, and hanging MassWildlife signage.

Surveys

MassWildlife also hired six private survey contractors to help resolve a number of challenging boundary questions that have arisen in the Districts. Land Agents, Stewardship Biologists, Realty staff and District Managers worked closely with these contractors, who

	Western	Valley	Central	Northeast	Southeast	TOTAL
WMA	46,386.3	19,369.8	38,614.9	13,944.9	43,071.1	161,387.0
WCE	15,362.8	8,733.7	8,725.5	2,126.5	11,277.0	46,525.3
Access	35.8	518.3	683.4	234.7	54.7	1,526.8
Sanctuary	435.0		367.9	552.5	73.0	1,428.4
WCR	69.4	2.4	746.4	127.0	37.9	983.1
Installation	2.4	436.1		106.4	114.4	659.3
Other				372.0	5.0	377.0
TOTAL	62,292	29,060	49,138	17,464	54,633	212,587



Photo by Bill Byrne/MassWildlife

Three Mile Pond WMA in Sheffield.

prepared survey plans and set boundary markers at nine different properties spread among the Districts.

Conservation Restriction Baseline Documentation and Monitoring Efforts

Contractors working with Realty Section staff completed an additional two Baseline Documentation Reports on Conservation Restrictions. Approximately 130 CR monitoring visits were conducted by District and Field Headquarters staff, and reports were submitted to USFW and Forest Legacy Program as required.

Forest products harvesting continues to be the most common activity that requires review and approval on CR properties by agency staff. This review is provided by a team of staff members, including Stewardship Biologists in the Districts, Realty Staff in Westborough, and Forestry Project staff in the Wildlife Section. The reviews offer opportunities to track and positively influence forestry activities with respect to sustainable forestry that benefits wildlife and wildlife habitat.

Realty Section staff and District Stewardship Biologists conducted CR monitoring visits on over 1/3 of the agency’s Conservation Restriction holdings. Many of these site visits were conducted in conjunction with land owners Documented occurrences of rare and endangered species on Conservation Restriction properties. In house training was provided for Stewardship Biologists and Realty staff on use of tablets for field data collection, to streamline data collection and the pro-

duction of monitoring reports and incorporate findings in our Land Information System database.

Stewardship Staff also met with representatives from municipalities who own Conservation Restrictions lands held by MassWildlife to discuss the revitalized stewardship program and the agency’s role in stewarding the properties. Stewardship staff also successfully assisted one CR landowner in their application for MassWildlife habitat management grant to restore early successional habitat and install native pollinator plants. Staff also implemented the agency’s new Walking Trails Policy in providing landowners feed-back on developing recreational trails on both Fee and CR properties.

Intern

The Realty Section was fortunate to host intern Kaiti Titherington for six months during FY17. Kaiti graduated from the University of Maine and holds a Bachelor’s degree in Wildlife Biology. Kaiti had previously worked for the Natural Heritage and Endangered Species Program as a shore bird biologist and has served as a seasonal biologist for the Wildlife Section. She brought her multiple field and strong organizational skills to the Realty Section helping to build our Land Information System, archiving documents, preparing Baseline Documentation Reports, and conducting CR monitoring visits.

Row Labels	Sum of Report Acres
Central District	50540.905
ACCESS	684.97
Bare Hill Pond Access	1.45
Blackstone / West River Access	28
Cusky Pond Access	23
Fisherville Pond Access	1.6
Five Mile River Access	178.52
Glen Echo Lake Access	1
Leadmine Pond Access	0.05
Moose Brook Access	20.13
Mossy Pond Access	17
Natty Brook Access	95.17
Quag Pond Bog Access	31
Quinapoxet River Access	32
Quinsigamond Marsh Access	59
Quinsigamond River Access	18.6
Sevenmile River Access	77
South Meadow Pond Access	0.25
Sputtermill Pond Access	58.5
Tully River Access	1
Ware River Access - Barre	40
Webster Lake Access	1.7
Sanctuary	367.91
Mount Watatic Sanctuary	228
Susan B. Minns Sanctuary	139.91
WCE	9364.3
Benjamin Hill WCE	87.5
Breakneck Brook WCE	526
Burnshirt River WCE	100
Carter Pond WCE	300.5
Fish Brook WCE	75
Fitchburg Watershed WCE	1875
Hitchcock Mountain WCE	610
Lawrence Brook WCE	591.4
Leadmine Mountain WCE	826.37
Long Pond WCE	8.85
McKinstry Brook WCE	31

Millers River WCE	204.72
Moose Brook WCE	125
Mt. Pisgah WCE	19.12
Muddy Brook WCE	575.69
Newton Reservoir WCE	622
Nineteenth Hill WCE	623.75
Potter Hill WCE	90.8
Quisset WCE	247
Savage Hill WCE	234
Secret Lake WCE	311.3
Slater Woods WCE	73.9
Stuart Pond WCE	28.7
Taft Hill WCE	394.6
Wekepeke WCE	564
Whitmanville WCE	118.1
Winimusset WCE	100
WCR	856.91
Breakneck Brook WCR	176
Five Mile River WCR	17.27
Hitchcock Mountain WCR	610
McKinstry Brook WCR	26
Raccoon Hill WCR	22
Williamsville Pond WCR	5.64
WMA	39266.815
Bennett WMA	281.2
Birch Hill WMA	4550.75
Bolton Flats WMA	1319.88
Breakneck Brook WMA	707
Chockalog Swamp WMA	52.5
Clinton Bluff WMA	42
Coy Hill WMA	865.8
E. Kent Swift WMA	157
Fish Brook WMA	142.5
Four Chimneys WMA	200
High Ridge WMA	2240.87
Hitchcock Mountain WMA	268.41
Lackey Pond WMA	174.54
Lawrence Brook WMA	295.5
Leadmine WMA	826
Long Pond WMA	5.6
Martha Deering WMA	232.58

McKinstry Brook WMA	291.3
Merrill Pond WMA	1037.06
Millers River WMA	3799.76
Mine Brook WMA	1425.79
Moose Brook WMA	849.195
Moose Hill WMA	640.1
Mt. Pisgah WMA	88.8
Muddy Brook WMA	1810.68
Nineteenth Hill WMA	293.6
Oakham WMA	742.2
Phillipston WMA	3249.83
Popple Camp WMA	1459.91
Poutwater Pond WMA	391.74
Prince River WMA	897.55
Quaboag WMA	1822.53
Quacumquasit WMA	179.82
Quisset WMA	424.69
Raccoon Hill WMA	646.16
Richardson WMA	467.22
Savage Hill WMA	930.96
Scripture Hill WMA	121
Stone Bridge WMA	505.17
Sucker Brook WMA	102.6
Thayer Pond WMA	131
Ware River WMA	185.36
Wayne F. MacCallum WMA	979.58
West Hill WMA	350
Whortleberry Hill WMA	324.4
Winchendon Springs WMA	854.06
Winimusset WMA	670.17
Wolf Swamp WMA	1232.45
Row Labels	Sum of Report Acres
Connecticut Valley District	29576.56
ACCESS	518.31
Connecticut River Access	94.8
Deerfield River Access	21
Lake Lorraine Access	6.75
Lake Rohunta Access	2.49
Little Alum Pond Access	0.5

Mill River Access	14.15
Millers River Access	52.8
Packard Pond Access	0.54
Sawmill River Access	52
Tully Brook Access	154.88
Ware River Access	39
Westfield River Access	79.4
Installation	579.22
Bitzer Fish Hatchery	74.54
Reed Fish Hatchery	316
Sunderland Fish Hatchery	45.59
Wilbraham Nature and Cultural Center	143.09
WCE	8827.4
Amythyst Brook WCE	36.9
Bachelor Brook WCE	93.7
Brushy Mountain WCE	78
Chestnut Hill WCE	175.4
Facing Rock WCE	190
Flagg Mountain WCE	345
Great Swamp WCE	0.94
Honey Pot WCE	52.74
Lake Rohunta WCE	59
Little Tully Mountain WCE	461.38
Ludlow Reservoir WCE	1750
Orange WCE	877.97
Paul C. Jones Working Forest WCE	3486
Satan's Kingdom WCE	527.5
Tully Mountain WCE	692.87
WCR	2.39
Wendell WCR	2.39
WMA	19649.24
Bachelor Brook WMA	93.7
Bennett Meadows WMA	201
Brewer Brook WMA	386.29
Brushy Mountain WMA	91.44
Catamount WMA	413
Darwin Scott WMA	27.3
East Mountain WMA	493.86
Facing Rock WMA	1366.1

Flagg Mountain WMA	223.69
Great Swamp WMA	689.33
Green River WMA (Valley District)	381.95
Herman Covey WMA	1492.98
Honey Pot WMA	178.42
Lake Warner WMA	98
Leyden WMA	759
Montague Plains WMA	1746.7
Montague WMA	1985.44
Mt. Esther WMA	328.95
Mt. Toby WMA	688.1
Mt. Tom WMA	79.9
Orange WMA	443.6
Palmer WMA	1478.43
Pauchaug Brook WMA	161.3
Poland Brook WMA	707.53
Rainbow Beach WMA	45.9
Satan's Kingdom WMA	1774.79
Shattuck Brook WMA	178.8
Southampton WMA	170.6
Southwick WMA	348.28
Sunderland Islands WMA	15
Tully Mountain WMA	704
Wales WMA	207.15
Warwick WMA	379
Wendell WMA	599.09
Westfield WMA	234.03
Whately WMA	388.59
Williamsburg WMA	88
Row Labels	Sum of Report Acres
Northeast District	20841.05
ACCESS	234.69
Baddacook Pond Access	0.16
Flint Pond Access	89
Ipswich River Access	1.79
Knops Pond Access	0.6
Lake Attitash Access	6.03
Long Sought For Pond Access	1
Mascuppic Lake Access	0.25

Nashua River Access - Dunstable	15
Nashua River Access - Groton	10.1
Nashua River Access - Pepperell	11.2
Nashua River Access - Shirley	31.2
Sudbury River Access	51.86
Weymouth Back River Access	16.5
Installation	107.82
Acton Installation	1.4
Ayer Game Farm	90.72
Northeast District HQ	15.7
Other	371.95
Gov. Thos. Dudley Park	4.75
King Phillip Woods	87.2
Mount Watatic Reservation	280
Sanctuary	552.48
Carr Island Sanctuary	110.5
Henry Cabot Lodge Bird Sanctuary (Egg Rock)	2
J. C. Phillips Sanctuary	390.98
Milk Island Sanctuary	29
Ram Island Sanctuary (North)	20
WCE	2099.67
Concord River WCE	18.9
Cow Pond Brook WCE	127
Devil's Den WCE	28
Great Meadows WCE	16
Great Swamp Brook WCE	106
Groton Town Forest WCE	513
Hunting Hills WCE	84.59
Martin H. Burns WCE	113.44
Meadow Pond WCE	58
Pepperell Springs WCE	255
Squannacook River WCE	299.33
Sucker Brook WCE	12
Surrenden Farm West WCE	169.7

Throne Hill WCE	177.5
Wright Pond WCE	121.21
WCR	127
Mill Creek WCR	59
Squannacook River WCR	68
WMA	17347.44
Ashby WMA	946.76
Boxborough Station WMA	124.1
Crane Pond WMA	5362.65
Delaney WMA	
Dunstable Brook WMA	177.35
Eagle Island WMA	5
Elbow Meadow WMA	210.33
Fessenden Hill WMA	21
Flagg Swamp WMA	54
Great Marsh North WMA	506.59
Hauk Swamp WMA	61
Hunting Hills WMA	430.02
Martin H. Burns WMA	1944.6
Mulpus Brook WMA	472.25
Nissitissit River WMA	410.56
Pantry Brook WMA	449.95
Salisbury Salt Marsh WMA	855.87
Squannacook River WMA	1641.2
Townsend Hill WMA	655.32
Trapfall Brook WMA	45.38
Unkety Brook WMA	564.81
Upper Parker River WMA	171
Whittier WMA	42
William Forward WMA	2195.7
Row Labels	Sum of Report Acres
Southeast District	55600.15
ACCESS	54.15
Agawam Mill Pond Access	1.4
Bakers Pond Access	1.75
Barnstable Harbor Access	2.78
Big Sandy Pond Access	0.2
Childs River Access	0.25
Cook Pond Access	3

Dogfish Bar Beach Access	2.4
Great Herring Pond Access	1.06
Johns Pond Access	0.52
Mashpee-Wakeby Pond Access	25
Nemasket River Access	0.46
Popponesset Beach Access	1.5
Robbins Pond Access	1
Scorton Creek Access	5.48
Shubael Pond Access	0.35
Snipatuit Pond Access	0.5
Spectacle Pond Access	0.5
Tispaquin Pond Access	6
Installation	108.36
Lobster Hatchery	14.8
Sandwich Fish Hatchery	69.76
Southeast District HQ	23.8
Other	11
SE Massachusetts Bioreserve	5
Southeast District HQ	6
Sanctuary	73
Billingsgate Island Sanctuary	6.5
Penikese Island Sanctuary	60
Ram Island Sanctuary (South)	2
Tarpaulin Cove Sanctuary	4.5
WCE	11378.52
Acushnet River WCE	30.2
Agawam Mill Pond Access WCE	0.5
Agawam River WCE	3.98
Angeline Brook WCE	100.7
Assawompsett Pond Complex WCE	3065
Bettys Neck WCE	329.22
Billington Sea WCE	69.74
Brandt Island Cove WCE	109.52

Bread and Cheese Brook WCE	5.52
Camp Cachelot WCE	789
Copicut WCE	486.22
Halfway Pond WCE	28
Lake Nippenicket WCE	8.35
Maple Springs WCE	164.63
Pickerel Cove WCE	78.3
Pilgrim Springs WCE	17.05
Plymouth Pine Hill WCE	240.7
Plymouth Town Forest WCE	296
Poor Meadow Brook WCE	202
Quashnet River WCE	14.1
Santuit Pond WCE	293
Sippican Woods WCE	390.14
South Triangle Pond WCE	47.5
Stump Brook Reservoir WCE	174
Taunton River WCE	125.07
Watuppa Reservation WCE	4300
Weweantic River WCE	10.08
WCR	37.9
Plymouth Grassy Pond WCR	33.9
Taunton River WCR	4
WMA	43937.22
Atwood Reservoir WMA	511.07
Bearse Pond WMA	5.8
Black Brook WMA	411.32
Blueberry Pond WMA	1.5
Brayton Point WMA	2.2
Burrage Pond WMA	1842.05
Camp Edwards WMA	15013.16
Canoe River WMA	116.6
Chase Garden Creek WMA	56.4
Church Homestead WMA	163
Clapps Pond WMA	68.35
Cooks Pond WMA	69.18
Copicut WMA	3992.56

Dartmoor Farm WMA	473
Dennis Grassy Pond WMA	7.24
Eastham Salt Marsh WMA	7.44
English Salt Marsh WMA	288.5
Erwin S. Wilder WMA	944.53
Fisk Forestdale WMA	235
Fox Island WMA	71.1
Frances A. Crane WMA	2170.31
Freetown Swamp WMA	584.52
Gosnold WMA	3.45
Halfway Pond WMA	122.64
Hartley Reservoir WMA	70
Haskell Swamp WMA	3111.22
Head Of The Plains WMA	2
Hockomock Swamp WMA	4896.28
Hog Ponds WMA	24.5
Hyannis Ponds WMA	365
Katama Plains WMA	18.57
Maple Springs WMA	774.57
Mashpee Pine Barrens WMA	198.35
Mashpee River WMA	55.8
Meetinghouse Swamp WMA	123
Miacomet Heath WMA	3.83
Muddy Pond WMA	72
Noquochoke WMA	204.5
North Attleborough WMA	36.46
Old Sandwich Game Farm WMA	93.13
Olivers Pond WMA	12
Peterson Swamp WMA	250
Pickerel Cove WMA	15.9
Plymouth Grassy Pond WMA	25.5
Poor Meadow Brook WMA	161.61
Provincetown Corridor WMA	122

Purchade Brook WMA	106
Quashnet River WMA	51.54
Quashnet Woods State Reservation & WMA	360
Red Brook WMA	683.2
Rocky Gutter WMA	3142.89
Sandwich Hollows WMA	224.2
SE Pine Barrens WMA	436.84
Sly Pond WMA	192
South Shore Marshes WMA	22.4
Taunton River WMA	497.53
Triangle Pond WMA	92.16
Wasque Point WMA	99.5
West Meadows WMA	231.82
Row Labels	Sum of Report Acres
Western District	64579.987
ACCESS	35.82
Deerfield River Access - Charlemont	0.62
Hoosic River Access	5.9
Housatonic River Access	17
Konkapot River Access	8.8
Westfield River Access - Chester	3.5
Installation	2.35
Western District - Old HQ	2.35
Sanctuary	427.5
E. Howe Forbush Sanctuary	365.5
Grace A. Robson Sanctuary	62
WCE	17371.59
Abbott Brook WCE	1782
Alford Spring WCE	889.82
Allen Mountain WCE	208
Boulders WCE	1285.06
Cold Brook WCE	405
Cole Meadow WCE	101
Flag Rock WCE	41.38
Hawks Brook WCE	23.19
Housatonic River East Branch WCE	216.83

Jug End Fen WCE	81.57
Jug End WCE	262.48
Knightville WCE	925
Lilly Pond WCE	162
Mt. Darby WCE	319.29
Mt. Plantain WCE	1337.44
North Egremont WCE	21.5
North River West Branch WCE	96.2
Ram Hill WCE	190.35
Rockhouse Mountain WCE	78
Scout Pond WCE	505
Shales Brook WCE	5.6
Silver Brook WCE	162
Stage Brook WCE	581
Steadman Pond WCE	1170.95
Thorpe Brook WCE	300
Tower Brook WCE	300
Umpachene River WCE	239
Upper Westfield River WCE	12.5
Westfield Watershed WCE	2300
Widow White's Peak WCE	85
Windsor Brook WCE	3284.43
WCR	69.4
Windsor Brook WCR	69.4
WMA	46673.327
Abbott Brook WMA	18
Agawam Lake WMA	1068.05
Ashfield Hawley WMA	284
Barton's Ledge WMA	88.6
Bullock Ledge WMA	15.5
Chalet WMA	7499.26
Cummington WMA	288.97
Day Mountain WMA	382.45
Dolomite Ledges WMA	319.85
Eugene D. Moran WMA	1870.427
Fairfield Brook WMA	164.9
Farmington River WMA	1848.6
Fisk Meadows WMA	640.17

Flat Brook WMA	273.15
Fox Den WMA	4978.49
George L. Darey Housatonic Valley WMA	812.93
Green River WMA (Western District)	489.12
Hawks Brook WMA	509.83
Hinsdale Flats WMA	1853.02
Hiram H. Fox WMA	3754.19
Hop Brook WMA	424.8
Housatonic River East Branch WMA	27.5
Hubbard Brook WMA	195.93
John J. Kelly WMA	267
Jug End Fen WMA	53.54
Jug End State Reservation and WMA	1169.8
Jug End WMA	20
Kampoosa Fen WMA	72
Knightville Dam WMA	0
Lilly Pond WMA	350.7
Long Mountain WMA	929.84
Maple Hill WMA	578.05

Maxwell Brook WMA	36.4
Misery Mountain WMA	740.4
North Egremont WMA	25.96
Oak Hill WMA	712.3
Peru WMA	5013.47
Powell Brook WMA	404.58
Ram Hill WMA	468.83
Richmond Fen WMA	22.9
Savoy WMA	1883.34
Shales Brook WMA	234
Shaw Brook WMA	153.33
Stafford Hill WMA	904.6
Stage Brook WMA	150
Swift River WMA	291.73
Tekoa Mountain WMA	1383.3
Three Mile Pond WMA	1141.82
Tower Brook WMA	298.61
Tracy Pond WMA	225.07
Upper Westfield River WMA	310.32
Walnut Hill WMA	988.7
Williams River WMA	35
Grand Total	221138.652

Federal Aid Program Administration

Mike Sawyers
Federal Aid Coordinator

Overview

The Federal Aid Coordinator, acting through the Deputy Director, 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, as well as serving as liaison between the grantee and the Region 5 office of the U.S. Fish and Wildlife Service (USFWS) grant administrator for the U.S. Department of the Interior.

Federal Aid in Wildlife Restoration (Pittman-Robertson) MassWildlife's apportionment of Federal Aid in Wildlife Restoration funds, \$7,664,947, 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, land acquisition, and program coordination.

Federal Aid in Sport Fish Restoration (Dingell-Johnson and Wallop-Breaux)

The State's Federal Aid in Sport Fish Restoration Act apportionment of \$3,494,429 represents a decrease over 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 \$524,164 (15%); and the balance of \$2,970,264 was equally divided between the Division of Marine Fisheries and MassWildlife (\$1,485,132 each).

Two projects were obligated with the OFBA and MassWildlife shares of the FY 17 Dingell-Johnson and Wallop-Breaux funds. The OFBA, in cooperation with MassWildlife, had thirteen boat accommodation grants active in FY 17. MassWildlife activities reimbursed under the Sport Fish Restoration Program include aquatic resources education, program coordination, hatchery operations, hatchery maintenance, fish distribution, and anadromous fish coordination and technical assistance.

State Wildlife Grant Program (SWG)

MassWildlife's State Wildlife Grant apportionment of \$731,714 was an 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, program coordination, and in the development and implementation of the Massachusetts State Wildlife Action Plan.

Through a regional effort, New Hampshire, Connecticut, New York, Maine, and Massachusetts were awarded a total of \$3,000,000 through the FY 10, FY 11, FY 13, and FY 14 national State Wildlife Grant competitive programs to implement the Rangewide New England Cottontail (NEC) Initiative. Massachusetts' share of the funds (\$723,475) will be used to restore NEC habitat in Massachusetts. Implementation of the NEC Initiative will continue through FY 18.

MassWildlife was also awarded \$277,719 through the FY 13 national State Wildlife Grant competitive program to fund the Conservation of Snake Species Threatened by an Emerging Fungal Skin Disease. MassWildlife is partnering with New Hampshire, Connecticut, Vermont, New Jersey, Tennessee, Minnesota, Wisconsin, and Illinois to address this nationally important conservation issue. This cooperative project will continue through FY 18.

MassWildlife served as the lead state and was awarded \$269,955 through the FY 14 national State Wildlife Grant Competitive program to fund Conservation Planning and Implementation for the Wood Turtle. MassWildlife is partnering with Maine, New Hampshire, Connecticut, Pennsylvania, New Jersey, Maryland, and Virginia. This cooperative project will continue through FY 18.

MassWildlife was awarded \$20,000 through the FY 15 national State Wildlife Grant competitive program to fund the Multistate Recovery Actions for the Bog Turtle and Associated Headwater Wetland Species of Greatest Conservation Need. MassWildlife is partnering with Pennsylvania, Maryland, New Jersey, and Connecticut. This cooperative project will continue through FY 18.

MassWildlife served as the lead state and was awarded

\$402,545 through the FY 16 national State Wildlife Grant Competitive program to fund the Brook Floater Rangewide Conservation and Restoration Initiative. MassWildlife is partnering with the states of Maine, New Hampshire, and Virginia. This cooperative project will continue through FY 20.

Also in FY 16, MassWildlife was awarded \$101,000 through the national State Wildlife Grant competitive program to fund the Northeast Blanding's Turtle Initiative. MassWildlife is partnering with the states of New Hampshire, Maine, and Pennsylvania. This cooperative project expands upon a previous grant that was completed in FY 16. Implementation of the Blanding's Turtle grant will continue through FY 20.

The Endangered Species Act (Section 6)

MassWildlife's apportionment of \$39,000 was a decrease from the previous year apportionment. Funds will be used to reimburse the Federally-listed Plant Monitoring and Management project, the Piping Plover Piping Plover Monitoring, Management, and Research project, and Northern Red-bellied Cooter Adaptive Management.

During FY 16, a funding opportunity for White-nose Syndrome was awarded to MassWildlife in the amount of \$31,200 to investigate the status and population dynamics of Little Brown Bats in Massachusetts. These activities concluded during FY 17.

North American Wetlands Conservation Act (NAWCA)

During FY 15, the MassWildlife was awarded \$720,002 under the North American Wetlands Conservation Act for a proposal to fund wetland protection, restoration, and enhancement in the Great Marsh in Essex County. MassWildlife has established partnerships with other state agencies, municipalities, conservation organizations, and private individuals to accomplish the goals of the project. Project implementation will continue through FY 18.

Monarch Butterfly Conservation Fund

During FY 16, MassWildlife was awarded \$21,500 under the Monarch Butterfly Conservation Fund for a proposal to increase habitat for pollinating insects by seeding highway median and roadside areas with a mix of milkweed and other native plants for pollinators by partnering with other state agencies, including the Department of Transportation and Department of Conservation and Recreation. To increase public awareness about pollinators, MassWildlife also created a pollinator demonstration plot at the Westborough Field Headquarters. Project implementation will continue through FY 18.

Regional Conservation Partnership Program

During FY 17, 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. Implementation of this cooperative agreement will begin in FY 18.

Audits

The office of the State Auditor conducts a state audit of the MassWildlife Federal Aid Program once every two years and the U.S. Department of Interior, Office of Inspector General, conducts a federal audit of the program once every 5 years. No audits were active in FY 17.

Other Matters

Additional Federal Aid Coordinator's duties included responding to requests for information, public inquiries, MassWildlife inventory management, overview of projects performance and financial reporting, project assistance (both field and office), field visits, and serving as the liaison between all Federal Aid personnel and the MassWildlife.

Federal Aid Program Personnel

Kris McCarthy, Associate Director of
Administration & Finance
Mike Sawyers, Federal Aid Coordinator
Lori Cookman, Fiscal Program Coordinator
Debra Chamberlain, Assistant to the
Federal Aid Coordinator
Debbie McGrath, Federal Aid Bookkeeper

Personnel Report – FY2017

Johanna Zabriskie
EEA Deputy Human Resources Director / Dept. of Fish and Game

New Hires - Employee			
Name	Title	Action	Date of Action
Bartus, Anne-Marie	Clerk III	New Hire	May 30, 2017
Bradbury, Timothy	Game Biologist I	New Hire	September 6, 2016
Fleming, Connor	Wildlife Technician II	New Hire	December 11, 2016
LaChance, Michael	Conservation Biologist II	New Hire	December 11, 2016
Mattocks, Steven	Aquatic Biologist I	New Hire	August 7, 2016
Medeiros, Daisy	Office Support Specialist II	New Hire	July 10, 2016
Wattles, David	Game Biologist IV	New Hire	October 2, 2016
Young, Cameron	Wildlife Technician II	New Hire	December 11, 2016
Seasonals & Interns Hires			
Name	Title	Action	Date of Action
Asta-Ferrero, Joseph	Fisheries Technicians	Contract Seasonal Employee	April 2, 2017
Bird, Chalis	Wildlife Technician	Contract Seasonal Employee	March 5, 2017
Boulia, Joseph	Fisheries Technician	Contract Seasonal Employee	April 2, 2017
Burke Perez, Daniel	Laborer I	Seasonal Employee	May 21, 2017
Burt, Adam	Fisheries Technician	Contract Seasonal	June 27, 2017
Diebboll, Hannah	Fisheries Technician	Contract Seasonal Employee	May 15, 2017
Dunin-Wilczynski, Elizabeth	Fisheries Technician	Contract Seasonal Employee	April 16, 2017
Folco, March Gabriel	Tern Colony – Predator Control	Contract Seasonal Employee	May 7, 2017
Jillson, Leo Richard	Seasonal Tern Colony Intern	Contract Seasonal Employee	May 7, 2017
Johnson, Jason	Fisheries Technician	Contract Seasonal Employee	April 16, 2017
Lagacy, Eli	Fisheries Technician	Contract Seasonal Employee	May 15, 2017

Pszybysz, Tara	Fisheries Technician	Contract Seasonal Employee	April 16, 2017
Scholten, Brian	Fisheries Technician	Contract Seasonal Employee	April 16, 2017
Sorlien, Mariel	Tern Colony – Site Manager	Contract Seasonal Employee	May 10, 2017
Titherington, Kaiti	Tern Colony – Site Manager	Contracted Seasonal Employee	May 10, 2017
White, Laura	Tern Colony – Site Manager	Contract Seasonal Employee	May 10, 2017
Terminations - Employee			
Name	Title	Action	Date
Bourque, Barbara	Clerk III	Retired	January 2, 2017
Conlee, Laura	Asst. Dir. of Wildlife Research	Resigned	October 15, 2016
Desrosier, Robert	Wildlife Technician III	Retired	December 31, 2016
DiGirolomo, Rebecca	Game Biologist III	Resigned	February 25, 2017
Griffin, Emily	Game Biologist I	Resigned	May 2, 2018
Medeiros, Daisy	Office Support Specialist II	Resigned	June 6, 2017
Resha, Kaylee	Game Biologist I	Resigned	March 4, 2017
Terminations - Contractors			
Name	Title	Action	Date
n/a			
Transfers -			
Name	Title	Action	Date of Action
Mathews, Timothy	Wildlife Technician II	Transfer to NE District	July 17, 2016
Promotions			
Name	Title	Action	Date
Drudi, Travis	Wildlife Technician III	Promotion	December 18, 2016
Sypek, Ian	Wildlife Technician II	Promotion	September 25, 2016
Wansleben, Thomas	Game Biologist III	Promotion	April 30, 2017
Longsdorf, Jennifer	Program Coordinator I	Promotion	January 22, 2017
Brewer, Elaine	Conservation Biologist II	Promotion	February 19, 2017
Cleveland, Ryan	Wildlife Technician II	Promotion	April 30, 2017
Mathews, Timothy	Wildlife Technician III	Promotion	June 11, 2017
Fortier, Daniel	Wildlife Technician III	Promotion	August 28, 2016
Kendall, Joseph	Wildlife Technician III	Promotion	November 27, 2016

Reclassifications			
Name	Professional Titles	Action	Effective Date
McSweeney, Nicole	Aquatic Biologist III	Reclassification	August 28, 2016

Financial Report

Kris McCarthy
Associate Director of Administration & Finance

SUMMARY REVENUE AND FUND EQUITY						
INLAND FISH/GAME FUND 07/01/2016-06/30/2017						
REVENUE						
Fishing, Hunting, and Trapping Licenses				\$	5,140,712.51	
Archery Stamps				\$	173,235.60	
Primitive Firearm Stamps				\$	186,055.40	
Waterfowl Stamps				\$	57,422.00	
Wildlands Stamps				\$	952,790.00	
Trap Registrations				\$	2,825.00	
Antlerless Deer Permits				\$	200,850.00	
Bear Permits				\$	76,540.00	
Turkey Permits				\$	128,885.00	
Special Licenses, Tags and Posters				\$	40,115.00	
Magazine Subscriptions				\$	99,375.93	
Sales, Other				\$	10,976.00	
Fines and Penalties				\$	950.00	
Rents				\$	53,926.86	
Prior Year Refunds				\$	-	
Donations				\$	36,552.53	
Miscellaneous Income				\$	208,277.26	
PAC				\$	33,166.00	
NSF Charge/Debt. Collection				\$	140.00	
Total				\$	7,402,795.09	
FEDERAL AID REIMBURSEMENTS:						
Dingell-Johnson (Fisheries)				\$	1,604,836.84	
Pittman-Robertson (Wildlife)				\$	5,847,243.94	
Total				\$	7,452,080.78	
TAXES:						
Gasoline Tax Apportionment				\$	1,006,649.36	
OTHER FINANCIAL SOURCES:						
Reimbursement for Half-Price Licenses				\$	191,385.00	
Investment Earnings				\$	9,635.25	
Total				\$	201,020.25	
TOTAL REVENUE				\$	16,062,545.48	
FUND EQUITY AS OF JUNE 30, 2017				\$	12,502,157.84	

LICENSE AND STAMP SALES					
07/01/2016-06/30/2017					
<u>Code</u>	<u>Type of License</u>		<u>Cost</u>	<u>Quantity</u>	<u>Amount</u>
F1	Resident Citizen Fishing		22.50	107,746	2,424,285.00
F2	Resident Citizen Minor Fishing		FREE	7,213	0.00
F3	Resident Citizen Fishing (Age 65-69)		11.25	8,736	98,280.00
F4	Resident Cit. Fishing (Over 70)		FREE	13,342	0.00
F4	Resident Cit. Fishing (Disabled)		FREE	122	0.00
F6	Non-Res. Citizen/Alien Fishing		32.50	10,799	350,967.50
F7	Non-Res. Citizen/Alien Fishing (3 day)		18.50	2,891	53,483.50
F8	Resident Fishing (3 day)		7.50	2,171	16,282.50
F9	Non-Resident (Citizen) Minor Fishing		6.50	320	2,080.00
	Quabbin 1-Day Fishing		5.00	3,198	15,990.00
T1	Resident Citizen Trapping		30.50	659	20,099.50
T2	Resident Citizen Minor Trapping		6.50	3	19.50
T3	Resident Citizen Trapping (Age 65-69)		15.25	55	838.75
H1	Resident Citizen Hunting		22.50	16,140	363,150.00
H2	Resident Citizen Hunting (Age 65-69)		11.25	1,021	11,486.25
H3	Resident Citizen Hunting (Paraplegics)		FREE	6	0.00
H4	Resident Alien Hunting		22.50	151	3,397.50
H5	Non-Res. Cit./Alien Hunting (Big Game)		94.50	3,021	285,484.50
H6	Non-Res. Cit./Alien Hunting (Sm. Game)		60.50	1,187	71,813.50
H8	Resident (Citizen) Minor Hunting		6.50	1,424	9,256.00
S1	Resident Citizen Sporting		40.00	33,401	1,336,040.00
S2	Resident Citizen Sporting (Age 65-69)		20.00	4,039	80,780.00
S3	Resident Citizen Sporting (Over 70)		FREE	10,837	0.00
S3	Resident Citizen Sporting (Disabled)		FREE	40	0.00
S4	Resident Sporting Paraplegic		FREE	26	0.00
TOTAL LICENSE SALES (GROSS)				228,548	5,143,734.00
<u>Type of Stamp</u>					
M1	Archery Stamps		5.10	33,973	173,262.30
M2	Waterfowl Stamps		5.00	11,488	57,440.00
M3	Primitive Firearm Stamps		5.10	36,488	186,088.80
W1	Wildlands Stamps		5.00	172,340	861,700.00
W2	Non-Resident Wildlands Stamps		5.00	18,218	91,090.00
	Duplicate Stamps		2.50	0	0.00
TOTAL STAMP SALES (GROSS)				272,507	1,369,581.10
<u>Previous Years Stamp Sales</u>					
M1	Archery Stamps			0	0.00
M2	Waterfowl Stamps			0	0.00
M3	Primitive Firearm Stamps			0	0.00
TOTAL STAMP SALES (GROSS)				0	0.00
Fees Retained and Adjustments by Clerks					\$ (688.05)
Refunds					\$ (2,411.54)
TOTAL					\$ (3,099.59)
TOTAL LICENSE/STAMP SALES (NET)					6,510,215.51

HOW THE SPORTSMEN'S DOLLAR WAS SPENT				
INLAND FISH AND GAME FUND				
JULY 1, 2016 TO JUNE 30, 2017				
PROGRAMS/ASSESSMENTS				
<u>Administration:</u>	FY 2017	PERCENTAGES		
Administration	\$ 2,058,335			
Information-Education	\$ 1,250,846			
Dcamm ISA Field Headquarters	\$ 126,089			
Total	\$ 3,435,271	18.92%		
<u>Fisheries and Wildlife Programs:</u>				
Hatcheries	\$ 2,468,936			
Game Bird Program	\$ 611,544			
Seasonals	\$ 108,362			
Cooperative Units	\$ 175,427			
Fisheries and Wildlife Management	\$ 5,905,278			
Total	\$ 9,269,547	51.05%		
<u>Other Programs:</u>				
Land Acquisitions	\$ 1,476,935			
Waterfowl Management Program	\$ 45,952			
Hunter Safety Program	\$ 549,133			
Total	\$ 2,072,020	11.41%		
<u>Other Assessments:</u>				
Payroll Taxes	\$ 157,501			
GI and Other Fringe Benefits	\$ 3,224,571			
Total	\$ 3,382,072	18.62%		
TOTAL EXPENDITURES	\$ 18,158,910	100.00%		

SUMMARY								
REVENUES, EXPENDITURES AND FUND EQUITY								
NATURAL HERITAGE AND ENDANGERED SPECIES FUND								
07/01/2016 - 06/30/2017								
REVENUES:					FY 2017			
Natural Heritage and Endangered Species Tax Checkoff Donations					\$ 316,006			
Sales					\$ 12,773			
NRCS/Wildlife Habitat Incentives Program (WHIP)					\$ 38,750			
State Wildlife Grant (SWG)					\$ 744,423			
NAWCA					\$ 35,366			
Massachusetts Endangered Species Act Fees					\$ 437,324			
Contracts					\$ 17,811			
Direct Donations					\$ 17,000			
Interest					\$ 861			
TOTAL REVENUES:					\$ 1,620,314			
EXPENDITURES:								
Natural Heritage and Endangered Species Program					\$ 2,319,729			
Tern Restoration					\$ 49,632			
State Wildlife Grant					\$ 38,341			
TOTAL EXPENDITURES:					\$ 2,407,702			
FUND EQUITY AS OF JUNE 30, 2017					\$ 2,050,692			

SUMMARY OTHER EXPENDITURES								
Capital Outlay Funds:					FY 17			
Land Protection : Habitat Management- CR Stewardship					\$ 1,057,174			
Staffing for Land and Infrastructure Programs					\$ 464,004			
Hatchery/District/Westborough Field Headquarters Repairs					\$ 36,048			
Habitat Grant Program					\$ 296,489			
Dam Safety and Repair					\$ 487,210			
Bird Island Restoration					\$ 109,520			
TOTAL CAPITAL EXPENDITURES					\$ 2,450,444			
Interdepartmental Service Agreements								
Massachusetts Highway Department					\$ 144,861			
Natural Heritage and Endangered Species Line Item:					\$ 147,415			
Federal Grant Accounts								
New England Cottontail					\$ 31,674			
Other Trust Accounts								
Federal Duck Stamp (e-stamp)					\$ 49,555			

Appendix A

Anadromous Fish Passage Data



Table 1. Daily anadromous fish passage at Holyoke 2016.

Date	American Shad		Blueback Herring		Sea Lamprey		Striped Bass		Atlantic Salmon		Gizzard Shad		Shortnose Sturgeon	
	Daily	YTD	Daily	YTD	Daily	YTD	Daily	YTD	Daily	YTD	Daily	YTD	Daily	YTD
1-Apr	2	2	0	0	0	0	0	0	0	0	0	0	0	0
2-Apr	4/2 - 4/3, no lifting, temperature < 7 C													
3-Apr														
4-Apr	0	2	0	0	0	0	0	0	0	0	0	0	0	0
5-Apr	0	2	0	0	0	0	0	0	0	0	0	0	0	0
6-Apr	0	2	0	0	0	0	0	0	0	0	0	0	0	0
7-Apr	0	2	0	0	0	0	0	0	0	0	0	0	0	0
8-Apr	0	2	0	0	0	0	0	0	0	0	0	0	0	0
9-Apr	4/29 - 4/10, no lifting, temperature < 4 C													
10-Apr														
11-Apr	0	2	0	0	0	0	0	0	0	0	0	0	0	0
12-Apr	0	2	0	0	0	0	0	0	0	0	0	0	0	0
13-Apr	2	4	0	0	0	0	0	0	0	0	0	0	0	0
14-Apr	4	8	0	0	0	0	0	0	0	0	0	0	0	0
15-Apr	4	12	0	0	0	0	0	0	0	0	0	0	0	0
16-Apr	43	55	0	0	0	0	0	0	0	0	0	0	0	0
17-Apr	11	66	0	0	0	0	0	0	0	0	0	0	0	0
18-Apr	104	170	0	0	0	0	0	0	0	0	0	0	0	0
19-Apr	536	706	0	0	0	0	0	0	0	0	0	0	0	0
20-Apr	1,613	2,319	0	0	0	0	0	0	0	0	2	2	0	0
21-Apr	301	2,620	0	0	0	0	0	0	0	0	0	2	1	1
22-Apr	833	3,453	0	0	4	4	0	0	0	0	3	5	0	1
23-Apr	1,135	4,588	0	0	8	12	0	0	0	0	7	12	0	1
24-Apr	1,141	5,729	0	0	5	17	0	0	0	0	7	19	1	2
25-Apr	909	6,638	0	0	37	54	0	0	0	0	10	29	2	4
26-Apr	533	7,171	0	0	2	56	0	0	0	0	3	32	0	4
27-Apr	156	7,327	0	0	23	79	0	0	0	0	1	33	1	5
28-Apr	295	7,622	0	0	1	80	0	0	0	0	3	36	0	5
29-Apr	5,929	13,551	0	0	22	102	0	0	0	0	7	43	2	7
30-Apr	1,292	14,843	0	0	6	108	0	0	0	0	10	53	1	8

1-May	2,116	16,959	0	0	4	112	0	0	0	0	14	67	1	9
2-May	6,147	23,106	0	0	119	231	0	0	0	0	13	80	2	11
3-May	2,553	25,659	0	0	2	233	0	0	0	0	29	109	0	11
4-May	1,599	27,258	0	0	0	233	0	0	0	0	39	148	0	11
5-May	503	27,761	0	0	0	233	0	0	0	0	13	161	2	13
6-May	1,353	29,114	0	0	0	233	0	0	0	0	17	178	0	13
7-May	1,285	30,399	0	0	5	238	0	0	0	0	4	182	1	14
8-May	2,349	32,748	0	0	1	239	0	0	0	0	4	186	0	14
9-May	5,152	37,900	0	0	44	283	0	0	0	0	5	191	0	14
10-May	9,589	47,489	2	2	101	384	0	0	0	0	32	223	1	15
11-May	36,837	84,326	0	2	945	1,329	0	0	0	0	36	259	0	15
12-May	54,006	138,332	0	2	367	1,696	0	0	0	0	72	331	0	15
13-May	28,725	167,057	3	5	124	1,820	0	0	0	0	17	348	0	15
14-May	28,808	195,865	1	6	141	1,961	0	0	0	0	10	358	0	15
15-May	13,408	209,273	2	8	1,839	3,800	0	0	0	0	7	365	1	16
16-May	14,242	223,515	5	13	75	3,875	0	0	0	0	5	370	1	17
17-May	7,531	231,046	2	15	91	3,966	0	0	0	0	2	372	0	17
18-May	8,743	239,789	4	19	65	4,031	0	0	0	0	5	377	0	17
19-May	8,615	248,404	0	19	161	4,192	0	0	0	0	12	389	1	18
20-May	12,222	260,626	2	21	464	4,656	0	0	0	0	8	397	0	18
21-May	11,167	271,793	1	22	888	5,544	0	0	0	0	7	404	0	18
22-May	12,079	283,872	17	39	405	5,949	0	0	0	0	9	413	1	19
23-May	13,828	297,700	23	62	1,450	7,399	1	1	0	0	7	420	0	19
24-May	5,581	303,281	9	71	322	7,721	0	1	1	1	5	425	0	19
25-May	7,441	310,722	19	90	695	8,416	0	1	0	1	12	437	1	20
26-May	7,809	318,531	2	92	7,720	16,136	0	1	0	1	3	440	0	20
27-May	9,152	327,683	18	110	6,617	22,753	4	5	0	1	7	447	0	20
28-May	7,245	334,928	3	113	4,214	26,967	4	9	0	1	8	455	0	20
29-May	6,359	341,287	0	113	4,279	31,246	2	11	0	1	4	459	0	20
30-May	2,733	344,020	0	113	1,254	32,500	2	13	0	1	1	460	0	20
31-May	5,665	349,685	8	121	1,001	33,501	24	37	0	1	0	460	0	20
1-Jun	7,405	357,090	5	126	933	34,434	11	48	0	1	3	463	0	20
2-Jun	5,209	362,299	2	128	254	34,688	11	59	0	1	1	464	0	20
3-Jun	1,407	363,706	1	129	171	34,859	3	62	0	1	1	465	0	20
4-Jun	1,865	365,571	0	129	171	35,030	9	71	0	1	8	473	0	20

5-Jun	1,525	367,096	2	131	77	35,107	26	97	1	2	5	478	1	21
6-Jun	1,367	368,463	3	134	43	35,150	33	130	1	3	2	480	0	21
7-Jun	2,240	370,703	0	134	13	35,163	27	157	0	3	4	484	4	25
8-Jun	3,933	374,636	2	136	31	35,194	172	329	0	3	59	543	1	26
9-Jun	1,477	376,113	0	136	9	35,203	28	357	0	3	22	565	1	27
10-Jun	720	376,833	0	136	11	35,214	21	378	0	3	9	574	0	27
11-Jun	1,257	378,090	1	137	3	35,217	18	396	0	3	10	584	2	29
12-Jun	774	378,864	0	137	7	35,224	14	410	0	3	5	589	1	30
13-Jun	765	379,629	0	137	3	35,227	6	416	0	3	2	591	1	31
14-Jun	300	379,929	0	137	6	35,233	6	422	0	3	1	592	0	31
15-Jun	777	380,706	0	137	7	35,240	13	435	0	3	1	593	1	32
16-Jun	457	381,163	0	137	7	35,247	13	448	0	3	2	595	0	32
17-Jun	829	381,992	0	137	0	35,247	17	465	0	3	0	595	0	32
18-Jun	361	382,353	0	137	2	35,249	15	480	0	3	0	595	1	33
19-Jun	554	382,907	0	137	0	35,249	16	496	0	3	1	596	2	35
20-Jun	373	383,280	0	137	0	35,249	29	525	0	3	0	596	2	37
21-Jun	470	383,750	0	137	0	35,249	26	551	0	3	0	596	0	37
22-Jun	125	383,875	0	137	0	35,249	20	571	0	3	1	597	1	38
23-Jun	137	384,012	0	137	0	35,249	4	575	0	3	0	597	2	40
24-Jun	149	384,161	0	137	0	35,249	5	580	0	3	0	597	0	40
25-Jun	167	384,328	0	137	0	35,249	13	593	0	3	0	597	0	40
26-Jun	249	384,577	0	137	0	35,249	9	602	0	3	0	597	3	43
27-Jun	150	384,727	0	137	0	35,249	6	608	0	3	0	597	0	43
28-Jun	148	384,875	0	137	0	35,249	6	614	0	3	0	597	2	45
29-Jun	121	384,996	0	137	0	35,249	5	619	0	3	0	597	2	47
30-Jun	280	385,276	0	137	0	35,249	0	619	0	3	0	597	0	47
1-Jul	87	385,363	0	137	0	35,249	2	621	0	3	0	597	0	47
2-Jul	42	385,405	0	137	0	35,249	0	621	0	3	0	597	1	48
3-Jul	117	385,522	0	137	0	35,249	1	622	0	3	0	597	1	49
4-Jul	66	385,588	0	137	0	35,249	9	631	0	3	0	597	0	49
5-Jul	15	385,603	0	137	0	35,249	2	633	0	3	0	597	0	49
6-Jul	16	385,619	0	137	0	35,249	0	633	0	3	0	597	0	49
7-Jul	36	385,655	0	137	0	35,249	0	633	0	3	0	597	1	50
8-Jul	42	385,697	0	137	0	35,249	0	633	0	3	0	597	0	50
9-Jul	9	385,706	0	137	0	35,249	4	637	0	3	0	597	7	57

10-Jul	11	385,717	0	137	0	35,249	0	637	0	3	0	597	0	57
11-Jul	34	385,751	0	137	0	35,249	1	638	0	3	0	597	0	57
12-Jul	66	385,817	0	137	0	35,249	0	638	0	3	1	598	3	60
13-Jul	32	385,849	0	137	0	35,249	0	638	0	3	0	598	4	64
14-Jul	50	385,899	0	137	0	35,249	0	638	0	3	0	598	10	74

Table 2. Anadromous fish passage recorded at the Holyoke fishlift, Connecticut River, Massachusetts 1955-2016

Year	American Shad	Blueback Herring	Atlantic Salmon	Striped Bass	Sea Lamprey	Gizzard Shad	Year	American Shad	Blueback Herring	Atlantic Salmon	Striped Bass	Sea Lamprey	Gizzard Shad
1955	4,900	-	-	-	-	-	1986	350,000	520,000	260	187	20,000	27
1956	7,700	-	-	-	-	-	1987	280,000	360,000	208	521	23,000	94
1957	8,800	16	1	-	-	-	1988	290,000	340,000	72	256	16,000	95
1958	5,700	29	1	-	2	-	1989	350,000	290,000	80	923	15,000	294
1959	15,000	20	-	-	73	-	1990	360,000	390,000	188	1,000	22,000	956
1960	15,000	796	2	-	17	-	1991	520,000	410,000	152	1,200	41,000	486
1961	23,000	1,200	-	-	42	-	1992	720,000	310,000	368	327	28,000	1,100
1962	21,000	19	-	-	209	-	1993	340,000	100,000	167	194	23,000	341
1963	31,000	32	-	-	64	-	1994	181,000	32,000	256	159	30,000	165
1964	35,000	13	-	-	537	-	1995	190,000	110,000	150	1,300	18,000	2,000
1965	34,000	53	-	-	26	-	1996	276,000	55,000	202	537	45,000	1,100
1966	16,000	54	-	-	2	-	1997	299,000	64,000	94	679	32,000	2,100
1967	19,000	356	-	-	46	-	1998	316,000	11,000	196	492	97,000	1,100
1968	25,000	-	-	-	-	-	1999	194,000	2,700	91	859	20,000	35,000
1969	45,000	10,000	-	-	-	-	2000	225,000	11,000	50	489	21,000	38,000
1970	66,000	1,900	-	-	-	-	2001	273,000	11,000	25	1,200	49,000	5,500
1971	53,000	302	-	-	-	-	2002	375,000	2,000	34	1,100	74,000	3,100
1972	26,000	188	-	-	-	-	2003	287,000	2,700	28	881	53,000	859

1973	25,000	302	-	-	-	-	200 4	191,00 0	145	34	259	59,000	287
1974	53,000	504	-	-	-	-	200 5	117,00 0	534	131	233	28,000	132
1975	110,00 0	1,600	-	-		23,00 0	200 6	155,00 0	21	118	144	18,000	127
1976	350,00 0	4,700	-	-		32,00 0	200 7	159,00 0	75	106	243	40,000	75
1977	200,00 0	33,000		2	-	52,00 0	200 8	153,00 0	84	80	617	57,000	127
1978	140,00 0	38,000		23	-	43,00 0	200 9	161,00 0	40	61	668	19,000	68
1979	260,00 0	40,000		19	103	31,00 0	201 0	164,00 0	76	41	298	40,000	371
1980	380,00 0	200,00 0		126	148	34,00 0	201 1	244,00 0	138	72	138	19,000	423
1981	380,00 0	420,00 0		319	510	53,00 0	201 2	495,00 0	39	29	336	14,000	337
1982	290,00 0	590,00 0		11	231	26,00 0	201 3	393,00 0	976	69	250	22,000	827
1983	530,00 0	450,00 0		25	346	29,00 0	201 4	373,00 0	976	27	69	22,000	410
1984	500,00 0	480,00 0		66	110	22,00 0	201 5	412,56 5	87	13	21	22,245	84
1985	480,00 0	630,00 0		285	369	40,00 0	201 6	385,89 9	137	3	638	35,249	598

Table 3. Temporal characteristics of American shad passage at Holyoke, 2016

Cumulative Percentage of Total American Shad Passage

	25%	50%	75%	90%	Highest Day
Holyoke Fishlift:					
Day*	30	33	41	49	30
Date	5/12	5/14	5/23	5/31	5/12

* Day one is 13 April, the first day shad were lifted at the Holyoke fish passage facility.

Table 4. Population age structure of American shad sampled at the Holyoke fishlift 2015.
(from CT DEP)

2016 American Shad Age Structure at the Holyoke Lift							
Age	3	4	5	6	7	Total	% Rpt Spawn
%Bucks	9.9%	28.1%	50.4%	10.7%	0.8%		5.8%
Shad (n)	21,051	59,644	107,008	22,805	1,754	212,262	
	4	5	6	7			% Rpt Spawn
%Roes	12.3%	47.2%	37.7%	2.8%			11.3%
Shad (n)	21,299	81,919	65,535	4,915	173,669		
	3	4	5	6	7		% Rpt Spawn
% Combined	5.3%	20.7%	48.9%	23.3%	1.8%		8.4%
Shad (n)	20,402	79,906	188,715	90,107	6,801	385,930	

Table 5. Holyoke fish lift, spring, 2016. American Shad trap and truck contributions; recipients included Connecticut Department of Energy and Environmental Protection (CT), Rhode Island Division of Fish and Wildlife (RI), Conte Anadromous Fish Research Center (USGS-CAFL), US Fish and Wildlife Service (USFWS), and Normandeau Associates (NAI).

Date	CT	RI	USGS	USFWS	NAI	Sums
4/27	.	.	.	.	12	12
4/28	.	.	.	.	32	32
5/2	.	.	.	.	113	113
5/3	.	.	.	.	49	49
5/8	.	.	.	.	50	50
5/9	.	40	.	.	61	101
5/10	.	.	42	.	110	152
5/11	.	.	75	.	136	211
5/12	.	.	75	.	116	191
5/13	.	38	.	.	88	126
5/15	.	.	.	.	44	44
5/16	.	.	.	.	114	114
5/17	.	52	76	.	115	243
5/18	.	49	76	.	110	235
5/19	.	.	80	.	129	209
5/20	.	51	.	.	.	51
5/23	.	.	.	.	117	117
5/24	.	50	75	.	112	237
5/25	.	.	83	.	107	190
5/26	.	53	75	.	65	193
5/27	86	.	.	.	.	86
5/30	.	.	.	.	105	105
5/31	.	.	80	.	109	189
6/1	82	.	.	70	110	262
6/2	.	.	.	120	164	284
6/3	.	35	.	120	63	218
6/6	.	.	.	.	106	106
6/7	.	.	.	177	114	291
6/8	.	.	.	128	65	193
6/9	.	.	.	75	65	140

6/10	.	.	.	121	.	121
6/13	.	.	.	.	65	65
6/14	.	.	.	75	102	177
6/15	93	.	.	.	66	159
6/16	.	.	.	.	65	65
6/17	.	.	.	68	.	68
6/23	.	.	.	.	40	40
7/6	.	.	.	.	17	17
7/13	.	.	.	.	16	16
Totals	261	368	737	954	2952	5272

Table 6. Holyoke Dam upstream American eel passage monitoring, 2016.

Holyoke Dam upstream American Eel passage monitoring, 2016. Date range, number of collections, total eels collected, and descriptive statistics for number of eels per collection (catch) and catch-per-unit-of-effort (CPUE, eels/h fished) for each trap.

Trap	Date Range	N	Sum	Catch				CPUE (catch/night)			
				Min	Max	Mean	SD	Max	Mean	SD	
Tailrace Ramp	5/24-11/15	112	18,517	0	4360	166.8	653.2	4,360	167.6	656.1	
Spillway Ramp	5/17-11/15	118	40	0	16	0.3	1.8	16	0.3	1.8	
Stilling Basin Ramp	5/17-11/15	126	1,293	0	228	10.5	25.2	78	8.3	15.3	
South Hadley Ramp	6/14-11/15	105	18,599	0	4,972	175.5	568.9	2,102	117.7	329.1	
Total	5/17-11/15	461	38,449								

Table 7. Daily fish passage at the Turners Falls Fish Passage Facilities 2016

Date	Cabot Shad	Spillway Shad	Gatehouse e Shad	Gatehouse Lamprey
4/21/2016	NC			
4/22/2016	0	0	0	0
4/23/2016	0	0	13	0
4/24/2016	0	0	9	0
4/25/2016	0	4	9	0
4/26/2016	11	0	6	0
4/27/2016	2	0	1	0
4/28/2016	6	0	0	0
4/29/2016	1	0	1	0
4/30/2016	9	0	3	0
5/1/2016	58	0	8	0
5/2/2016	65	0	2	0
5/3/2016	74	0	1	0
5/4/2016	95	1	1	0
5/5/2016	37	1	4	0
5/6/2016	58	0	0	0
5/7/2016	54	0	1	0
5/8/2016	106	0	3	0
5/9/2016	84	0	0	0
5/10/2016	128	0	9	0
5/11/2016	281	7	37	2
5/12/2016	551	2	32	0
5/13/2016	2419	5	20	1

5/14/2016	2442	22	1172	27
5/15/2016	2823	672	1840	97
5/16/2016	854	224	474	1
5/17/2016	617	116	1237	10
5/18/2016	390	76	1096	2
5/19/2016	825	57	137	6
5/20/2016	643	573	942	4
5/21/2016	1420	1483	3363	209
5/22/2016	806	258	753	40
5/23/2016	658	55	213	24
5/24/2016	1014	24	2426	127
5/25/2016	724	1178	2456	125
5/26/2016	900	3258	7156	579
5/27/2016	1304	2046	3859	586
5/28/2016	1605	1791	3601	1363
5/29/2016	2515	1170	4422	1811
5/30/2016	1696	1372	3980	2325
5/31/2016	1283	942	2293	1465
6/1/2016	1548	1810	3553	2305
6/2/2016	1313	627	1452	1818
6/3/2016	1499	366	2141	766
6/4/2016	711	241	1540	470
6/5/2016	305	160	988	406
6/6/2016	708	142	175	136
6/7/2016	621	185	230	204

6/8/2016	215	120	637	96
6/9/2016	73	28	207	20
6/10/2016	120	88	163	2
6/11/2016	98	42	92	5
6/12/2016	96	34	119	1
6/13/2016	43	23	0	0
6/14/2016	25	17	7	0
6/15/2016	68	26	NC	NC
6/16/2016	124	37	75	8
6/17/2016	177	23	36	6
6/18/2016	117	0	91	7
6/19/2016	56	0	76	27
6/20/2016	27	24	132	0
6/21/2016	32	15	87	12
6/22/2016	9	7	76	1
6/23/2016	22	12	93	0
6/24/2016	11	1	88	1
6/25/2016	11	5	47	1
6/26/2016	2	3	97	21
6/27/2016	4	2	121	8
6/28/2016	14	0	378	0
6/29/2016	6	8	211	0
6/30/2016	18	2	19	0

7/1/2016	32	7	63	0
7/2/2016	14	0	26	2
7/3/2016	9	0	51	1
7/4/2016	3	0	65	0
7/5/2016	12	1	41	0
7/6/2016	4	3	2	0
7/7/2016	4	3	1	0
7/8/2016	0	0	NC	NC

34,709 19,399 54,760 15,128

Table 8. Historic Fish Passage at the Turners Falls Fish Passage Facilities

Year	Location	American Shad	Blueback Herring	Striped Bass	Sea Lamprey	Atlantic Salmon	Gizzard * Shad
		Shad	Herring	Bass	Lamprey	Salmon	Shad
1980	Cabot	687	0	11	187	0	
	Spillway	5	0	0	0	0	
	Gatehouse	298	0	1	66	1	
1981	Cabot	224	0	0	1,622	7	
	Spillway**						
	Gatehouse	200	0	0	935	8	
1982	Cabot						
	Spillway**						
	Gatehouse	11	4	0	210	0	
1983	Cabot	26,697	106	6	859	0	
	Spillway	263	1	1	649	0	
	Gatehouse	12,705	28	7	703	0	
1984	Cabot	1,831	4	0	334	1	
	Spillway	4,563	12	0	851	1	
	Gatehouse	4,333	21	0	683	1	
1985	Cabot	31,000	1,726	0	3,198	2	
	Spillway	843	243	0	3,185	3	
	Gatehouse	3,855	301	0	1,809	3	

1986	Cabot	22,144	7,091	0	1,424	5	
	Spillway	5,857	6,248	0	2,230	4	
	Gatehouse	17,858	9,578	0	1,961	10	
1987	Cabot	33,114	2,866	0	1,324	2	
	Spillway	3,679	2,841	0	2,921	3	
	Gatehouse	18,959	5,091	0	2,590	12	
1988	Cabot	28,546	349	0	335	2	
	Spillway	3,354	865	0	1,912	2	
	Gatehouse	15,787	1,079	0	1,175	7	
1989	Cabot	14,403	199	0	578	1	
	Spillway	1,494	279	0	947	0	
	Gatehouse	9,511	510	1	868	2	
1990	Cabot	31,056	711	0	1,304	8	1
	Spillway	5,898	768	0	1,013	2	0
	Gatehouse	27,908	1,585	0	1,301	16	13
1991	Cabot	87,168	6,433	1	2,089	2	0
	Spillway	6,282	2,718	0	3,026	2	0
	Gatehouse	54,656	7,522	3	4,090	4	1
1992	Cabot	94,046	1,765	1	1,836	9	0
	Spillway	11,760	884	0	3,275	6	0
	Gatehouse	60,089	2,157	2	2,710	14	7
1993	Cabot	21,045	243	0	711	7	0
	Spillway	898	90	0	2,082	3	0
	Gatehouse	10,221	278	0	1,637	7	0
1994	Cabot**						
	Spillway	1,507	17	0	1,740	1	0
	Gatehouse	3,729	97	0	1,702	5	0
1995	Cabot	33,938	4,234	0	1,417	2	1
	Spillway	543	31	0	1,372	0	0

	Gatehouse	18,369	2,957	0	1,813	4	4
1996	Cabot**						
	Spillway	2,293	13	0	2,651	4	0
	Gatehouse	16,192	515	0	4,556	3	3
1997	Cabot	22,518	231	0	2,374	2	4
	Spillway	3,473	15	0	2,219	1	3
	Gatehouse	9,216	128	0	2,265	2	2
1998	Cabot	14,947	2	0	8,707	6	1
	Spillway	4,721	0	0	8,642	2	2
	Gatehouse	10,527	4	0	7,579	5	2
1999	Cabot	11,501	5	0	2,014	2	543
	Spillway	4,215	0	8	1,449	2	440
	Gatehouse	6,751	2	0	916	0	275
2000	Cabot	12,289	0	0	1,455	0	9
	Spillway	2,240	0	0	1,962	4	358
	Gatehouse	2,590	0	0	1,350	5	199
2001	Cabot	20,933	0	0	3,678	0	0
	Spillway	2,344	0	0	5,280	0	0
	Gatehouse	1,540	0	0	2,144	0	0
2002	Cabot	7,922	0	0	14,709	0	0
	Spillway	5,372	0	0	12,367	0	0
	Gatehouse	2,870	0	0	10,160	0	0
2003**							
2004	Cabot	5,933	0	0	13,352	0	0
	Spillway	1,980	0	0	5,821	0	0
	Gatehouse	2,192	0	0	8,418	0	0
2005	Cabot	5,404					
	Spillway	1,626					
	Gatehouse	1,581					

2006	Cabot	11,991	1	198	5,377	4	9
	Spillway	2,577	0	153	5,133	8	0
	Gatehouse	1,810	0	46	3,005	7	0
2007	Cabot	11,130	**	**	11,061	5	**
	Spillway	1,793	**	**	5,555	3	**
	Gatehouse	2,248	**	**	15,438	5	**
2008	Cabot	15,089	**	**	**	6	**
	Spillway	627	**	**	**	5	**
	Gatehouse	3,995	**	**	32,035	10	**
2009	Cabot	13,391	**	**	**	0	**
	Spillway	919	**	**	**	5	**
	Gatehouse	3,814	**	**	8,296	8	**
2010	Cabot	30,232	**	**	**		**
	Spillway	2,735	**	**	**		**
	Gatehouse	16,768	**	**	6,352	8	**
2011	Cabot	27,077	**	**	**	2	**
	Spillway	1,966	**	**	**	6	**
	Gatehouse	16,798	**	**	2,032	7	**
2012	Cabot	51,901	**	**	**	2	**
	Spillway	10,608	**	**	**	3	**
	Gatehouse	26,727	**	**	4,503	1	**
2013	Cabot	46,886	**	**	**		**
	Spillway	10,571	**	**	**		**
	Gatehouse	35,494	**	**	6,016		**
2014	Cabot	40,666	**	**	**	3	**
	Spillway	24,262	**	**	**	8	**
	Gatehouse	39,914	**	**	5,553	11	**
2015	Cabot	47,588	**	**	**	3	**
	Spillway	41,835	**	**	**		**

	Gatehouse	58,078	**	**	8,436		**
2016	Cabot	34,709	**	**	**	3	**
	Spillway	19,399	**	**	**		**
	Gatehouse	54,760	**	**	15,128		**

* 1990 was the first year gizzard shad observed using the ladders was recorded.

** Not monitored

Table 9. Daily Fish Counts -

West Springfield Fish Ladder 2016

Date	American Shad	Sea Lamprey	Atlantic Salmon	White Sucker	Small-mouth	Brown Trout	Rainbow Trout	Brook Trout	Tiger Trout	Max. H2O Temp. (C°)
7-Apr	0	0	0	0	0	0	0	0	0	6.0
8-Apr	0	0	0	0	0	0	0	0	0	6.0
9-Apr	0	0	0	0	0	0	0	0	0	5.5
10-Apr	0	0	0	0	0	0	0	0	0	5.5
11-Apr	0	0	0	0	0	0	0	0	0	6.0
12-Apr	0	0	0	0	0	0	0	0	0	7.0
13-Apr	0	0	0	0	0	0	0	0	0	7.5
14-Apr	0	0	0	0	0	0	0	0	0	8.5
15-Apr	0	0	0	1	0	0	0	0	0	8.5
16-Apr	0	0	0	0	0	0	0	0	0	8.5
17-Apr	0	0	0	1	0	0	0	0	0	9.0
18-Apr	0	0	0	10	0	0	0	0	0	10.0
19-Apr	1	1	0	101	3	0	0	0	0	12.0
20-Apr	3	2	0	26	2	0	0	0	0	12.5
21-Apr	4	2	0	64	1	0	0	1	0	13.0
22-Apr	4	0	0	136	9	0	0	0	0	13.5
23-Apr	7	2	0	64	14	0	0	0	0	14.5
24-Apr	6	15	0	19	5	1	0	0	0	14.0
25-Apr	26	3	0	5	11	2	0	0	0	13.0
26-Apr	2	0	0	0	1	0	0	1	0	12.5

27-Apr	0	0	0	0	0	0	0	0	0	11.0
28-Apr	1	1	0	0	0	0	0	0	0	11.0
29-Apr	1	0	0	0	4	0	0	0	0	12.5
30-Apr	14	0	0	0	9	0	0	0	0	14.0
1-May	26	1	0	1	10	0	1	0	0	12.5
2-May	0	0	0	0	0	0	0	0	0	10.5
3-May	1	0	0	0	0	0	0	0	0	9.5
4-May	3	0	0	0	0	0	0	0	0	9.5
5-May	3	0	0	0	0	0	0	0	0	9.0
6-May	3	0	0	0	0	0	0	0	0	10.0
7-May	34	0	0	0	0	2	0	0	0	10.5
8-May	26	0	0	2	1	2	0	0	0	11.0
9-May	24	1	0	4	3	1	0	1	0	11.5
10-May	49	0	0	1	14	0	0	0	0	12.0
11-May	162	1	0	25	29	0	1	1	0	14.5
12-May	331	8	0	178	64	2	0	1	0	16.0
13-May	525	29	0	71	43	0	0	0	1	16.0
14-May	304	10	0	21	30	4	0	0	0	16.0
15-May	131	13	0	16	23	3	0	0	0	14.5
16-May	54	0	0	3	2	0	0	0	0	13.5
17-May	21	0	0	2	0	0	0	0	0	12.0
18-May	13	0	0	0	2	0	0	1	0	13.5
19-May	608	2	0	18	42	0	1	0	2	16.0
20-May	530	5	0	10	24	0	0	3	1	17.0
21-May	303	14	0	17	31	0	0	0	1	16.0
22-May	151	0	0	2	2	1	0	0	0	15.5
23-May	363	12	0	5	18	0	0	1	0	17.0
24-May	341	24	0	48	25	1	0	1	0	17.0
25-May	206	17	1	7	17	1	0	0	1	18.5
26-May	250	41	0	33	41	1	0	1	2	20.5
27-May	263	61	1	21	18	2	2	1	1	21.0
28-May	216	41	0	15	7	5	0	1	0	22.5
29-May	186	13	0	16	15	3	2	3	1	23.5
30-May	46	8	0	4	9	2	1	1	0	22.5
31-May	147	25	0	10	6	1	0	1	2	23.0

[illegible]

6-Jul	3	0	0	4	4	0	0	0	0	26.0
7-Jul	4	0	0	0	3	0	0	0	0	26.5
8-Jul	0	0	0	8	7	0	0	1	0	26.0
9-Jul	1	0	0	2	3	0	0	0	0	24.0
10-Jul	2	0	0	0	0	0	0	0	0	24.0
11-Jul	3	0	0	0	1	0	0	0	0	22.5
12-Jul	2	0	0	0	1	0	0	0	0	24.0
13-Jul	2	0	0	0	1	0	0	0	0	25.5
14-Jul	0	0	0	0	0	0	0	0	0	-
	6,003	456	3	1,023	603	49	11	35	13	

Table 10. Historic yearly passage totals, Westfield River fish passage facility, West Springfield, Massachusetts, 1992-2016.

	America n	Blueba ck	Sea	Stripe d	Atlanti c	Gizzar d	White	Small-	Brow n	Rainbo w	Broo k	Tige r
Date	Shad	Herring	Lampr ey	Bass	Salmo n	Shad	Sucker	mouth	Trou t	Trout	Trout	Trou t
*1992					2							
*1993					10							
*1994					7							
*1995					6							
1996	1,413	1	4,699	0	19	0	4,699	110	12	91	7	0
1997	1,012	-	2,255	0	37	0	2,255	64	77	8	12	0
1998	2,292	2	1,756	5	47	1	5,515	149	210	18	42	44
1999	2,668	-	643	0	17	1	1,227	109	162	3	23	103
2000	3,558	-	2,040	0	11	122	3,158	207	77	9	9	44
2001	4,720	2	2,345	2	8	0	3,735	129	116	18	8	34
2002	2,762	4	3,638	2	5	1	2,242	146	160	9	14	90
2003	1,957	5	404	0	6	0	1,832	155	90	2	4	29
2004	913	1	1,171	0	12	0	2,789	148	77	8	6	75
2005	1,237	0	818	0	27	0	1,161	201	58	29	5	28
2006	1,534	0	1,276	1	34	0	3,447	188	39	10	7	69
2007	4,497	0	1,797	0	21	0	2,280	133	44	11	15	21
2008	3,212	0	1,220	0	30	0	1,757	246	34	0	11	6
2009	1,395	0	538	0	2	0	1,865	260	21	15	5	7
2010	3,444	4	447	0	3	0	954	185	24	2	11	21
2011	5,029	0	1,590	0	9	0	1,544	496	24	10	5	38
2012	10,373	3	392	0	6	176	1,529	326	50	6	13	34
2013	4,938	0	729	0	11	0	1,241	620	37	3	11	56
2014	4,787	4	1,127	0	2	0	1,663	290	65	15	33	59
2015	3,383	0	218	0	3	0	2,065	341	54	4	34	19
2016	6,003	0	456	1	1	0	1,023	601	49	11	35	13

*1992-1995 Adult salmon were netted at the base of the dam.

Table 11. 2016 Anadromous Fish Passage at Essex Dam, Lawrence, MA

	America n	River	Sea	Atlantic	Gizzard	Striped
Date	Shad	Herring	Lampre y	Salmon	Shad	Bass
21-Apr	0	11	0	0	0	0
22-Apr	0	64	0	0	0	0
23-Apr	0	50	3	0	0	0
24-Apr	1	16	4	0	0	0
25-Apr	0	0	0	0	0	0
26-Apr	0	65	2	0	0	0
27-Apr	0	6	0	0	0	0
28-Apr	0	6	2	0	0	0
29-Apr	1	0	1	0	0	0
30-Apr	4	226	0	0	0	0
1-May	1	31	1	0	0	0
2-May	0	517	0	0	0	0
3-May	0	111	3	0	0	0
4-May	4	420	0	0	0	1
5-May	0	65	4	0	0	0
6-May	0	1	0	0	0	0
7-May	0	68	1	0	0	0
8-May	3	0	1	0	0	0
9-May	47	0	10	0	0	0
10-May	283	124	7	0	0	3
11-May	674	46553	217	0	0	3
12-May	885	78373	342	0	3	3
13-May	1477	55836	437	0	1	3
14-May	1311	41290	303	0	0	17
15-May	1323	28349	339	0	1	7
16-May	938	1456	20	0	0	3
17-May	1169	116	13	0	1	6
18-May	1001	45358	107	0	2	27
19-May	2596	13466	80	0	0	8
20-May	3077	12364	46	0	3	9
21-May	2366	4618	150	1	3	18

22-May	2125	6445	105	0	5	28
23-May	2736	10230	283	0	1	19
24-May	837	16580	283	0	2	36
25-May	2677	495	195	1	3	47
26-May	1158	16163	424	0	5	22
27-May	4049	3474	491	1	11	40
28-May	2806	14656	389	0	0	19
29-May	3181	1121	62	0	1	20
30-May	3046	3716	54	0	1	29
31-May	2843	4329	186	1	1	68
1-Jun	2382	5226	99	0	1	64
2-Jun	2489	92	136	1	0	47
3-Jun	1075	2723	192	0	6	39
4-Jun	861	504	61	0	5	44
5-Jun	945	1038	43	0	2	85
6-Jun	925	100	24	0	5	139
7-Jun	1157	346	25	0	2	104
8-Jun	1629	86	8	0	8	121
9-Jun	1490	69	2	0	4	71
10-Jun	1327	58	0	0	2	45
11-Jun	1122	28	0	0	0	46
12-Jun	793	14	2	0	1	25
13-Jun	1002	6	1	0	1	8
14-Jun	759	48	1	1	0	26
15-Jun	800	1	2	0	0	11
16-Jun	726	0	2	0	0	30
17-Jun	424	0	1	0	1	10
18-Jun	193	4	0	0	3	7
19-Jun	553	22	0	0	1	16
20-Jun	514	0	0	0	1	11
21-Jun	323	0	0	0	3	14
22-Jun	421	0	0	0	2	5
23-Jun	264	0	0	0	0	9
24-Jun	288	0	0	0	1	6
25-Jun	300	0	0	0	5	16

26-Jun	230	0	0	0	1	19
27-Jun	239	0	0	0	3	5
28-Jun	178	0	0	0	0	11
29-Jun	183	0	0	0	0	1
30-Jun	238	0	0	0	0	6
1-Jul	157	67	0	0	1	13
2-Jul	114	4	0	0	1	10
3-Jul	103	25	0	0	0	5
4-Jul	116	1	0	0	2	7
5-Jul	109	0	0	0	1	10
6-Jul	76	9	0	0	0	7
7-Jul	53	0	0	0	1	9
8-Jul	34	0	0	0	2	7
9-Jul	51	0	0	0	0	4
10-Jul	44	0	0	0	1	7
11-Jul	62	0	0	0	1	9
12-Jul	74	0	0	0	0	5
13-Jul	49	0	0	0	0	18
14-Jul	35	0	0	0	0	9
15-Jul	2	0	0	0	0	6
Total	67,528	417,240	5,164	6	112	1,603

Table 12. Historic Fish Passage at Essex Dam, Lawrence, MA

Year	Atlantic Salmon ¹	American Shad	River Herring ²	Striped Bass	Sea Lamprey	Gizzard Shad
1982	16	0	0	0	0	
		(Lifts for seven	weeks in fall only)			
1983	88	5,500	4,800	50	2,800	
1984	104	5,500	1,800	40	2,000	
1985	212	13,000	23,000	110	18,000	
1986	98	18,000	16,000	64	13,000	
1987	129 (6) *	17,000	77,000	133	18,000	
1988	65	12,000	360,000	86	8,900	
1989	85	7,900	379,000	262	12,000	
1990	243	6,000	250,000	377	8,300	
1991	331	16,000	380,000	632	10,000	
1992	197	21,000	102,000	424	18,000	
1993	61	8,600	14,000	169	11,000	
1994	17	4,300	89,000	426	5,000	23
1995	34	14,000	33,000	1,800	4,000	224
1996	69	11,000	51	584	3,600	6
1997	67	22,000	362	2,200	8,600	180
1998	123	28,000	1,400	1,400	4,000	58
1999	191	57,000	7,900	843	9,700	208
2000	85	69,000	19,000	1,100	11,000	3,100
2001	84	75,000	1,600	511	3,700	57
2002	56	55,000	526	1,900	8,100	158
2003	120	53,000	11,000	979	2,200	50
2004	131	45,000	15,000	806	6,700	17
2005	31	6,456	98	257	848	1
2006	49	574	1,105	-	-	0
2007	73	15,876	1,169	56	1,399	1
2008	123	24,936	108	42	4,873	12

2009	78	23,229	1,456	46	2,041	0
2010	85	10,442	518	59	3,433	6
2011	402	13835	740	0	2571	2
2012	137	21396	8992	139	2067	11
2013	22	37166	17359	103	548	11
2014	41	34711	33517	129	4923	29
2015	13	89421	128692	248	5035	25
2016	6	67528	417240	1603	5164	112

1. Captured and transported to Nashua National Fish Hatchery for broodstock.

2. River herring is an undetermined mix of both alewife and blueback herring.

* In addition to the 129 salmon captured, 6 salmon escaped the fish trap.

** In addition to the 17 salmon captured, 2 salmon escaped and 2 were illegally taken by angling.

Table 13. Fish passage at the Pawtucket Dam Fishlift, Lowell, MA in 2016.

Date	American		Atlantic		River		Sea		American	
	Shad	YTD	Salmon	YTD	Herring	YTD	Lampry	YTD	Eel	YTD
April/27/2016	0		0		0		0		0	
April/28/2016	0	0	0	0	0	0	0	0	0	0
April/29/2016	0	0	0	0	0	0	0	0	0	0
April/30/2016	0	0	0	0	0	0	0	0	0	0
May/1/2016	0	0	0	0	50	50	0	0	0	0
May/2/2016	0	0	0	0	6	56	0	0	0	0
May/3/2016	0	0	0	0	53	109	0	0	0	0
May/4/2016	0	0	0	0	78	187	0	0	0	0
May/5/2016	0	0	0	0	51	238	0	0	0	0
May/6/2016	0	0	0	0	13	251	0	0	0	0
May/7/2016	0	0	0	0	16	267	0	0	0	0
May/8/2016	0	0	0	0	153	420	0	0	0	0
May/9/2016	0	0	0	0	29	449	0	0	0	0
May/10/2016	0	0	0	0	19	468	0	0	0	0
May/11/2016	7	7	0	0	234	702	0	0	0	0
May/12/2016	107	114	0	0	13,950	14,652	1	1	0	0
May/13/2016	8	122	0	0	23,400	38,052	1	2	0	0
May/14/2016	40	162	0	0	18,032	56,084	8	10	0	0
May/15/2016	35	197	0	0	15,600	71,684	4	14	0	0
May/16/2016	11	208	0	0	14,500	86,184	2	16	0	0
May/17/2016	19	227	0	0	5,700	91,884	0	16	0	0
May/18/2016	17	244	0	0	3,500	95,384	0	16	0	0
May/19/2016	16	260	0	0	12,300	107,684	0	16	0	0
May/20/2016	16	276	0	0	5,200	112,884	2	18	0	0
May/21/2016	39	315	0	0	7,950	120,834	6	24	0	0
May/22/2016	104	419	0	0	1,135	121,969	3	27	0	0

May/23/2016	56	475	0	0	3,503	125,47 2	8	35	0	0
May/24/2016	104	579	0	0	1,070	126,54 2	20	55	0	0
May/25/2016	113	692	0	0	4,080	130,62 2	14	69	0	0
May/26/2016	125	817	0	0	6,052	136,67 4	18	87	0	0
May/27/2016	59	876	1	1	3,275	139,94 9	31	118	0	0
May/28/2016	395	1,27 1	0	1	64	140,01 3	24	142	0	0
May/29/2016	545	1,81 6	0	1	617	140,63 0	16	158	0	0
May/30/2016	370	2,18 6	1	2	305	140,93 5	15	173	0	0
May/31/2016	220	2,40 6	0	2	655	141,59 0	13	186	0	0
June/1/2016	186	2,59 2	0	2	271	141,86 1	3	189	0	0
June/2/2016	102	2,69 4	0	2	43	141,90 4	6	195	0	0
June/3/2016	192	2,88 6	0	2	0	141,90 4	10	205	0	0
June/4/2016	154	3,04 0	1	3	3	141,90 7	13	218	0	0
June/5/2016	157	3,19 7	0	3	8	141,91 5	2	220	0	0
June/6/2016	182	3,37 9	0	3	131	142,04 6	3	223	0	0
June/7/2016	235	3,61 4	0	3	35	142,08 1	2	225	0	0
June/8/2016	179	3,79 3	0	3	6	142,08 7	1	226	0	0
June/9/2016	93	3,88 6	0	3	0	142,08 7	0	226	0	0
June/10/2016	133	4,01 9	0	3	0	142,08 7	0	226	0	0
June/11/2016	246	4,26 5	0	3	0	142,08 7	0	226	0	0
June/12/2016	188	4,45 3	0	3	0	142,08 7	1	227	0	0
June/13/2016	76	4,52 9	0	3	0	142,08 7	0	227	1	1

June/14/2016	1	4,53 0	0	3	0	142,08 7	0	227	0	1
June/15/2016	27	4,55 7	0	3	0	142,08 7	0	227	0	1
June/16/2016	71	4,62 8	1	4	0	142,08 7	0	227	0	1
June/17/2016	71	4,69 9	0	4	0	142,08 7	0	227	1	2
June/18/2016	73	4,77 2	1	5	0	142,08 7	0	227	0	2
June/19/2016	64	4,83 6	0	5	0	142,08 7	0	227	0	2
June/20/2016	75	4,91 1	0	5	0	142,08 7	0	227	0	2
June/21/2016	117	5,02 8	0	5	0	142,08 7	0	227	1	3
June/22/2016	48	5,07 6	0	5	0	142,08 7	0	227	0	3
June/23/2016	43	5,11 9	0	5	0	142,08 7	0	227	0	3
June/24/2016	50	5,16 9	0	5	0	142,08 7	0	227	0	3
June/25/2016	15	5,18 4	0	5	0	142,08 7	0	227	1	4
June/26/2016	40	5,22 4	0	5	0	142,08 7	0	227	1	5
June/27/2016	39	5,26 3	0	5	0	142,08 7	0	227	0	5
June/28/2016	112	5,37 5	0	5	0	142,08 7	0	227	0	5
June/29/2016	56	5,43 1	0	5	0	142,08 7	0	227	0	5
July/1/2016	9	5,44 0	0	5	0	142,08 7	0	227	0	5
July/2/2016	5	5,44 5	0	5	0	142,08 7	0	227	1	6
July/3/2016	18	5,46 3	0	5	0	142,08 7	0	227	0	6
July/4/2016	5	5,46 8	0	5	0	142,08 7	0	227	0	6
July/5/2016	7	5,47 5	0	5	0	142,08 7	0	227	0	6
July/6/2016	10	5,48 5	0	5	0	142,08 7	0	227	0	6

July/7/2016	6	5,49 1	0	5	0	142,08 7	0	227	1	7
July/8/2016	0	5,49 1	0	5	0	142,08 7	0	227	0	7
July/9/2016	0	5,49 1	0	5	0	142,08 7	0	227	0	7
July/10/2016	3	5,49 4	0	5	0	142,08 7	0	227	0	7
July/11/2016	11	5,50 5	0	5	0	142,08 7	0	227	0	7
July/12/2016	1	5,50 6	0	5	0	142,08 7	0	227	0	7
July/13/2016	6	5,51 2	0	5	0	142,08 7	0	227	0	7
July/14/2016	5	5,51 7	0	5	0	142,08 7	0	227	0	7
July/15/2016	0	5,51 7	0	5	0	142,08 7	0	227	0	7
Total		5,51 7		5		142,08 7		227		7

Table 14. Historic fish passage at the Pawtucket fishway and ladder, Lowell, MA.

(0-999 fish are reported to the nearest individual: 1,000-9,999 to the nearest 100:

10,000-99,999 to the nearest 1,000: 100,000 or greater to the nearest 10,000).

Year	American shad	River herring	Sea lamprey	Striped bass
1986*	1,600	570	910	0
1987	3,900	31,000	1,900	2
1988	1,300	32,000		
1989	922	37,000	1,900	1
1990**	443	9,900	169	4
1991				
1992***	6,600	34,000	200	0
1993	1,700	4,300	1,500	0
1994****	383	34,000	340	0
1995	5,300	12,000	920	18
1996*****	1,300	292	395	4
1997	4,400	20	2,000	26
1998	4,200	13	545	5
1999	16,000	2,900	3,700	17
2000	13,000	673	2,300	66
2001	7,700	58	606	16
2002	5,300	0	2,000	32
2003	6,600	194	822	51
2004	11,000	7,500	2,200	129
2005	716	201	185	7
2006	0	27	9	0
2007	1,700	0	127	2
2008	4,200			
2009	2,800	139	260	2
2010	479	43	507	
2011	1,200	256	272	5
2012	1,800	1,800	166	1
2013	13,500	9,800	70	2

2014	3,500	24,000	691
2015	20,937	31,686	208

5

- * Testing period- Facility not fully functional.
- ** Lifts began 5/5, however counts did not begin until 5/30.
- *** Fishlift out of operation 6/2 - 6/18.
- **** Expanded estimate of fish ascending the fish ladder at Pawtucket Falls.
- ***** River herring counts include fish stocked by USFWS.

