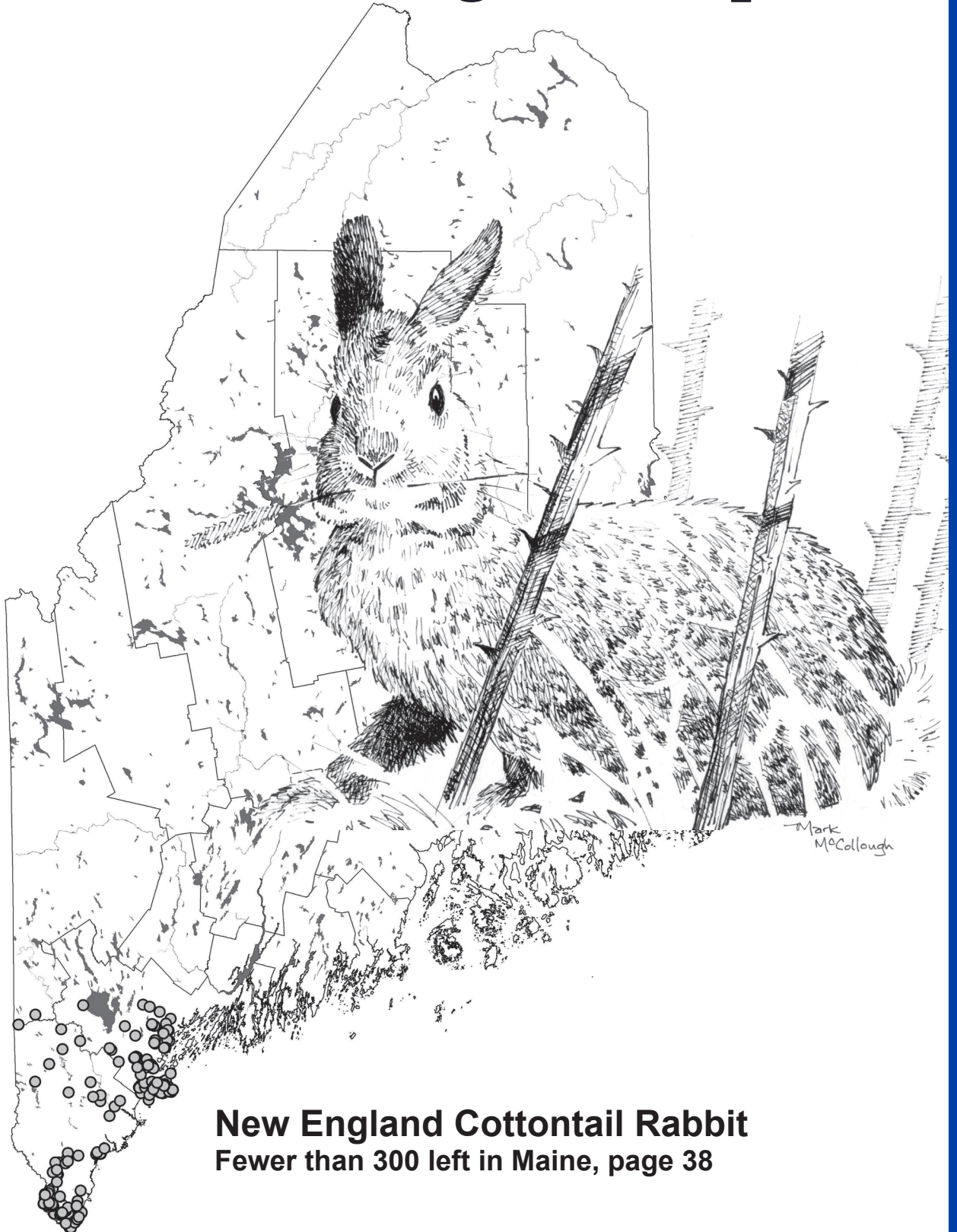


MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE
Chandler E. Woodcock, Commissioner

Research & Management Report



New England Cottontail Rabbit
Fewer than 300 left in Maine, page 38

Fishing lead-free is better for our lakes and our loons.

Lead poisoning is the leading cause of death for adult Common Loons in Maine — a direct result of the ingestion of lost or discarded lead sinkers and lead-headed jigs.

Protect our treasured loons.
Switch to lead-free fishing gear.

fishleadfree.org

Maine's Fish Lead-Free Law: Maine has banned the use and sale of lead sinkers 1 oz. or less. The sale of bare lead-headed jigs 2 1/2" long or less will be banned in September 2016, followed by a ban on use in September 2017.



2015 Research and Management Report

Cover Images: New England cottontail rabbit in a brushy thicket (pen and ink drawing by Mark McCollough)
Map of known locations of New England cottontail rabbits (Image by IFW)
○Known locations of New England cottontail rabbits



These studies are financed in part through Federal Aid in Wildlife Restoration Funds under Projects 81D, 82R, and 83C, and through the Endangered Species Conservation Act.

The Department of Inland Fisheries and Wildlife receives Federal funds from the U.S. Department of the Interior. Accordingly, all Department programs and activities must be operated free from discrimination in regard to race, color, national origin, age or handicap. Any person who believes that he or she has been discriminated against should write to The Office of Equal Opportunity, U.S. Department of the Interior, Washington, D.C.



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STATE OF
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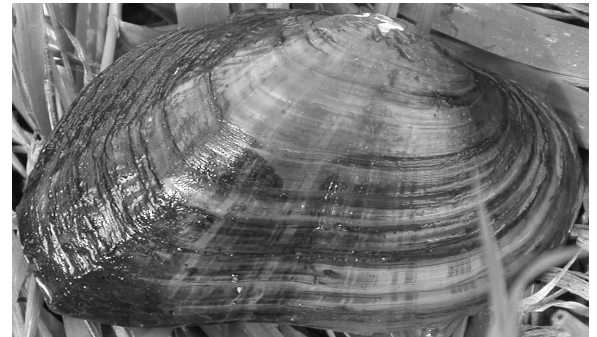
Our Main Number: 1-207-287-8000

MAINE'S STATE WILDLIFE GRANT PROGRAM 10 YEARS OF ENHANCED WILDLIFE CONSERVATION

The State Wildlife Grant (SWG) Program was established by Congress in 2001 to help states develop and implement management programs that benefit wildlife and their habitats, including species that are not hunted or fished. Beginning with the approval of Maine's first Wildlife Action Plan in 2005, an amazing breadth and diversity of conservation work has been conducted by the Maine Department of Inland Fisheries and Wildlife (IFW) and its conservation partners. Funding from SWG provides critical support to *Beginning with Habitat*, which is Maine's premier habitat conservation outreach program, providing habitat maps and assistance with open-space planning to municipalities, land trusts, and landowners. IFW has also directed significant portions of SWG funding to monitoring, research, and restoration efforts for sensitive wildlife species across the state.

Ten years have passed since the state's conservation partners and IFW prepared Maine's first Wildlife Action Plan. Together, we have accomplished much for wildlife, but we know more remains to be done. Maine's traditional "outdoor" values and its rural economy depend upon thriving wildlife populations. Continued habitat loss and fragmentation and a changing climate also present a challenge to much that we value. Some examples of the accomplishments of the past decade that have been supported by SWG funding include:

- Ecoregional surveys of rare, threatened, and endangered fauna
- Lake habitat inventory program
- Status of the brook floater freshwater mussel in portions of the mid-coast, central, and eastern Maine
- Maine Butterfly Atlas
- Status of the spicebush swallowtail butterfly
- Status of the ringed boghaunter dragonfly
- Cobblestone tiger beetle conservation
- River surveys and analysis of wood turtle populations
- Northern black racer conservation
- Timber rattlesnake habitat surveys
- New England cottontail conservation
- Bald eagle monitoring and habitat conservation
- Peregrine falcon monitoring
- Status and monitoring of Maine owls
- Piping plover and least tern management
- Enhancing shorebird conservation in Casco Bay
- Survey and mapping of important shorebird habitats
- Enhancing the value of shorebird migration monitoring
- Identification of important wintering areas for purple sandpipers
- Maine Seabird Atlas
- Monitoring of roseate tern nesting activity
- Tern and great cormorant monitoring in Penobscot and Jericho Bays
- Black tern and inland-nesting seabird surveys
- Aerial surveys of common loons in northern and downeast Maine
- Aerial census of nesting great blue herons and other colonial wading birds
- Harlequin duck and purple sandpiper surveys in Outer Penobscot, Jericho, Blue Hill, and Frenchman's Bays
- Wintering surveys of Barrow's goldeneye
- Field survey of grassland birds in southern Maine
- Studies of sea run brook trout in two Maine streams
- Lake whitefish



Brook Floater (Photo by Ethan Nedeau)

- Environmental factors associated with unique lake communities in Maine
- Effects of dam removal and relocation on yellow lampmussels and tidewater mucklets
- Conservation genetics of Clayton's copper butterfly
- Habitat and distribution of the arrowhead spiketail dragonfly in Maine
- Blandings turtle road mortality research
- Canada lynx ecology and conservation
- Risk assessment of saltmarsh passerines to mercury contamination
- Effects of tidal restriction on the breeding ecology of saltmarsh sparrows
- Conservation genetics of saltmarsh sparrow populations
- Nesting ecology of rusty blackbirds
- Foraging behavior of razorbills

Through 2014 and 2015, IFW biologists have been working to develop a prioritized list of Species of Greatest Conservation Need (SGCN) to be eligible for research, assessment, and conservation funding through the federal SWG grant program. Our Habitat Group has developed a relational database that will tie SGCN to their spatially explicit habitats and to threats, potential conservation actions, monitoring plans, and reporting results. Congress would like to see greater transparency in this annually-allocated granting program, and States aim to deliver just that. We are working with our local conservation partners throughout this entire process and are due to report a final State Wildlife Action Plan to the U.S. Fish and Wildlife Service by October 2015.

For a complete summary of the accomplishment of the State Wildlife Grant Program in Maine over the past 10 years, along with notes and results from the recent update process, please visit our website at <http://www.maine.gov/ifw/wildlife/reports/wap.html>.

“The last word in ignorance is the man who says of an animal or plant, “What good is it?” If the land mechanism as a whole is good, then every part is good, whether we understand it or not. If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.”
 — Aldo Leopold (Round River, 1953, published posthumously)



Razorbills (Photo by Jonathan Mays)

FUNDING WILDLIFE AND HABITAT STEWARDSHIP

Many staff salaries and most of the administrative costs of the Wildlife Division's conservation and management programs for birds and mammals are funded by federal Pittman-Robertson Funds [FY13 \$3,272,274]. Pittman-Robertson (PR) Funds are derived from an 11% federal excise tax on sporting arms, ammunition, and archery equipment, and a 10% excise tax on handguns. Pittman-Robertson Funds require state matching dollars at a ratio of 1:3 in our favor, which come from a portion of the hunting license revenues [FY13 \$1,359,428].



The Wildlife Division also receives federal funding for the management of species of greatest conservation need (SGCN) in the form of State Wildlife Grants (SWG), originating from royalty payments made by the petroleum industry operating on federal lands or waters [FY13 \$477,284]. Also, there are the so-called "Section 6" funds from the U.S. Fish and Wildlife Service for the recovery of threatened and endangered species that are 'listed' under the federal Endangered Species Act [FY13 \$26,000].

Volunteer contributions to the dedicated Endangered and Nongame Wildlife Fund via the tax-form "Chickadee Check-off" and purchases of Loon Conservation License Plates provide the core State funding for Maine's nongame and endangered species programs [CY/TY14 \$294,758]. All donated money is deposited into the dedicated Maine Endangered and Nongame Wildlife Fund, which is a special, interest-bearing account from which money can only be spent for the conservation of Maine's nongame wildlife that includes rare, threatened, or endangered species (Table 1). This dedicated Fund is used to match and spend the federal SWG funds, just as revenues from hunting licenses and tags are used to match and leverage PR-grant \$s for the conservation and management of birds and mammals.

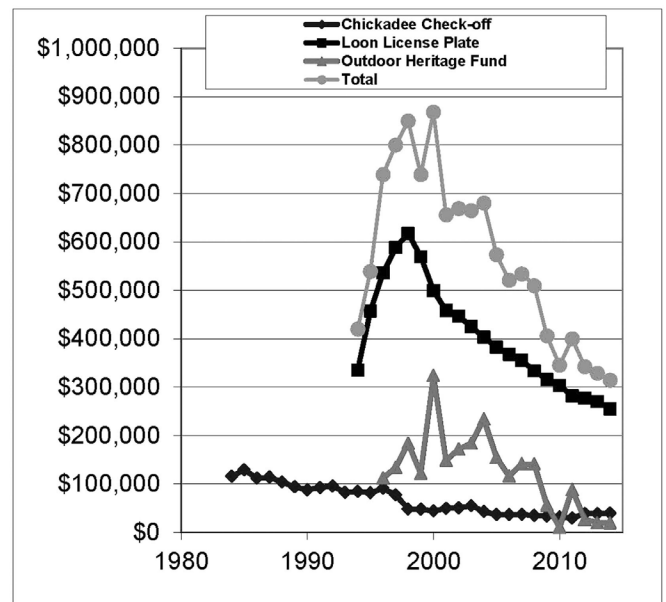


The Maine Outdoor Heritage Fund, derived from the sale of conservation instant-scratch lottery tickets, can also provide an important source of "State" funding for Maine's wildlife conservation programs. The Division also receives funding from the Oil Spill Conveyance Fund [FY13 \$21,506], which is used for oil spill preparedness and response.

Throughout the pages of the *2015 Research & Management Report* is a summary of last year's accomplishments with much help from our conservation partners. You will see how efficiently we can assess fish and wildlife resources and habitats using cooperative partnerships, volunteer assistance, and new techniques and technologies. There is always cause to do more.

Table 1. A history of income derived from the "Chickadee Check-off," Loon License Plate, and Maine Outdoor Heritage Funds to benefit wildlife programs.

Year	Chickadee Check-off				Loon License Plate		Maine Outdoor Heritage Fund	
	Total Given (TY)	Number of Givers	Average Donation	Percent of Taxpayers Giving	Income to IFW	Number of Registrations	Income to IFW	Number of Projects Funded
1984	\$115,794	25,322	\$4.57	5.3%				
1985	\$129,122	29,200	\$4.42	6.0%				
1986	\$112,319	26,904	\$4.17	5.4%				
1987	\$114,353	26,554	\$4.31	5.2%				
1988	\$103,682	24,972	\$4.15	4.8%				
1989	\$93,803	20,322	\$4.62	3.6%				
1990	\$88,078	18,332	\$4.80	3.2%				
1991	\$92,632	19,247	\$4.81	3.4%				
1992	\$95,533	18,423	\$5.18	3.2%				
1993	\$82,842	15,943	\$5.20	2.8%				
1994	\$84,676	10,863	\$7.79	2.0%	\$335,042	59,829		
1995	\$81,775	10,014	\$8.17	1.8%	\$457,307	81,662		
1996	\$90,939	11,024	\$8.25	2.0%	\$535,679	95,657	\$112,232	3
1997	\$77,511	8,686	\$8.92	1.5%	\$588,364	105,065	\$133,971	5
1998	\$48,189	4,065	\$11.85	0.7%	\$617,484	110,265	\$184,109	7
1999	\$47,908	3,775	\$12.69	0.7%	\$569,610	101,716	\$121,436	5
2000	\$44,496	3,297	\$13.50	0.6%	\$499,486	89,194	\$323,884	11
2001	\$49,348	3,713	\$13.29	0.6%	\$458,057	81,796	\$148,408	5
2002	\$50,412	3,661	\$13.77	0.6%	\$446,342	79,704	\$172,191	8
2003	\$55,348	3,792	\$14.60	0.6%	\$425,147	75,919	\$184,129	5
2004	\$43,158	3,234	\$13.35	0.6%	\$402,695	69,615	\$234,126	10
2005	\$36,769	2,931	\$12.54	0.5%	\$381,948	67,814	\$154,656	7
2006	\$36,865	2,924	\$12.60	0.5%	\$367,791	65,677	\$116,121	6
2007	\$37,209	2,852	\$13.04	0.5%	\$355,180	63,425	\$141,526	6
2008	\$34,929	2,757	\$12.67	0.4%	\$333,536	59,560	\$141,059	7
2009	\$33,751	2,688	\$12.56	0.4%	\$316,148	56,455	\$56,128	3
2010	\$31,466	2,423	\$12.99	0.4%	\$303,121	54,237	\$10,906	2
2011	\$29,454	2,357	\$12.50	0.4%	\$282,005	50,358	\$88,398	8
2012	\$38,623	3,021	\$12.78	0.5%	\$277,207	48,072	\$26,500	2
2013	\$38,678	3,055	\$12.66	0.5%	\$270,126	46,844	\$19,810	3
2014	\$39,919	3,233	\$12.35	0.5%	\$254,839	45,507	\$19,375	2



THE RESEARCH AND ASSESSMENT SECTION: AN IFW SOURCE FOR SCIENTIFIC INFORMATION

Another exciting year has passed, and here we are wrapping up our 10-yr commitment to update our Wildlife Action Plan. This is a conservation plan for what have been defined as Maine's Species of Greatest Conservation Need (SGCN). A lot of these species are invertebrates like dragonflies, butterflies, and bees that most of us would not recognize when we see them, and some are large daytime or nighttime predatory birds that are hard to miss when our paths cross. The land mammals tend to be small, like a bog lemming, the bats, or the New England cottontail rabbit that graces the cover of this annual report. Be sure to watch out for rare turtles crossing roads in southern Maine; as you might guess, the snapping turtle did not make the list of SGCN, which can be found here: <http://www.maine.gov/ifw/wildlife/reports/MWAP2015.html>.

Many of these species are at the northern or southern edge of their continental range or only exist in very local and specific types of habitats that are relatively rare in the State. Many of these species go unnoticed on a daily basis, but they are our State's natural heritage, and it is a rich heritage. It has been a terrific collaborative planning effort with partners and stakeholders for about the past two years. There was a lot of thought, and rethinking, about how to conserve Maine's rich natural heritage on what is mostly private lands. I've heard it said by our Landowner Relations Coordinator that Maine lands are about 94% privately owned. It is these landowners who host our rich wildlife heritage and allow us close access to it, so please remember the landowners when you are out and about in Maine's fields and forests.



Bumble Bee (Photo by Sharon Fielder)

If we are successful in our Mission, then those fish and wildlife resources will be around for a long time for current and future generations to enjoy and use wisely. These resources are not owned by anybody and are held and managed by our State as a public trust, which is like a trust fund for all Mainers. That makes us all rich, even if it does take years to get drawn for a moose permit (me too). I couldn't help but notice all the license plates from away when coming down through Greenville in early August. I saw plates from Nova Scotia and Ontario to Virginia and Indiana. Our neighbors have heard of our wealth, and periodically come to experience it. With so many water access sites, scenic highway picnic areas, and hiking trails along streams, through the forests, and up to bold mountain views, there is wealth of nature to be had here.

You may have already noticed from Table 1 of this report that, for the third year in a row, voluntary donations into the dedicated Maine Endangered and Nongame Wildlife Fund have increased at tax time. One of the things we try to do in this document is show you some ways those funds are being spent, and almost invariably we will take one dollar from in-state donations and match it to two or three dollars from a federal grant before we spend it. Most of the small sections of this report will list funding sources at their end. We are very grateful for donations received from this source and also the conservation license plates. If possible, would it be fun to design another plate for the Fund?

We started new field projects for deer, bumble bees, and bats this past year. The harvestable deer resource is one enjoyed by many, whether in pursuit with a looking glass or hunting rifle. Too many deer can cause various problems, and Maine is one of a few states where we can have what our publics might view as too many deer at one end of the state and too few at the other. Expect to see requests for public feedback for deer management purposes in 2015 and 2016. Public feedback is key to proper wildlife management and conservation.

The bumble bee project is a great example where the public helps us keep track of our wildlife resources. These types of projects have become more popular across the country and are often referred to as "citizen science". Our new bat biologist, who also studies furbearing mammals, wasted no time bringing a national acoustic bat monitoring program to the backroads of Maine, and we are getting a lot of volunteer help with a side project for bats as well. Conservation awareness for pollinators like butterflies and bees and, for other reasons, bats, is at an all-time high.

Our Information and Education folks work with biologists and game wardens frequently to come up with new and better ways to engage the public on topics of current interest. We're always open to new ideas. You can find extra copies of this report at Augusta headquarters, regional offices, and on our website too [http://www.maine.gov/ifw/wildlife/reports/research_management.html]. Enjoy.

-- Shawn Haskell, Ph.D.
Research and Assessment Section Supervisor

ENDANGERED AND THREATENED SPECIES CONSERVATION

Maine's List of Endangered and Threatened Species

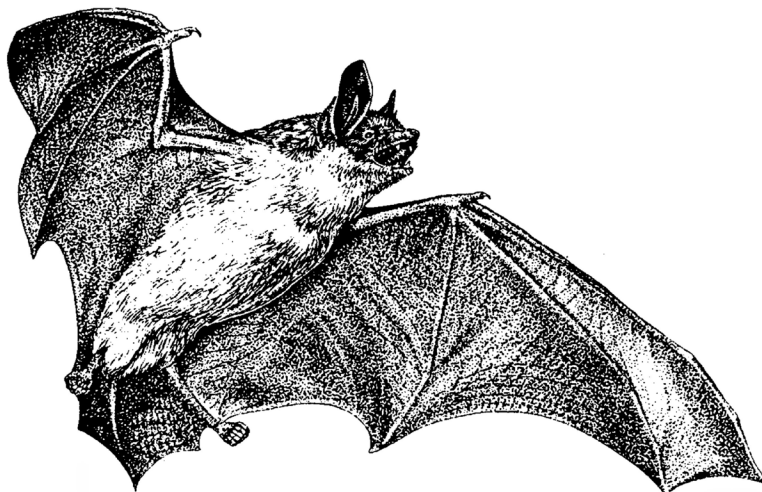
In 2015, IFW completed its sixth update to the State List of Endangered and Threatened (E/T) Species. Maine is one of few states where E/T changes are adopted in statute. Over the past 18 months, potential changes were reviewed by staff biologists, administrators, peer scientists, citizens, the IFW Advisory Council, and finally the Maine Legislature. The 127th Legislature adopted these changes as Public Law 2015 -Chapter 121. The new law was signed by the Governor on May 29, 2015; see <http://legislature.maine.gov/bills/getPDF.asp?paper=SP0281&item=3&num=127>.

These changes feature the addition of six new species to the List:

- 3 cave-dwelling bats of the genus *Myotis* = Little Brown Bats, Eastern Small-footed Bats, and Northern Long-eared Bats are all experiencing catastrophic declines due to widespread mortality from the pandemic disease White-nose Syndrome.
- 3 rare invertebrates that are each currently documented at only a single locality in Maine = the Cobblestone Tiger Beetle, the Frigga Fritillary (a butterfly), and the Six-whorl Vertigo (a land snail).

Additional changes to the State E/T List include three status changes for species already listed:

- 1 bird was “up-listed to Endangered” from its current status as Threatened = the Black-crowned Night Heron.
- 2 insects were “down-listed to Threatened” from their current status as Endangered = the Tomah Mayfly and the Roaring Brook Mayfly.



Little Brown Bat

IFW has listing authority for land-dwelling animals as well as those that occupy inland waters. The E/T List administered by IFW now includes 51 species. Only one species (Bald Eagle) has been removed from the List due to species recovery.

Authority for state-listing of marine fauna (except birds) also is held by the State Legislature, based on input by the Maine Department of Marine Resources; see <http://legislature.maine.gov/legis/statutes/12/title12sec6975.html>. The Maine Natural Areas Program maintains an informational list of rare, threatened, and endangered plants in the State; see <http://www.maine.gov/dacf/mnap/features/plantlist.pdf>.

State endangered species programs are complimentary to (but typically do not duplicate) federal listings under the U.S. Endangered Species Act (ESA). ESA considers the status of species over “all or a significant portion of the species range.” Unless a population is isolated as a “distinct population segment,” federal listings do not focus on variable status within individual states or regions. The U.S. Fish and Wildlife Service - Maine Field Office compiles federal listings under its jurisdiction; see http://www.fws.gov/mainefieldoffice/Endangered_and_Threatened_Species.html. Another federal agency, the National Oceanic and Atmospheric Administration – National Marine Fisheries Program has lead responsibility for marine mammals, sea turtles, and fish that are Endangered or Threatened in the Gulf of Maine; see <http://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/index.html>.

Taxa group (Class)		
Common Name	Scientific Name	Legal Status (year listed)
Birds (Class Aves)		
American Pipit	<i>Anthus rubescens</i>	Endangered (1997)
Arctic Tern	<i>Sterna paradisaea</i>	Threatened (1997)
Atlantic Puffin	<i>Fratercula arctica</i>	Threatened (1997)
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Recovered (2009) / Threatened (1996) / Endangered (1978)
Barrow's Goldeneye	<i>Bucephala islandica</i>	Threatened (2007)
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Endangered (2015) / Threatened (2007)
Black Tern	<i>Chlidonias niger</i>	Endangered (1997)
Common Moorhen	<i>Gallinula chloropus</i>	Threatened (2007)
Golden Eagle	<i>Aquila chrysaetos</i>	Endangered (1987)
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Endangered (1987)
Great Cormorant	<i>Phalacrocorax carbo</i>	Threatened (2007)
Harlequin Duck	<i>Histrionicus histrionicus</i>	Threatened (1997)
Least Bittern	<i>Ixobrychus exilis</i>	Endangered (2007)
Least Tern	<i>Sternula antillarum</i>	Endangered (1984)
Peregrine Falcon	<i>Falco peregrinus</i>	Endangered (1975)
Piping Plover	<i>Charadrius melodus</i>	Endangered (1987)
Razorbill	<i>Alca torda</i>	Threatened (1997)
Roseate Tern	<i>Sterna dougallii</i>	Endangered (1997) / Threatened (1987)
Sedge Wren	<i>Cistothorus platensis</i>	Endangered (1987)
Short-eared Owl	<i>Asio flammeus</i>	Threatened (2007)
Upland Sandpiper	<i>Bartramia longicauda</i>	Threatened (1997)
Fish (Class Actinopterygii)		
Redfin Pickerel	<i>Esox americanus americanus</i>	Endangered (2007)
Swamp Darter	<i>Etheostoma fusiforme</i>	Threatened (1997)
Insects (Class Insecta)		
Boreal Snaketail	<i>Ophiogomphus colubrinus</i>	Threatened (2007)
Clayton's Copper	<i>Lycaena dorcas claytoni</i>	Threatened (2015) / Endangered (1997)
Cobblestone Tiger Beetle	<i>Cicindela marginipennis</i>	Endangered (2015)
Frigga Fritillary	<i>Boloria frigga</i>	Endangered (2015)
Edwards' Hairstreak	<i>Stayrium edwardsii</i>	Endangered (1997)
Hessel's Hairstreak	<i>Callophrys hesseli</i>	Endangered (1997)
Juniper Hairstreak	<i>Callophrys gryneus</i>	Endangered (2007)
Katahdin Arctic	<i>Oeneis polixenes katahdin</i>	Endangered (1997)
Pine Barrens Zanclognatha	<i>Zanclognatha martha</i>	Threatened (1997)
Purple Lesser Fritillary	<i>Boloria chariclea grandis</i>	Threatened (2007)
Rapids Clubtail	<i>Gomphus quadricolor</i>	Endangered (2007)
Ringed Boghaunter	<i>Williamsonia lintneri</i>	Threatened (2007)
Roaring Brook Mayfly	<i>Epeorus frisoni</i>	Threatened (2015) / Endangered (2007)
Sleepy Duskywing	<i>Erynnis brizo</i>	Threatened (2007)
Tomah Mayfly	<i>Lycia rachelae</i>	Threatened (1997)
Twilight Moth	<i>Erynnis brizo</i>	Threatened (2007)
Mammals (Class Mammalia)		
Eastern Small-footed Bat	<i>Myotis leibii</i>	Threatened (2015)
Little Brown Bat	<i>Myotis lucifugus</i>	Endangered (2015)
New England Cottontail	<i>Sylvilagus transitionalis</i>	Endangered (2007)
Northern Bog Lemming	<i>Synaptomys borealis</i>	Threatened (1987)
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Endangered (2015)
Molluscs (Class Bivalvia)		
Brook Floater	<i>Alasmidonta varicose</i>	Threatened (2007)
Tidewater Mucket	<i>Leptodea ochracea</i>	Threatened (1997)
Yellow Lampmussel	<i>Lampsilis cariosa</i>	Threatened (1997)
Reptiles (Class Reptilia)		
Black Racer	<i>Coluber constrictor</i>	Endangered (1987)
Blanding's Turtle	<i>Emydoidea blandingii</i>	Endangered (1997) / Threatened (1987)
Box Turtle	<i>Terrapene carolina</i>	Endangered (1987)
Spotted Turtle	<i>Clemmys guttata</i>	Threatened (1987)
Snails (Class Gastropoda)		
Six-whorled Vertigo	<i>Vertigo morseii</i>	Endangered (2015)

Program History and Funding

The Legislature first enacted the Maine Endangered Species Act (MESA) in 1975, but it initially included only federally-listed species. State E/T listings began in 1984 when program staffing was made possible by creation of Maine's Endangered and Nongame Wildlife Fund. The "Chickadee Check-off" was the only source of state funds for the next decade and remains (32 years later) the second largest source of state revenue for the program. This voluntary donation on tax returns has always been championed by a small fraction of taxpayers. Perhaps most presume that there must be General Fund support of the program, but there is not. If only one in four individual tax returns donated the \$5 minimum on Schedule CP, the "Chickadee Check-off" income would increase by a factor of 20!

Since 1995, the major source of state income for the conservation of Maine E/T species is a portion of income generated by the "Loon Plate." Vehicle registrations that opt for this conservation plate support both MESA programs and state parks. As more and more specialty plates for vehicles have appeared, proceeds from the "Loon Plate" have declined. IFW uses each state dollar to leverage additional federal aid funds, but the scope of the program is ultimately limited by available state match = all of which is currently generated by voluntary contributions. For more information on supporting these efforts, see the IFW web page <http://www.maine.gov/ifw/wildlife/endangered/support.html> or contact the IFW help desk http://www.maine.gov/ifw/aboutus/auto_forms/contact_us.htm.

Recognition of a species as Endangered or Threatened provides additional conservation options and priority to those that are most vulnerable species. Recovery of listed species is never quick or simple. Species recovery often spans decades, must address an array of limiting factors, and often requires special attention to populations and habitats. It may entail coordinated efforts across state or international borders. IFW has to allocate limited resources strategically to earn the maximum conservation benefit. Many conservation partners are integral to conservation success of E/T species.

There have been no extirpations of Maine-listed E/T species since the program's inception. However, the array of challenges is increasing, even as voluntary contributions that are the sole source of state revenue are waning. In addition to the funding challenges, there have been no changes to conservation strategies provided under MESA over the last 15 years. The concept of "safe harbors" to help incentivize landowners to restore and maintain critical habitats of E/T species is being explored as a new provision of state law.

IFW personnel time is supported by federal aid funds from the Pittman–Robertson program for wildlife restoration and federal State Wildlife Grants for conservation of species "at risk", as well as state revenues from the Loon License Plate and Chickadee Check-off fund.

-- Charlie Todd
Endangered and Threatened Species Coordinator



Harlequin Ducks

HABITAT GROUP

Donald Katnik, Ph.D., Habitat Group Leader/Oil Spill Response Coordinator - Supervises Group activities and coordinates habitat-related projects with other Department staff and other State and Federal agencies. Coordinates oil spill response planning efforts for the Department including training, identifying and prioritizing sensitive areas, and developing spill response plans.

MaryEllen Wickett, Ph.D., Wildlife Biologist and Programmer/Analyst - Creates and maintains customized applications and tools for accessing and using the Department's fish and wildlife habitat data both within and outside the agency. Creates, analyzes, and maintains wildlife/habitat databases. Provides technical support and habitat data analyses for landscape planning efforts and development of species' habitat models.

Amy Meehan, Wildlife Biologist and GIS Specialist - Collects wildlife habitat data from Regional Wildlife Biologists and others. Creates and maintains computer databases. Conducts field inventories of wildlife habitat and provides Geographic Information Systems (GIS) support for a variety of projects.

Jason Czapiga, GIS Coordinator - Develops, maintains, and analyzes databases of wildlife observations and habitat. Provides assistance to other Division biologists to assess species' habitats on a statewide basis.

INFORMATION FOR HABITAT CONSERVATION AND MANAGEMENT

What We Do

Habitat Group creates and maintains data on wildlife observations and habitat. These data are used for regulatory reviews, oil spill response, species management, and conservation planning. Each of these uses requires different types of data. Regulatory maps are political/social compromises – they include only about half of the habitat in Maine and are based on legal definitions. In the regulatory world, an area is either regulated or it is not, so the mapping is more black and white. In contrast, oil spill response, species management, and conservation planning consider all habitat in Maine but focus on relative values, which vary with environmental gradients, proximity to other habitats, disturbance, and other elements of the landscape. Habitat Group also develops custom applications to make these data available to Department staff and we provide a range of technical support, primarily with mapping and wildlife/habitat databases, but also with general network and server problems. Unlike other RAS Groups that work on numerous, specific projects that may be relatively short in duration, much of the work that Habitat Group does is ongoing maintenance of existing data sets and custom applications.

This work is supported by federal State Wildlife Grants, the federal Pittman-Robertson Funds program, state revenues from the sales of hunting licenses, Loon Conservation Plate, and Chickadee Check-off Funds, and the Maine Coastal and Inland Surface Oil Clean-up Fund.

Species Conservation Range Maps

Maine Department of Inland Fisheries and Wildlife was tasked with producing a set of conservation range maps for the 2015 update to Maine's State Wildlife Action Plan (SWAP). The plan identifies 354 Species of Greatest Conservation Need (SGCNs). The maps use locations from 15 observation data sets and a map of potential habitat to show where conservation actions might benefit each species. Species taxonomy and formatting of information, including spatial coordinates, varied across data sets. We wrote a computer program to extract and standardize the observation data to determine presence/absence of each SGCN across Maine's townships and sub-watersheds. The goal was to summarize information across these data sets but to retain the identity of each source because they varied in reliability and intent. The program also identified townships and sub-watersheds containing potential habitat for each SGCN based on habitat associations in our SWAP database. The maps were exported as Adobe Acrobat PDF files that allow users to toggle the visibility of each observation data set. Throughout the rewriting of Maine's SWAP, additional data sets were identified for incorporation into the maps. Our conservation partners also provided input into the map formats. The automated program allows the entire set of maps to be easily updated. We also developed Python-program scripts to summarize data across SGCNs; for example, to show areas for conservation actions targeting birds or all SGCNs associated with wetlands. Our goal is to build an interactive web mapping service on top of this automated process. It will allow us to continue to update and add data throughout the SWAP's 10-year period and will save Maine considerable time and effort in our 2025 SWAP update. Finally, archiving the lookup tables will allow users to view changes in SGCN distributions over time.

This work is supported by federal State Wildlife Grants, Loon Conservation Plate, and Chickadee Check-off Funds.

Oil Spill Response

As a state Natural Resource Trustee, IFW is obligated to respond to oil spills that affect wildlife or wildlife habitat. This year the oil spill response community completed its 5-year update of the “Area Contingency Plan,” which was developed to guide spill response for southern Maine and New Hampshire. One section of this plan details how areas will be prioritized for protection during a spill response. Another section addresses the potential use of chemical dispersants. In June, Don Katnik attended the Arctic and Marine Oil Spill Program’s Technical Seminar on Environmental Contamination and Response and presented our work on prioritizing natural resources for spill response. The paper was well received. The seminar also focused on the use of chemical dispersants, responding to a spill of diluted bitumen extracted from tar sands, and risk assessments for the proposed Northern Gateway pipeline. Regional staff in the Wildlife Management Section responded to several requests for assistance from the Maine Department of Environmental Protection (DEP) on spills with potential impacts to wildlife or wildlife habitats—fortunately no significant impacts occurred. We also assisted DEP with annual training for their responders; this year it included a train-derailment exercise. Don Katnik organized training for IFW staff that included presentations from DEP, the Department of Marine Resources, the National Oceanic and Atmospheric Administration, and a wildlife rehabilitator.

This work is supported by the Maine Coastal and Inland Surface Oil Clean-up Fund.

Ongoing Work - Assessing Freshwater Wetlands

Field verification of habitats mapped from aerial photos is an important part of making data as accurate as possible. The Department has mapped specific wetlands as “Inland Waterfowl/Wading Bird Habitat,” a Significant Wildlife Habitat protected under Maine’s Natural Resources Protection Act (NRPA). This mapping was done from high resolution aerial imagery. Each wetland was scored based on five criteria (wetland type, diversity, size, habitat interspersion, and percent open water) to rate it as “high,” “moderate,” or “low” value to inland waterfowl and wading birds. Those wetlands that scored a “moderate” or “high” value are considered Significant Wildlife Habitats under NRPA. In most cases, the aerial imagery depicts these wetlands, which usually are at least 5 acres in size, with more than enough detail to score them. In some cases, though, a field visit to confirm the mapping is needed. Usually these field visits are conducted on a case-by-case basis, for example when a specific wetland might be affected by a project that is being reviewed. Last year, however, Habitat Group began working with the Department’s Regional Biologists to conduct proactive field assessments of wetlands that rated near the “low”/“moderate” score cutoff. We surveyed approximately 100 of these “borderline” wetlands in southern Maine. In July 2015, we hope to visit the remaining 30 in Region A of southern Maine, then begin visiting wetlands in Region B of mid-coast Maine.

This work is supported by federal State Wildlife Grants, the federal Pittman-Robertson Funds program, and state revenues from sales of hunting licenses, the Loon Conservation Plate, and Chickadee Check-off Funds.

Ongoing Work - Coastal/Tidal Wildlife Habitat

One example of a multi-year project for Habitat Group is updating the Department’s maps of coastal/tidal habitat. Salt marshes, tidal flats, eelgrass beds, and mussel bars all provide important habitat for wildlife. These were originally mapped nearly 20 years ago using data that, by today’s standards, were very coarse. For several years, Habitat Group has been working to make this information more current and accurate. Tidal flats have been especially difficult to map because they include a variety of substrates (gravel, sand, mud) and are defined as existing between the high and low tide lines. There is a map of Maine’s high tide line, but not the low tide line. Its location, and therefore the extent of the tidal flat polygons, must be inferred from low-tide aerial photos that were captured \pm 2 hours of low tide and therefore may underestimate the true intertidal zone and from nautical charts. In February 2015, a draft map of updated coastal/tidal habitat areas was completed. While reviewing these draft data, we identified several additional habitat components that should be included. The first was subtidal flats—shallow areas with tidal flat substrates that are only exposed during extreme low tides but still provide important feeding areas for waterfowl. The second component was rocky areas within tidal flats. Previously these were excluded as not being actual flats, but the map reviewers believed that birds using tidal flats would also use those rocky outcrops within them, so they should be included as part of the tidal flat habitat. Third, freshwater inflows increase the value of coastal/tidal habitats. In the current draft version, we mapped freshwater inflows within 250 feet mapped habitats. The review team suggested mapping all freshwater inflows. Habitat Group is now revising the mapping to incorporate such suggestions.



Coastal/Tidal Habitat (Photo by Donald Katnik)

This work is supported by federal Pittman-Robertson Funds program, sales of hunting licenses, and the Maine Coastal and Inland Surface Oil Clean-up Fund.

BIRD GROUP

Birds enrich our lives and reflect the quality and health of our environment. North America provides habitat for over 900 species of birds. The Maine Bird Records Committee considers 423 bird species (nearly half of all North American birds) to be positively documented within the state of Maine. Maine's diverse mosaic of differing habitats provide nesting space for 225 species of birds, and many more species that either migrate through or winter in Maine. Maine's landscape is used by at least 29 inland species that reach the northern limits of their breeding distribution in Maine and 28 species at their southern limits. In addition, many of Maine's island-nesting seabirds reach their southern breeding terminus on Maine's coastal islands. Several other species have expanded their breeding ranges into Maine over the past century including most recently the sandhill crane (*Grus canadensis*). Two species, the peregrine falcon (*Falco peregrinus*) and the wild turkey (*Meleagris gallopavo*) have been reintroduced back into Maine following extirpation and are now carefully monitored and managed.

Maine is strategically located at a constriction point of the funnel in what is referred as the Atlantic Flyway, a migratory path along eastern North America that begins in the eastern Canadian arctic and Maritimes and tapers down the east coast. The Atlantic Ocean has a channeling effect on these migratory movements as birds fly south in late summer and fall. In addition, Maine's vast coastline and more than 4,000 coastal islands provide important stopover areas for millions of migrating birds. This flyway includes some of the continent's most productive ecosystems and is home to about a third of the U.S. human population. Conserving birds and their habitats in Maine's portion of this important flyway is a monumental task.

Brad Allen, Bird Group Leader – Brad oversees group activities and budgets and continues to investigate the lives and times of the common eider. Brad also coordinates Department interests in seabird research and management activities.

Danielle D'Auria, Wildlife Biologist – Danielle is the Department's species expert on marsh birds, wading birds, common loons, and black terns. Over the past three years, she has also devoted a great deal of effort to heron surveys and coordination of a volunteer heron monitoring program. Her other field-related duties include marsh bird surveys and research, black tern surveys, and inland seabird surveys.

Thomas Hodgman, Wildlife Biologist – Tom develops and implements programs and surveys to assess the status of songbirds in Maine and coordinates several priority bird research programs. Tom's recent focus is working with two graduate students studying saltmarsh sparrows and rusty blackbirds. Tom routinely provides technical assistance and advice to the Wildlife Management Section regarding a wide range of bird conservation issues.

Kelsey Sullivan, Wildlife Biologist – Kelsey coordinates IFW's waterfowl banding programs, surveys, and research to assess the status of game bird populations in Maine. Game bird species that Kelsey is responsible for include ruffed grouse, American woodcock, wild turkeys, ducks, and Canada geese. He is Maine's representative on the Atlantic Flyway Council Technical Section.

Lindsay Tudor, Wildlife Biologist – Lindsay coordinates the Department's shorebird program with current emphasis on shorebird habitat protection under the Natural Resources Protection Act and piping plover and least tern management. Lindsay's research involves shorebird movements within the Gulf of Maine, and her primary survey responsibilities include coastal shorebirds and harlequin ducks.

Erynn Call, Wildlife Biologist – Erynn focuses on the ecology and management of Maine's raptors. Her current research centers on rivers and river-associated birds including bald eagles and ospreys. Ongoing and newly initiated state-wide river bird monitoring programs will offer a greater understanding of habitat relationships, presence and removal of dams, and the importance of sea-run fishes to raptors. Other work includes review and collaboration on various raptor research and monitoring efforts of industry, universities, federal agencies, and nonprofits organizations.

Lisa Bates, Wildlife Management Institute (WMI) contractor – Lisa splits her time between the Mammal Group and the Bird Group. When she is with the Bird Group, Lisa participates in various field activities including Canada goose capture and banding, pre-season waterfowl banding, and ruffed grouse capture and radio telemetry work.

Matt O'Neal, WMI contractor – Matt also splits his time between the Mammal Group and Bird Group. This year his field work activities with the Bird Group include: wading bird surveys, great blue heron colony site visits, Canada goose capture and banding, pre-season waterfowl banding and ruffed grouse capture and radio tagging.

BIRD GROUP CONTRACT WORKERS, VOLUNTEERS, AND OTHERS

The Bird Group would like to thank the following dedicated individuals who have assisted us with our bird conservation and management tasks over the last year: Diane Winn and Marc Payne, Avian Haven; Maine Warden Service pilots Jeff Beach, Charlie Later, and Jeff Spencer; Maine Forest Service pilots Jeff Miller, Chris Blackie, and Lincoln Mazzei; USFWS pilot/biologist Mark Koneff; Rich MacDonald, Colleen Bovaird, Anne and John Marshall, Patricia and Grant Mudge, Donna Kausen, Rebecca Holberton, Shannon Buckley, Kate Ruskin, Mo Correll, Kate O'Brien, Lauren Gilpatrick, Douglas Haislet, John Morgan, Todd Jackson, Bill Carll, Soren Siren, Courtney Hagensaaers, Tom Berube, Glen Mittelhauser, John Drury, Dave Hiltz, Chris West, Don McDougal, Jim Dyer, Bill Hanson, Chris DeSorbo, Rick Gray, Wing Goodale, Lucas Savoy, Bruce Connery, Lesley Rowse; Joe Wiley, Bureau of Parks and Lands; Margo Knight, Don Mairs, Ron Joseph, Patrick Keenan, Bill Johnson, Bill Sheehan; Susan Gallo and Laura Minich Zitske of Maine Audubon; Don Reimer, Scott Kenniston, Libby Mojica, John Sewell, Sharon Fiedler, Sara Williams, Brittany Currier, Shannon Prescott, Ken Janes, Gordon Smith, Doug Sutor, Michael Fahay, Robin Robinson, Jill Glover, Julie Johnston, Brian Johnston, Deanne Richmond, Andrew and Brody Gibbs, Jaime Bray, Laird Townsend, Marek Plater, Dan Grenier, Douglas McMullin, The Nature Conservancy, Maine Coast Heritage Trust, many Heron Observation Network volunteers, many Maine River Bird Project volunteers, many private landowners who have granted us access to their property for surveys and monitoring, and IFW regional staff.

BIRD CONSERVATION AND MANAGEMENT

Piping Plovers

Banner Year for Maine's Endangered Piping Plovers!

Piping plovers are small, sand-colored shorebirds that nest on sandy beaches and dunes along the Atlantic Coast from Newfoundland to South Carolina. Habitat loss, lack of undisturbed nest sites, and predation are the primary factors jeopardizing populations of piping plovers. With less than 2,000 nesting pairs on the Atlantic coast the piping plover is federally listed as Threatened and is listed as Endangered in Maine. Maine's population of piping plovers has been monitored annually since 1981.

With only 24 pairs of piping plovers returning to nest in 2008 and the realization that we were very close to losing this species from our state; municipalities, landowners, government agencies, and private organizations combined efforts to protect nesting piping plovers and attempt to reverse the declining population trend. Inland Fisheries and Wildlife (IFW), Maine Audubon, Maine's Bureau of Parks and Lands, Rachel Carson National Wildlife Refuge (RCNWR), USDA APHIS Wildlife Services, The Nature Conservancy, and Bates College have a long-standing collaboration regarding piping plover management. The towns of Wells, Ogunquit, Old Orchard Beach, and Scarborough are also committed to managing their beaches using guidelines established with IFW that provide recreational opportunities for beachgoers and still protect plover broods. These towns have included funds in their budgets to hire plover volunteer coordinators. Plover volunteer coordinators recruit and coordinate volunteers who monitor and help protect plover nests and chicks during the nesting season.

Funding from U.S. Fish and Wildlife's (USFWS) Landowner Incentive Program and grants from Maine Outdoor Heritage Fund and National Fish and Wildlife Foundation provided increased efforts in law enforcement, predator management, and outreach at certain plover beaches. Such efforts resulted in productivity rates increased to a level needed to sustain and grow the population. Maine's piping plover population and distribution has steadily increased from 24 pairs nesting on 11 beaches in 2008 to 62 pairs nesting on 20 beaches in 2015. The 2015 nesting season produced 115 piping plover fledglings, the most fledged on Maine beaches since record-keeping began in 1981!

IFW is asking for help from all beachgoers to protect these birds by observing these simple guidelines:

- Avoid fenced areas marked with "Restricted Area" signs.
- Observe birds and chicks only from a distance, using binoculars.
- Keep pets off the beach, or leashed, from mid-April through mid-September.
- Don't fly kites near posted areas. They resemble hawks and can keep birds away from nests.
- Take your food scraps and trash off the beach when you leave as it attracts nest predators such as skunks and raccoons.
- Call the Maine Warden Service to report harassment of birds. It's a federal offense to harm an Endangered Species.

This work is supported by volunteer assistance, the federal State Wildlife Grants program, and Section 6 Funding, as well as state revenues from the Loon Conservation Plate and Chickadee Check-off Funds.

-- Lindsay Tudor

Semipalmated Sandpipers

The semipalmated sandpiper is a small, abundant North American shorebird, somewhat drab in appearance, but capable of flying great distances, making migratory journeys from high Arctic breeding grounds in Canada to their South American wintering areas. These tiny sandpipers, weighing only 1.4 ounces can rack up around 10,000 miles during spring and fall migrations. Though they stop at specific staging areas to refuel along their migratory routes, also known as tidal habitats, most “semis” are capable of flying 1,200 to 3,000 mile segments of their journey nonstop. During southward migration, Maine hosts thousands of semis, providing these weary travelers with the necessary fats and proteins to fuel the next leg of their journey, a nonstop, transoceanic flight to South America (2,000 miles or more).

Recent surveys indicate the eastern North American population of semipalmated sandpipers may have declined by as much as 50% over the past three decades. Habitat loss and degradation along migratory routes and in wintering areas located in South America are believed to be major factors in this decline. Because the Gulf of Maine region is a major flyway for semipalmated sandpiper populations, it plays a critical role in supporting these birds during migration. Understanding the movements of these individuals as they migrate through the region is key to identifying and preserving important stopover sites.



Shorebirds (Photo by Jonathan Mays)

Until recently, tracking individuals across large distances was only feasible for large species. However, recent development of tiny VHF tracking devices called “nanotags” combined with automated receiver towers allows for tracking local movements of shorebirds, as well as long distance, as researchers throughout the Atlantic coast install receiver towers. This newly established Atlantic Seaboard Digital Tracking Array was founded by Dr. Phil Taylor at Acadia University with partners in the Northeast Regional Migration Monitoring Network (NRMN), which includes IFW, University of Maine, Maine Coastal Islands National Wildlife Refuge, Rachel Carson National Wildlife Refuge (RCNWR), and Bird Studies Canada.

In 2013 and 2014, IFW partnered with University of Maine and Maine Natural History Observatory to capture and place nanotags on semipalmated sandpipers feeding and roosting on coastal habitats in Harrington and Addison. Our objectives were to determine local movements related to shorebird foraging and roosting behaviors, information on length of stay by individual birds, and combined with existing survey data, to determine population status of shorebirds using the Harrington - Addison staging areas. In 2014 and continuing in 2015, this study was expanded in partnership with RCNWR and Biodiversity Research Institute to capture and place nanotags on semis using beach and saltmarsh habitats in Wells and Kennebunk. Knowledge of departure weights and condition indicators, along with knowledge of invertebrate concentrations and availability throughout the migration window, will be used to determine whether Maine staging sites are providing migrating shorebirds with resources needed for successful migration.

Our research team installed two automated radio-telemetry stations located at the outlets of the Pleasant and Harrington rivers. These stations were sited in partnership with private landowners, and consisted of a tower with fixed antennas, and an automated telemetry sensor, which continuously recorded detections from radio transmitter tags. Towers were strategically placed near feeding flats where birds using the Mill River, Harrington River, and Pleasant River could be detected during their stay. In both years of the project, semis were captured between August and September, totaling 158 sandpipers. A total of 72 transmitters were deployed and, subsequently, detected by the automated receivers. All birds were weighed, measured, and color banded. Researchers also collected blood samples from 51 birds without nanotags to check triglyceride levels to determine if birds were gaining fat and to check for blood parasites.

In the Downeast study, adult birds weighed, on average, five grams more than juvenile birds, even when differences in body size were taken into account. Also, young birds stayed longer, almost three weeks (17.5 days), on average, compared to adults (12.4 days). This additional 5-day stopover time may have been needed by young birds, on their first migration, to put on the energy reserves required to support subsequent non-stop flights to reach the wintering grounds. Most birds showed that they were using this stopover site to actively put on fat and leaner birds required more time to do so. We also confirmed that semipalmated sandpipers initiate their non-stop 3-5 day trans-oceanic flight directly from the Downeast study area to wintering grounds in South America.

In contrast, the average length of stay in Wells/Kennebunk was 16.5 days for adults. Juveniles were sporadic in departure dates, ranging over almost a month. Thirteen birds tagged at Wells were recorded at 16 different towers south of Maine and one bird, after staying for one week, ventured north toward Downeast Maine. Results from RCNWR suggest birds using beach and saltmarsh habitats in southern Maine may be staying longer to gain the fats needed to continue migration or need to increase local movements to find habitats with the resources they need. Certainly, birds using beach habitats surrounded by development are exposed to greater levels of human related disturbance than shorebirds using relatively pristine habitats in rural Downeast Maine. It will be interesting to learn if southern Maine results are similar in 2015.

Also in 2015, IFW, with support from Biodiversity Research Institute and Bureau of Parks and Lands, will move their study to the mid-coast region. This project will include shorebirds, using beach and saltmarsh habitats, located at Popham Beach State Park (Phippsburg) and Reid State Park (Georgetown). We will attach nanotags to 30 shorebirds and color band, measure, weigh and collect blood on all shorebirds captured. We will periodically survey for the presence of tagged birds at key locations using hand held telemetry receivers. We will monitor Seawall Beach, Popham Beach, and Reid State Park for banded shorebirds and record number of interactions between feeding and roosting shorebirds and beachgoers. Besides two automated telemetry receiver towers strategically located within the study area, five additional receiver towers, provided by Maine Coastal Island National Wildlife Refuge, will be located on offshore islands in the midcoast region, outside the study area.

Once again, we will extend the geographic range of tracking beyond the receiver units deployed in Maine by capitalizing on the integration of this project with over 50 automated telemetry stations, deployed in Canada and along the Atlantic coast by other NRMN partners.

This work is supported by Maine Outdoor Heritage Fund, federal State Wildlife Grants program, and Eastern Maine Conservation Initiative, as well as state revenues from the Loon Conservation Plate and Chickadee Check-off Funds.

-- Lindsay Tudor

Purple Sandpipers

The population of purple sandpipers wintering in the northwest Atlantic is not well understood. The population is likely underestimated due to lack of survey data, and population trends not adequately monitored by traditional bird surveys, such as the Christmas Bird Count (CBC) and International Shorebird Surveys. What data that do exist, through the CBC, suggests this species is in decline. A long-term monitoring plan to determine population trend is a conservation action identified in both Maine's State Wildlife Action Plan and the Atlantic Flyway Shorebird Business Strategy.

In 2013, Environment Canada and IFW biologists developed a long term monitoring plan for purple sandpipers wintering in Maine, Newfoundland, and Atlantic Canada. In 2014, Maine biologists initiated the first year in the long-term monitoring plan conducting a 4-day boat survey in outer Penobscot Bay, Frenchman Bay, and Blue Hill Bay and recorded only 2,771 purple sandpipers, down 49% from surveys of the same sites conducted in 2004.

In 2015, despite weather challenges during late March and early April, IFW biologists, with support from Glen Mittelhauser from Maine Natural History Observatory and boat operator Dave Hiltz F/V Sure Thing, again embarked on the four-day boat survey of purple sandpiper wintering sites located in outer Penobscot Bay, Frenchman Bay, and Blue Hill Bay. Despite rough seas, snow, and drizzle, biologists recorded 2,845 purples feeding and roosting on 160 rockweed and barnacle-covered ledges. Purple sandpipers are incredibly cryptic, blending in with surrounding seaweed as they feed on intertidal invertebrates, making detecting and counting the robin-sized birds challenging. The crew consisted of two primary observers and two secondary observers. Dave Hiltz is an expert at finding the birds and maneuvering his 28 foot boat close enough to ledges for accurate counts.



Purple Sandpipers (Photo by Jonathan Mays)

2015 survey results are only slightly greater than the dismal 2,771 purples recorded in 2014. Survey results from both years suggest purple sandpiper numbers are experiencing a steep decline. Pending funding, we anticipate a survey effort using the same sampling plan will continue in 2016 and progress until 2020 in order to determine a statistically rigorous assessment of Maine's purple sandpiper population.

This work is supported by federal State Wildlife Grants program, as well as state revenues from the Loon Conservation Plate, Maine Birder Band fund, and Chickadee Check-off Funds.

-- Lindsay Tudor

Biologists Took to the Air to Estimate Maine's Heron Population

This spring, IFW biologists and pilots from Maine Warden Service and Maine Forest Service conducted over 76 hours of aerial surveys for great blue heron colonies across the state. These surveys are conducted using Cessna airplanes, which are flown at low level, so observers can find colonies and count nests. Once a colony is located, several passes are often required to count the number of active and inactive heron nests at each site. The nests are made of sticks and can be in live or dead trees and occur in uplands, wetlands, and on islands. When nests are in a dense stand of snags (dead trees), their gray color blends in well and can be difficult to count. When colonies are large (in Maine, the largest colony is ~120 pairs), biologists must estimate the number of nests, for there is no way to fly over slow enough to count each one individually. Further, when herons are incubating eggs, their gray bodies are difficult to see against the gray background of the nest.



Nesting Great Blue Herons (Photo by Dave Cleaveland, Maine Imaging)

Despite these challenges, aerial survey is a preferred method for surveying colonies across the state because it is a quick and efficient way to cover such a large area. Over 90% of Maine is forested and, therefore, considered potential nesting habitat for herons. Instead of attempting to survey every inch of the state, I worked with Mark Otto, a statistician with the USFWS, to design a survey specifically for nesting great blue herons. The survey samples two types of randomly selected plots, each 100 km² in size. The "Area" plots are searched for new colonies and usually take an hour to cover methodically. The "List" plots contain known colonies, and only those known colonies need to be checked for nesting activity. It is the comparison of the results from the Area plots and the List plots that produces a highly accurate estimate for the entire state. The plan is to repeat these surveys at future intervals (e.g. every 5 years) to obtain a population trend.

Since the listing of great blue herons as a Species of Special Concern in 2007, IFW has been working to determine if a decline observed in the coastal nesting population is also happening statewide. Between the mid-1980s and 2009, the number of nesting pairs on coastal islands in Maine dropped about 66% from over 1,200 to 430 pairs. A statewide comprehensive survey had never been done. In 2009, we started a citizen science program called the Heron Observation Network (HERON), which enlisted volunteers to monitor known colonies across the state. Their annual monitoring efforts have contributed greatly to our knowledge of the statewide population, and this information fed directly into this year's aerial surveys.

Between May 1st and June 19th, we conducted aerial surveys on 17 days and checked 129 known colonies, found 8 new colonies, and counted 1,106 active nests within 95 colonies. Meanwhile, HERON volunteers were also hard at work conducting annual ground surveys. During the 2015 nesting season, there were 89 volunteers monitoring 125 great blue heron colonies across the state. A summary of their efforts will be published on the HERON blog later this year. The data collected by HERON volunteers will also be used to help ground-truth our aerial counts for specific colonies. This fall, we will analyze the data and, ultimately, estimate how many great blue herons we have nesting in Maine.

For more information on HERON, and Maine's colonial wading birds, visit <http://www.maine.gov/wordpress/ifwheron/>.

This work is supported by the federal State Wildlife Grants program, volunteer assistance, the Maine Birder Band, the sale of Heron Observation Network stickers produced by Burlly Bird, state revenues from the Loon Conservation Plate, and Chickadee Check-off Funds.

-- Danielle D'Auria

The Maine River Bird Project

The goal of the Maine River Bird Project is to better understand relations between rivers and river birds, emphasizing dams, dam removal, and return of sea-run fishes. This group of birds includes any species that relies on the river, such as waterfowl, wading, shore, and aquatic insect-eating birds, as well as raptors, such as osprey and bald eagle. Maine hosts 12 species of sea-run fishes, which require access between the ocean and rivers to spawn. Initiated in 2008, this research encompasses completed, ongoing, and newly initiated study objectives.

Thus far, the project documented how dams alter the transfer of nutrients from sea-run fishes to river birds and how bird abundance relates to river features, such as the presence of dams, water flow, and land cover. Analysis of feather and prey samples collected along the Penobscot River suggested that, prior to its removal, the lowermost dam on the Penobscot (Veazie) acted as a barrier to the delivery of nutrients from sea-run fishes to bald eagle and belted kingfisher nestlings upriver. We expect these nutrients will be detected in future sampling of nestlings upriver as fish populations rebound after the removal of the Veazie and Great Works dams. Additionally, year-round river bird survey observations, collected by citizen scientists across ten rivers and 80 bankside survey sites, were combined with river feature data. The results of this analysis informed our current understanding of species-habitat relations and, with ongoing monitoring, will shed light on ecosystem changes associated with urbanization, climate, and river restoration.

In 2014, IFW collaborated with University of Maine - Orono, Unity College, and Biodiversity Research Institute to establish additional survey sites along the Sebasticook River. The five mile stretch between the Benton Falls dam and confluence with the Kennebec River in Winslow hosts the largest river herring spawning run in the northeast. Over three million river herring, a collective term for alewife and blueback herring, attract breeding and non-breeding bald eagle and osprey every year from mid-May to early July. From these ongoing surveys, we are learning about the extent and timing of use by counting these raptors and noting their location along the river. This helps us understand how use differs between bald eagle and osprey, and between sub-adult (<5 years old) and adult bald eagles. Results from 2015 are pending, however, in 2014 on a single day in mid-June, 64 eagles were observed across all sites, the largest aggregation documented in New England.

The Maine River Bird Project will improve understanding of relations between river features, river herring, and bird abundance and provide valuable insights to guide future management and conservation decisions.

-- Erynn Call

Maine Hosts Annual Eastern Golden Eagle Working Group Meeting

Eastern golden eagles have been designated as an endangered species in Maine since 1987. Birds breed in Quebec and winter mostly in the mid-Atlantic states. Throughout the year a few individuals can be found within Maine, as the region is on the edge of the breeding and wintering ranges. The last known breeding record in Maine was from 1997 at a cliff nest that was present for at least 70 years. Similar in size, golden eagles and sub-adult bald eagles are difficult to distinguish. Tips for identification can be found at www.maine.gov.

The Eastern Golden Eagle Working Group (EGEWG) is an international collaboration of scientists and managers from over 20 institutions, agencies, and private interests dedicated to research and conservation of golden eagles in the East. Golden eagles are a flagship species and occupy a wide range of conditions, as they inhabit 4 continents around the northern hemisphere. Recognized as the most successful and wide-ranging species of eagle in the world, golden eagles were never common in the East. However, their numbers are increasing and biologists hope they are here to stay. Golden eagles have been listed as Endangered in Maine since 1987 and last nested here in the late-1990s. Maine is one of the few states in the East that continues to have golden eagle activity in all seasons of the year.

Maine hosted the 4th meeting of this group in Rangeley July 9-11. Attendees from Quebec to Florida shared insights on wintering, migrating, and breeding golden eagles throughout the Appalachian corridor. Participants shared results from recent golden eagle



Golden Eagle (Photo by Avian Haven)

research pertaining to documentation of habitat selection, identification of roost sites, lead exposure, and indirect effects associated with wind development, such as changes in movement patterns.

This work is supported by volunteer assistance, the Maine Outdoor Heritage Fund, federal State Wildlife Grants Program, as well as state revenues from the Loon Conservation Plate and Chickadee Check-off Funds.

--Erynn Call

Plight of the Saltmarsh Sparrow

Early colonists arriving in the New World often settled in coastal areas. Here, they found resources from both land and sea to begin a new life. It was common practice, at that time and for decades thereafter, to harvest hay from the salt meadows of New England. These coastal marshes would have been filled with birdlife. While taking a breather from swinging a scythe in the July sun, a colonist must have witnessed many of the birds still present today in the saltmarsh, both as they flew by and through their songs carried on the ocean breeze. A faint whispering song, much like the sounds of the rustling of the wind in the cordgrass would have provided a retort to the sound of the scythe as it “sings” through the meadow grass. That whispering song too, was made by a recent colonist. Recent, in evolutionary time, that is. That little brown bird, an obligate of saltmarshes of the Atlantic coast, is known today as the saltmarsh sparrow. Many earlier names such as sharp-tailed finch and saltmarsh sharp-tailed sparrow have been cast aside for this simpler and more apt moniker. This species broke off the lineage of coastal sparrows just thousands of years ago making them a relatively recent inhabitant of the coastal marsh. They found a niche in the high marsh, where twice a day tidal flooding only happened at the new and full moons. For several thousand years, this was a successful strategy for a little sparrow. If able to tolerate such a harsh environment, they experienced virtually no competition for nest sites or food. The only real limitation was that pesky tide.



Saltmarsh Sparrow (Photo by Patrick Leary)

Nesting just a few inches above the surface of the marsh, down in the grass, they developed the ability to rapidly raise a brood of chicks in that brief window between those monthly extreme tides. It's not always successful. In fact, it's most often not successful as most nests fail due to flooding. But, with the ability to rapidly reneest after failure, they can have a second, or even third attempt before the nesting season is over. Sounds perfect, but, there's always a catch. If you nest just an inch or two off the ground in the middle of a saltmarsh, you have very little margin for error in keeping your chicks dry. What if those monthly “highest-of-high” tides become a little more common? So instead of a single tide that floods the entire marsh on the new moon, you have several days of these flood tides starting a few days before and ending a few days after the new moon. What if the ocean level rises a few inches higher each decade making those monthly high tides even higher? What if the frequency of rainstorms, severe thunderstorms, or hurricanes increases? More water in the rivers and creeks puts more water on the surface of the marsh at high tide. So perhaps now, that cozy little niche occupied by the saltmarsh sparrow seems...well, a little damp. Nature is full of checks and balances, however, and the saltmarsh has some degree of natural resilience in keeping pace with rising sea levels. Sediment is deposited in minute amounts each time the tide comes into the marsh. That slight accumulation of sediment, together with accumulation of organic matter, mostly from the roots of the saltmarsh plants, in many cases can keep pace with increases in ocean levels.

The past actions of humans, however, may be having an effect on this somewhat fragile system. For over 200 years, we have been disturbing saltmarshes and their birds in one way or another. Cutting saltmeadow hay to feed the family milk cow through the winter was common over a hundred years ago and probably had limited local effects. However, in our ever increasing desire to get from place to place as fast as possible, we constructed roads across marshes. Except for bridges and culverts to accommodate the incoming and outgoing tides, tidal flow, let alone the sediment carried by the tide, appears to have been of little concern. Only recently, however, have we realized that roads across saltmarshes starve the marsh of the sediment supply needed to keep pace with rising sea levels. Turns out, saltmarsh sparrows get a “brief” benefit of restricting tidal flow. Keeping water out of the marsh can result in less flooding of the marsh and fewer losses of nests to flooding, the number one cause of nest failure. But eventually the ocean wins and with ever increasing sea levels and a marsh surface that hasn't kept pace, marshes become wetter. And wetter marshes mean lower breeding

success for species nesting in the marsh. The latest analyses show that marshes that are crisscrossed with roads have declining populations of saltmarsh sparrows not just in Maine, but across their range. In fact, the only marshes where this species appears stable (not even increasing) is in sediment-rich systems with no roads in places like Cape Cod. So, is the saltmarsh sparrow doomed? Perhaps. Some analyses suggest just a half century remains for populations as we know them. With a global population at roughly 60,000 individuals, it seems like a lot of birds. But for a species whose global breeding range only extends from Thomaston, Maine to roughly Norfolk, Virginia and is declining in almost every marsh in every state where they occur, it won't be many decades before the population is perilously low.

Few people had even heard of the species just a decade ago. Now, they are ranked among the highest priority species for coastal conservation in the U.S. Much effort is underway to better understand the biology of this species and how best to manage its habitat. Such effort is taking the shape of long-term, multi-state, multi-agency partnerships that include both academics and wildlife managers. Although the "singing" of the steel blade of the scythe no longer slices through the cordgrass of New England's saltmarshes, it would be a shame to lose the whisper song of the saltmarsh sparrow, only to be replaced by the din of cars traveling across the marsh in a hurry to get somewhere.

IFW staff have been engaged in research activities focused on the conservation of saltmarsh sparrow and its sister species, the Nelson's sparrow, since 1997. The department has conducted extensive surveys for both species along the entire Maine coast in 1997-2001 and again with partners in 2011-2015. Additional studies of their diet, nesting success, home range, movements, population trend, effects of tidal restriction, and the effects of sea level rise and precipitation on abundance over time, have been a major focus of the agency. We have partnered with numerous, individuals, agencies and academic institutions across the northeast to stem the decline of this species.

This work is supported by a competitive State Wildlife Grant, the federal Pittman-Robertson Funds program, and the Loon Conservation Plate.

-- Thomas Hodgman

Game Birds

Migratory Game Birds

IFW collaborates with the USFWS in monitoring migratory game bird populations and assessing harvest of these species. To monitor populations, several surveys are conducted throughout the year that target specific migratory bird species groups, such as sea ducks and dabbling ducks. Following each migratory bird hunting season, harvest is measured using: 1) the Harvest Information Program (HIP), with data on total estimated harvest, an estimate of the number of active hunters, and the estimated number of days afield; 2) the Wing-collection Survey, where hunters contribute one wing from each harvested bird, which serves as a measure of productivity from the past spring; and, 3) analysis of band recoveries from numbered metal bands placed on birds prior to the fall hunting season to provide estimates of harvest rates and overall survivorship of a species.

American Woodcock

American woodcock are managed on the basis of two regions, referred to as the Eastern and Central Regions. These woodcock populations are basically located east and west of the Appalachian Mountains. Maine is one of the most important states for breeding woodcock within the Eastern Management Region.

Each spring, beginning in 1968, a coordinated survey called the Singing-ground Survey (SGS) is conducted in all states with woodcock populations. Each survey participant records the number of singing male woodcock they hear in the spring, along specific routes distributed throughout Maine. Fifty-seven routes were completed in Maine in the spring of 2015 by IFW staff, USFWS staff, and a number of volunteers. The long-term trend of the number of males heard per route (1968 to 2015) indicates an overall decline in American woodcock numbers across their range. This long-term decline is believed to be caused by an overall loss in woodcock habitat where these historical surveys have been conducted. In 2015, the average number of males heard on Maine's SGS routes was 3.24. Last year the average number of males heard on Maine survey routes was 3.58. The ten-year Maine average is 3.69 males/route.

Woodcock hunting season

Based on data from HIP, approximately 2,300 woodcock hunters harvested an estimated 10,400 woodcock in Maine in 2014. This was an increase in harvest compared to the previous year. The recruitment index of 1.8 immature (young of the year) to one adult female in the 2014 harvest was close to the long-term average of 1.7 young/adult female (1963–2013) and suggestive of good production in 2014. The recruitment index is a measure of the ratio of immature woodcock per adult female, derived from the Wing-collection Survey described above. Maine hunters provided 1,132 woodcock wings from the 2014 hunting season for that survey.

Waterfowl

Waterfowl harvest metrics are also derived from the Harvest Information Program. Harvest estimates for the 2007 to 2014 waterfowl seasons are listed in the following table (Table 2).

Table 2. Maine Waterfowl Harvest 2006-2013.

Species	2007	2008	2009	2010	2011	2012	2013	2014
American Black Duck	5,000	4,683	5,364	3,377	2,133	3,300	3,500	2,300
Mallard	12,700	11,265	12,711	8,379	7,441	14,000	10,200	9,200
Green-Winged Teal	6,100	7,872	4,923	3,189	2,042	2,300	4,600	1,500
Wood Duck	5,400	3,461	7,641	8,567	5,989	6,700	6,500	3,200
Ring-necked Duck	300	747	1,763	1,688	454	600	1,200	600
Common Goldeneye	1,600	2,307	1,469	313	318	600	700	500
Total (all regular ducks included)	31,100	30,335	33,871	39,100	31,500	39,900	36,000	21,600
Canada Goose	9,100	13,800	4,700	9,194	3,717	9,500	8,800	8,900
Sea Ducks								
Common Eider	13,100	11,143	4,355	4,505	6,400	5,200	3,100	1,000
Long-tailed Duck	1,000	4,305	656	2,321	2,695	NA	200	100
Scoter	1,700	4,052	890	1,092	674	3,200	1,800	900
Total Sea Duck Harvest	15,800	19,500	5,901	7,918	9,769	8,400	5,100	2,000
Total Waterfowl Harvest	56,000	63,635	44,472	56,212	44,986	57,800	49,900	32,500

Resident Game Birds

Wild turkeys and ruffed grouse are two species of game birds that spend their annual life cycle within the State of Maine. For this reason, all management authority and responsibility remain within IFW.

Wild Turkey

The spring wild turkey hunting season is the season of choice for the majority of turkey hunters. Over the last five years, participation in the spring turkey season has remained relatively stable and the harvest success rate remains high, at over 30%. The fall turkey season has been in place since 2002 and saw significant changes in 2013 with the opening of the season for most of the month of October to "shotguns allowable" hunting. This is reflected in the increase in the fall harvest in 2013 and 2014 (Table 3).

Table 3. Wild Turkey Spring (2002-2014) and Fall (2002-2014) Registered Harvests.

Season	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Spring	3,391	3,994	4,839	6,236	5,931	5,984	6,348	6,043	6,077	5,445	6,079	6,553	5,750
Fall	151	246	204	157	198	1,843	685	712	1,205	667	958	2,182	1,814

Ruffed Grouse

Beginning in 1994, moose hunters have been asked to report the number of ruffed grouse they, and their party, see or harvest during the moose hunting season. Data are compiled by geographic region, and IFW calculates the number of grouse seen per 100 hours of moose hunting effort (Table 4). Based on survey results, the 2014 statewide average of 52 grouse seen per 100 hours of moose hunting increased, compared to last year, and was the highest recorded over the 2000 to 2014 period.

Table 4. Grouse Seen or Harvested/100 hours of Moose Hunter Effort in Maine for the last 15 years (2000-2014).

Location	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Northeast	30	53	23	35	27	11	26	37	31	48	47	59	44	30	59
Northwest	50	55	43	50	56	24	45	44	51	101	101	81	93	62	70
Eastern Lowlands	25	55	29	29	24	8	20	53	23	34	34	30	34	30	62
West & Mountains	28	30	25	26	30	13	25	44	19	36	36	32	50	38	40
Downeast	-	-	13	21	20	9	22	19	28	30	29	15	13	15	14
Statewide	33	48	27	32	31	13	28	39	30	50	49	43	47	35	52

This work is supported by the federal Pittman-Robertson Fund, revenue from the sales of hunting licenses, and from volunteer assistance.

-- Kelsey Sullivan

Ruffed Grouse Research

Ruffed grouse (*Bonasa umbellus*) are arguably the most important, but until recently, the least studied game bird in the State of Maine. Grouse have been well-studied in other areas of North America, and resource managers here lean heavily on the knowledge gained through these studies to inform Maine's grouse management decisions. However, we still believe data are lacking in Maine to effectively inform grouse harvest management decisions into the future. So what changed? Recently Dr. Erik Blomberg joined the faculty in the Department of Wildlife, Fisheries, and Conservation Biology at the University of Maine. Erik is a nationally recognized expert in the ecology and conservation of grouse and well-suited to oversee the project of what we hope will become a landmark study here in Maine. Our research project began last summer and is titled "Understanding population dynamics of ruffed grouse inhabiting multiple-use forest landscapes to inform habitat and harvest management". To assist in this investigation, two of Erik's graduate students, Ellie Mangelinckx and Samantha Davis are now leading field investigations. The researchers are using a combination of banding and radio-telemetry to monitor survival and reproductive success of ruffed grouse at two study areas in Maine. Our overall objectives are to quantify seasonal survival, harvest rates, and to evaluate the effects of habitat composition on ruffed grouse nest success and chick survival in areas with differing forest land uses.

During August and September 2014, the team set 50 traps at each study area. Over this two-month period, these traps logged ~ 5,400 total trap nights and resulted in 196 total captures (including recaptures). They captured 154 unique grouse, and recorded 37 recaptures. They captured 58 adult males, 28 adult females, 31 juvenile males, and 37 juvenile females. At the onset of the hunting season, 106 radio-marked ruffed grouse were alive and available for monitoring, 60 at one central Maine site and 46 at another eastern Maine study site.

Central Maine Study Area: In central Maine, a total of ten radio-marked grouse and one banded-only grouse were harvested. Of these 11 birds, seven were taken by a single hunter who frequents the management area. Throughout the hunting season there were a total of 15 non-harvest related mortalities, mostly by mammalian and avian predators. We lost the signal of two other radioed grouse. During the winter months there were six mortalities at this study area. By this past spring, 27 grouse were being tracked, 11 females and 16 males.

Eastern Maine Study Area: 46 grouse were radioed in eastern Maine prior to the fall hunting season. During the hunting season, three were taken in October, one in November and two in December. Throughout the hunting season there were 13 non-harvest related mortalities, mostly by predators. Beginning in January 2015, there were 27 grouse alive in this study area. Winter mortality was high in this area and ten grouse died in January and February. Beginning in the spring, 14 radioed grouse remained alive, four females and ten males.

During this spring's breeding season, the researchers attempted to quantify characteristics of reproduction, such as clutch size, nest success, and brood productivity, and will eventually evaluate the effects of habitat characteristics (e.g. stem density, understory coverage, species composition) on reproductive output. Unfortunately, sample sizes for nests at the two areas were low, due in large part to high over-winter mortality.

This past spring, Ellie and Sam found and monitored 16 grouse nests. Eight of these hatched, four nests were destroyed by predators, and four hens were taken by predators during the incubation period. The four surviving hens that lost their nests, each attempted a second nest, and an additional nest from an unmarked hen was found with only three eggs, and was assumed to be a second nest for that hen. All second nests were successful. Clutches in first nests most commonly had ten eggs, whereas second nests commonly had seven eggs. As of this writing, seven of eight broods are currently active, with one female believed to have lost her brood shortly after hatch. The researchers have indicated that they are encountering other broods in the study areas on a routine basis.



Ruffed Grouse (Photo by Paul Cyr)

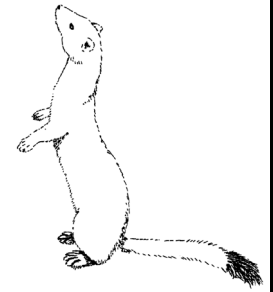
The project objectives leading up to the hunting season will be to evaluate general summertime habitat use by the radioed birds and to radio-mark moved birds. This will give us a better understanding of how birds are using the different management treatments at both our central Maine study area and the commercially harvested stands in the eastern Maine study area. This information should inform how the two different forest treatment types are similar or dissimilar from each other with respect to grouse habitat use. Ultimately, this work seeks to inform ruffed grouse management and improve our ability to conserve the species in Maine.

This work is supported by the federal Pittman-Robertson funds, state revenues from the sales of hunting licenses, and from the University of Maine.

-- Brad Allen

MAMMAL GROUP

The Mammal Group is one of five groups in the Research and Assessment Section (RAS) in the Bangor Office. We help develop and oversee the implementation of management systems for Maine's mammals, monitor populations using a variety of techniques, assist with permit reviews, and provide technical assistance to the public and policy makers. We address public and Departmental informational needs by conducting applied research, strategic planning, public outreach, and by responding to public information requests. Finally, the Mammal Group makes recommendations on changes to hunting and trapping rules to the Wildlife Division Director. These rule changes are made in close cooperation with regional biologists in the Wildlife Management Section, and after analyzing and applying biological data to our management systems.



Long-tailed Weasel

Wally Jakubas, Ph.D., Mammal Group Leader – Supervises Mammal Group personnel, oversees all group activities, writes grant proposals, manages contracts, and helps facilitate the work of Mammal Group biologists. Wally is the Department's lead biologist for the state endangered New England cottontail and serves on the technical and executive committees of the Rangelwide New England Cottontail Initiative. He actively participates in Mammal Group research projects and is an external member of the graduate faculties of the University of Maine and University of New Hampshire. Wally is the Departmental spokesperson on New England cottontail, wolf, and cougar issues.

Randy Cross, Wildlife Biologist – Supervises field crews in radiocollaring bears and collecting biological information, compiles these data, and writes reports for the Department's long-term (39-years) bear monitoring program. Randy also oversees the processing and aging of moose, deer, and bear teeth, and gives numerous talks to the public. Randy is a highly experienced field biologist who has worked for the Department's bear monitoring program for over 30 years. During Randy's tenure, he has shared his enthusiasm and knowledge of bears and bear management with many students, legislators, and members of the general public.

Lee Kantar, Wildlife Biologist – Oversees the management of Maine's moose population – the largest moose population in any state south of the Canadian border. Lee's work includes developing and conducting aerial surveys, collecting biological data, leading a team of biologists in making annual recommendations on moose hunting permits, serving as Departmental spokesperson on moose issues, and serving as IFW's liaison to the Northeast Wildlife Disease Cooperative. Lee is heading up a moose survival study in Maine in which GPS collars are deployed to track the movements and behavior of moose. The primary goal of this study is to identify the factors that limit the growth of Maine's moose population. This includes evaluating the impact that winter ticks and other parasites have on moose survival rates. Results from this study will help IFW estimate year-to-year changes in moose numbers and set allocations of moose permits.

Cory Mosby, Wildlife Biologist – Joined the Mammal Group this year. He comes to us from Grand Canyon National Park and has a solid background in furbearer biology, trapping, and bat conservation. Cory oversees the management of furbearers and small mammals for IFW. He reviews and proposes changes to Maine's trapping regulations, monitors the state's bat populations, provides technical assistance for permit reviews concerning bats and other small mammals, writes grant proposals, and serves as Departmental spokesperson on furbearer and small mammal issues.

Kyle Ravana, Wildlife Biologist – Oversees the management of Maine's white-tailed deer population. Kyle works closely with a team of regional biologists in making annual recommendations on the allocation of Any-deer permits, collects biological data on deer, assists in conducting deer population surveys, organizes IFW's monitoring efforts for chronic wasting disease, and serves as the Departmental spokesperson on white-tailed deer issues. Kyle is conducting a major winter survival study on white-tailed deer, to determine how winter severity affects deer survival rates. IFW's winter severity index is arguably the most important index for predicting year-to-year changes in deer numbers.

Jennifer Vashon, Wildlife Biologist – Oversees the management of black bear and lynx and is the Departmental spokesperson on lynx and bear issues. Jen designs and implements surveys and monitoring efforts for bears and lynx, analyzes biological data, and writes grant proposals, annual reports, and planning documents. Jen analyzes harvest data and makes annual recommendations for harvesting black bears, and provides technical support on nuisance bear issues. A major component of Jen's work involves implementing and reporting on the Department's federal Incidental Take Permit for the incidental trapping of Canada lynx – a federal threatened species. This includes responding to lynx incidental captures, training other biologists, and working with state and federal law enforcement officials.

MAMMAL GROUP CONTRACT WORKERS AND VOLUNTEERS

Each year, the Mammal Group depends on a number of dedicated, hard-working contractors and volunteers to help us accomplish all of our various projects and tasks. We deeply appreciate the efforts of these people and feel that they should be recognized as part of the team that manages Maine's wildlife. While all of our contractors and volunteers perform vital functions, we would like to recognize several individuals who are providing long-term support for our group.

Lisa Bates, Wildlife Management Institute (WMI) contractor – Lisa works on the Bear and Lynx Projects. This year, when Randy Cross was injured, she filled in as the leader for the bear field crew and was critical to the success of the field season.

Kelly Boland, USFWS temporary appointment – Kelly is the New England Cottontail Restoration Coordinator for Maine. Kelly's position is funded, in part, by IFW and by a grant from the National Fish & Wildlife Foundation. She works with various conservation partners to recruit landowners interested in habitat management for New England cottontail, heads up the Maine Lands Management Team, participates in the Outreach Technical Committee for the Rangeland Conservation Initiative, and provides technical support to IFW. Kelly works out of the Rachel Carson National Wildlife Refuge office.

Andrew Johnson, WMI contractor – Andrew works with the Natural Resources Conservation Service (NRCS) in Scarborough Maine to recruit and assist landowners in managing their property for New England cottontail under the Environmental Quality Incentives Program. Andrew's position is currently funded by IFW with support from NRCS and WMI.

Matt O'Neal, WMI contractor – Matt provides field and logistical support for the Moose Survival Study; including performing necropsies, working on the capture team, and making moose / calf observations. Matt helped considerably this year in responding to incidentally trapped lynx and assisted with the collection of biological data from deer. He is always ready to lend a hand when called on.

2014-15 Contract Workers & Volunteers – Bear Project: Jake Feener, Connor Griffin, Mitch Jackman, Brad Jones, Ethan Lamb, Kirk Michaud, Mike Latti, and Meaghan Taylor; **Deer Project:** Brian Allen, Holly Bates, Wade Beattie, Nicole Bellerose, Joe Bellerose, Adri Bessenaire, Aaron Black, Heather Brinson, Diane Dunham, Wendell Harvey, Ryan Harris, Emily Higgins, Sue Kelly, Ethan Lamb, Joshua Matijas, Marie Martin, Jerry McLaughlin, Eldon McLean, Joe Roy, Kevin Spigel, Dylan Whitaker, and Alexis Yashin; **Lynx Project:** Katelin Craven; **Moose Project:** Becky Bloomfield, Brittany Currier, Colin Hoffman, Joshua Matijas, Alexej Siren, and Justin Sutherland; **New England cottontail:** Sean Campbell.

MAMMAL CONSERVATION AND MANAGEMENT

White-tailed Deer

2014 Deer Harvest

Season Dates and Structure

Maine offered five different structured hunting seasons (i.e., Expanded Archery, Regular Archery, Youth Day, General Firearms, and two Muzzleloader seasons) which provided hunters with a total of 85 days in which they could pursue white-tailed deer, in 2014.

Doe Quotas, Any-Deer Permits, and Applicants

The Department distributed 37,185 doe permits amongst 12 Wildlife Management Districts (WMDs) to meet its doe harvest objective of 4,348 does, in 2014. IFW annually applies an expansion factor to the harvest quota to meet the doe harvest objective. This results in more permits issued than does expected to be harvested.

2014 Permit allocations ranged from zero in 17 WMDs (1-11, 13, 14, 18, 19, 27, and 28), to 8,550 permits in WMD 21. The top five WMDs receiving Any-deer Permits on a per 100 mi² basis were WMD 21 (1,778 permits), WMD 24 (1,543 permits), WMD 20 (1,233 permits), WMD 22 (528 permits), and WMD 23 (480 permits). In 2014, Maine residents drew 24,293 permits (65%), landowners (comprised of residents and non-residents) drew 5,615 permits (15%), juniors (comprised of residents and non-residents) drew 5,143 permits (14%), nonresidents drew 1,547 permits (4%), and Superpack permittees won 587 permits (2%). Overall, 64,811 people applied for Any-deer Permits for the

2014 hunting season (60,556 residents, 8,247 landowners (comprised of residents and non-residents), 6,165 juniors (comprised of residents and non-residents), 4,255 nonresidents, and 1,592 Superpack; (Superpack were all counted as part of resident applicants).

Statewide Statistics

22,490 deer were registered during the 2014 hunting season of which 1,588, 498, 810, 18,510, and 1,064 were taken during the expanded archery and regular archery, youth day, regular firearms, and muzzleloader seasons, respectively (Table 5). There were 2,305 fewer deer harvested in 2014 than in 2013, representing a 9% decrease from 2013.

Buck Harvest

The 2014 statewide harvest of 15,986 antlered bucks is a 4% decrease from the 2013 hunting season, in which hunters registered 16,765 adult bucks (Table 6). On average, Maine hunters harvested bucks at a rate of approximately 0.83 bucks per square mile during the 2013 hunting season. Excluding WMD 29, the top five buck-producing (per mi² basis) WMDs in 2014 were (in descending order), districts 24, 22, 21, 20, and 23 (Figure 1). Department biologists estimate that approximately 47% (~7,865) of harvested antlered bucks were 1½ year old deer, sporting their first set of antlers. The 2014 yearling male frequency (YMF) is similar to the frequency of yearling males in 2013. It is important to note that YMF does not translate to a removal of 47% of a population's yearlings. Rather, YMF provides IFW with an estimate of annual all-cause (i.e., hunting mortality, road-kill, natural mortality, etc....) buck mortality. The relatively low YMF in

Maine indicates that the state's buck population experiences a relatively low mortality rate and should thus have a healthy age structure.

Antlerless Deer Harvest

Overall, 6,484 antlerless deer were registered by hunters. Excluding WMD 29, the statewide total harvest of adult (yearling and older) does was 4,401 individuals, bringing the harvest to within 1% of the Department's recommended harvest of approximately 4,348 animals. Any-deer permittees tagged 1,438 fawns during the firearms seasons, while archers and youth day hunters tagged 366, and 167, young of the year, respectively.

Table 5. Statewide sex and age composition of the 2014 deer harvest in Maine by season type and week. Records were corrected and/or adjusted to account for registration errors.

Season	Sex/Age Class				Total Deer	Total Antlerless Deer	Percent by Season and Week		
	Adult		Fawn				Total	Buck	Antlerless
	Buck	Doe	Buck	Doe					
Archery	826	894	164	202	2,086	1,260	9%	5%	19%
Expanded	571	717	131	169	1,588	1,017	7%	4%	16%
October	255	177	33	33	498	243	2%	2%	4%
Youth Day	322	321	78	89	810	488	4%	2%	8%
Regular Firearms	14,168	2,904	816	622	18,510	4,342	82%	89%	67%
Opening Saturday	1,272	311	97	71	1,751	479	8%	8%	7%
November 3-8	3,773	797	241	174	4,985	1,212	22%	24%	19%
November 10-15	3,472	637	174	139	4,422	950	20%	22%	15%
November 17-22	3,153	487	143	100	3,883	730	17%	20%	11%
November 24-29	2,498	672	161	138	3,469	971	15%	16%	15%
Muzzleloader	670	282	56	56	1,064	394	5%	4%	6%
December 1-6	347	96	23	22	488	141	2%	2%	2%
December 8-13	323	186	33	34	576	253	3%	2%	4%
Unknown ¹					20				
Total	15,986	4,401	1,114	969	22,490	6,484	100%	100%	100%

¹Registration information with missing information may inhibit our ability to assign the data to a particular sex, and/or season.

Table 6. Sex and age composition, and harvest numbers, of the 2014 deer harvest in Maine by Wildlife Management District¹.

WMD	Total				Harvest Per 100 Adult Bucks				Harvest Per 100 Sq. Miles Habitat			
	Adult		Fawn		Antlerless Deer	All Deer	Adult Does	Antlerless	Adult Bucks ²		All	Adult Does
	Buck	Doe	Buck	Doe					Bucks ²	All		
1	132	1	0	0	1	133	1	1	9	9	0	
2	114	1	1	0	2	116	1	2	10	10	0	
3	139	0	0	0	0	139	0	0	16	16	0	
4	75	0	1	0	1	76	0	1	4	4	0	
5	277	2	0	0	2	279	1	1	19	19	0	
6	359	3	2	0	5	364	1	1	25	26	0	
7	358	5	6	1	12	370	1	3	26	27	0	
8	305	3	4	0	7	312	1	2	16	16	0	
9	108	0	0	0	0	108	0	0	12	12	0	
10	115	1	0	0	1	116	1	1	12	12	0	
11	423	0	1	0	1	424	0	0	25	26	0	
12	526	76	28	20	124	650	14	24	57	71	8	
13	455	35	14	4	53	508	8	12	81	90	6	
14	356	14	12	3	29	385	4	8	49	53	2	
15	775	282	78	68	428	1,203	36	55	83	129	30	
16	1,047	285	86	58	429	1,476	27	41	136	191	37	
17	2,048	536	178	144	858	2,906	26	42	153	217	40	
18	375	10	7	3	20	395	3	5	30	32	1	
19	176	2	0	0	2	178	1	1	15	15	0	
20	1,009	536	116	105	757	1,766	53	75	174	304	92	
21	920	598	109	118	825	1,745	65	90	191	363	124	
22	834	291	68	72	431	1,265	35	52	193	292	67	
23	1,257	469	114	110	693	1,950	37	55	161	250	60	
24	483	344	71	76	491	974	71	102	220	444	157	
25	913	300	70	64	434	1,347	33	48	130	192	43	
26	1,099	238	61	52	351	1,450	22	32	122	161	26	
27	449	2	1	0	3	452	0	1	61	62	0	
28	270	3	1	0	4	274	1	1	25	25	0	
29	322	232	50	59	341	663	72	106	222	457	160	
Unknown	267	132	35	12	20	466						
Statewide	15,986	4,401	1,114	969	6,325	22,490	28	40	56	78	15	

¹Sex/age data were corrected for errors in the deer registrations

²Recorded BKI

Harvest by Season and Week

Approximately 82% of the total deer harvest occurred during the 4-week firearms season (Table 5). Both Archery and Muzzleloader seasons remained virtually unchanged from 2013. Youth day took place on Saturday, October 26th, resulting in the harvest of 335 adult bucks, and 446 antlerless deer. Overall, Maine's youth experienced an increase in their deer harvest by approximately 3% over the 2013 hunting season.

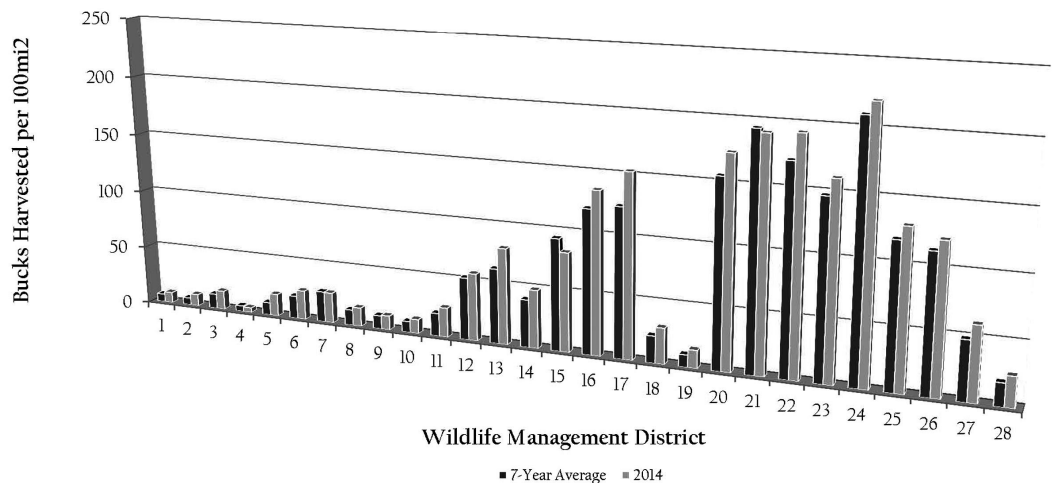


Figure 1. The 2014 buck-kill-index (BKI) exceeded the 7-year average BKI, in Maine. The BKI is used to assess white-tailed deer population trends within the state. Therefore, an increase in the BKI may be result of an increase in the abundance of deer on the Maine landscape.

Harvest by Hunter Residency

Residents tagged approximately 90.9% (20,454 deer) of the total harvest (Table 7). Among seasons, the proportion of the harvest registered by Maine residents was highest for archery (96.2%) and youth day (96.9%), followed by muzzleloader (94.9%), and firearms (90.0%). Regional differences occurred in the distribution of the harvest by residents and visitors to Maine (Table 8). In the more populous central and southern WMDs, most successful deer hunters were generally Maine residents (Table 9).

Hunter Participation

In 2014, Maine sold 204,672 hunting licenses that permit deer hunting. Of these, approximately 11% were bought by non-residents, representing a decrease in the proportion of sales to non-residents (Figure 2). However, total sale of licenses was the same as 2013. Statewide hunter participation is estimated at approximately 175,000 hunters, which translates to a hunter density of approximately six hunters per square mile, on average.

Table 7. Statewide deer registrations in Maine by season type and residence.

Season and Week	Residents	Nonresidents	Unknown	Total	Percent by Residents
Archery	1,976	78		2,054	96.2%
Expanded	1,505	52		1,557	96.7%
October	471	26		497	94.8%
Youth Day	782	25		807	96.9%
Regular Firearms	16,681	1,847		18,528	90.0%
Opening Saturday	1,702	43		1,745	97.5%
November 3-8	4,552	452		5,004	91.0%
November 10-15	3,930	481		4,411	89.1%
November 17-22	3,362	533		3,895	86.3%
November 24-29	3,135	338		3,473	90.3%
Muzzleloader	1,015	55		1,070	94.9%
December 1-6	450	38		488	92.2%
December 8-13	565	17		582	97.1%
Unknown ¹			31	31	100.0%
Total	20,454	2,005		22,490	90.9%

¹Missing records due to incomplete information.

Compared to the regular firearms season, which on average attracts an estimated 150,000 or more participants (estimated by license sales and the Department's Hunter Effort Survey), the expanded archery and special muzzleloading seasons attract far fewer hunters. In its 17th year, the expanded archery season attracted 9,957 participants (over 90% residents). Although special muzzle loading season experienced a decrease (~13%), participation, it continues to attract a large number of hunters with the sale of 12,928 permits.

Prospects for the 2015 Deer Season

In 2015, the Department will again offer 5 separate deer hunting seasons in Maine. The expanded archery season will open September 7th and run through December 12th. This season is limited to WMDs 24 and 29 as well as 10 other locations, primarily in residential-suburban areas with firearms discharge ordinances. Hunters with a valid archery license may purchase multiple antlerless permits for \$12.00 each and one buck permit for \$32.00. The purpose of the expanded archery season is to increase the harvest of does and fawns in and around urban areas; especially in areas that are difficult to access via the October archery and regular firearms hunting seasons. Harvesting does and fawns in urban areas not only provides additional hunting opportunity, but addresses the needs of landowners concerned about property damage caused by high deer densities in these areas. In the expanded archery zone, deer populations can only

Table 8. Deer registrations by hunter residence and county of kill in Maine during the 2014 hunting season.

County of Kill	Resident			Unknown	Total	Percent by Residents
	Residents	Transient ¹	Nonresidents			
Androscoggin	916	178	35		1,129	81.1%
Aroostook	796	163	167	12	1,138	69.9%
Cumberland	1,483	413	55	3	1,954	75.9%
Franklin	572	199	124		895	63.9%
Hancock	786	166	59	1	1,012	77.7%
Kennebec	1,489	220	41	15	1,765	84.4%
Knox	743	179	53	1	976	76.1%
Lincoln	437	80	32		549	79.6%
Oxford	1,000	293	186	2	1,481	67.5%
Penobscot	2,058	355	236	3	2,652	77.6%
Piscataquis	484	396	212		1,092	44.3%
Sagadahoc	533	207	20		760	70.1%
Somerset	1,259	492	262	3	2,016	62.5%
Waldo	987	365	111		1,463	67.5%
Washington	690	72	43	2	807	85.5%
York	2,028	149	192		2,369	85.6%
Unknown				432	432	
Statewide	16,261	3,927	1,828	474	22,490	72.3%

¹Resident transients are residents of the State of Maine who harvested a deer in a WMD in which they do not reside within.

for nonresidents the following Monday. This season ends Saturday, November 28th. Finally, the muzzleloader season will begin in all WMDs on November 30th, but will end on December 5th (6 days) in WMDs 1 – 11, 14, 19, 27 and 28. Elsewhere, the muzzleloading season will continue remain open from December 7th-12th. **Crossbow archery season will coincide with modern firearms and during the archery season for special situations. Please review your Maine State Hunting Regulations or contact your local game warden for questions about use of crossbows.**

Table 9. 2014 deer registrations by Wildlife Management District and hunter residence.

WMD	Residents		Transients ¹		Nonresidents		Unknown	Total
	Number	Percent	Number	Percent	Number	Percent		
1	12	9.0%	71	53%	50	37%	1	134
2	37	30.1%	49	40%	30	24%	7	123
3	88	55.7%	45	28%	6	4%	19	158
4			44		32			76
5	26	9.1%	185	65%	68	24%	6	285
6	290	79.2%	45	12%	29	8%	2	366
7	111	29.9%	135	36%	124	33%	1	371
8	47	14.9%	153	49%	112	36%	3	315
9	25	23.1%	54	50%	29	27%		108
10	56	43.4%	37	29%	23	18%	13	129
11	204	47.6%	146	34%	74	17%	5	429
12	435	66.1%	147	22%	68	10%	8	658
13	304	59.5%	156	31%	48	9%	3	511
14	144	37.2%	145	37%	96	25%	2	387
15	854	70.6%	240	20%	109	9%	7	1,210
16	1,115	75.1%	315	21%	46	3%	8	1,484
17	1,962	67.4%	684	23%	260	9%	7	2,913
18	262	65.0%	89	22%	44	11%	8	403
19	100	55.6%	60	33%	18	10%	2	180
20	1,361	76.0%	237	13%	168	9%	24	1,790
21	1,206	68.1%	493	28%	46	3%	25	1,770
22	1,033	80.7%	206	16%	26	2%	15	1,280
23	1,321	67.3%	470	24%	159	8%	12	1,962
24	608	61.7%	345	35%	21	2%	11	985
25	1,125	81.3%	137	10%	85	6%	37	1,384
26	1,130	75.0%	259	17%	61	4%	56	1,506
27	372	79.7%	68	15%	12	3%	15	467
28	140	50.0%	116	41%	18	6%	6	280
29	310	46.4%	322	48%	31	5%	5	668
Unknown					158			158
Statewide	14,678	54%	5,453	30%	2,051	13%	308	22,490

¹Resident transients are residents of the State of Maine whom harvest a deer from a WMD in which they do not reside.

be reduced if the limited number of archers that can gain access to huntable land are each able to harvest a substantial number of deer; hence the unlimited availability of doe tags.

The regular (statewide) archery season will run from October 1st - October 30th. Youth day will be Saturday, October 24th, and is reserved for hunters between 10 and 15 years old, who are accompanied by a licensed adult. The Department asks you to please remember that youth hunters are limited to bucks only in WMDs that have not been allocated a doe quota. The 25-day regular firearms season opens for Maine residents on Saturday, October 31st, and

Availability of Any-deer Permits among our 29 WMDs is directly related to our deer management objectives. We are continuing with a no doe harvest policy in most eastern and northern WMDs where we are trying to increase deer densities. In contrast, does must be more heavily harvested to meet, or maintain, current objectives of 15 to 20 deer/mi². Maine's deer density goals are publicly derived goals, providing a compromise between the interests of hunting and viewing opportunities while minimizing potential negative impacts to the public caused by whitetails (e.g., ornamental plant and crop damage, and deer-car collisions).

To accomplish deer management objectives in 2015, we have set doe harvest quotas ranging from 0 to 635 animals among our 29 WMDs. Totalling 3,274 does statewide, the 2015 doe quota is 25% below the doe harvest we

achieved in 2014. A total of 28,770 Any-deer Permits will be issued statewide ranging from 0 permits (WMDs 1, 2, 4, 5, 7-13, 19, and 27-29) to 6,350 permits in WMD 21. WMD 18 will receive its first allocation of ADPs since 2007.

The allocation of 28,770 Any-deer Permits, along with the archery and youth seasons, should result in the statewide harvest of roughly 3,274 does and an additional 1,596 fawns, in 2015. Antlered buck harvests should approximate 14,500 which is approximately a 10% decrease from the 2014 buck kill of 15,986 animals. If normal hunting conditions and hunter effort prevail, Maine's statewide deer harvest should be around 19,000 animals.

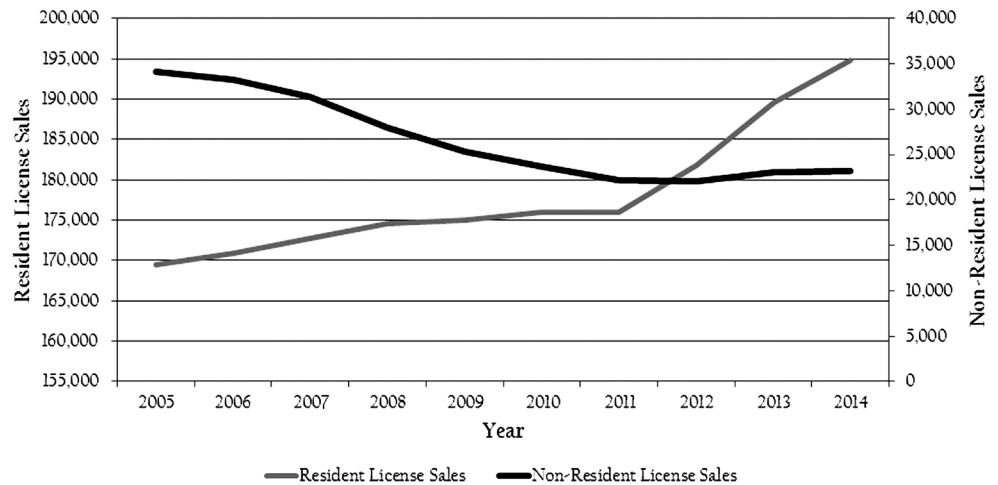


Figure 2. Until recently, Maine's sale of hunting licenses has been declining which may be attributable to the decline in the number of non-resident hunters, beginning around 2001. However, resident license sales have continued to increase during recent times, perhaps indicating a renewed interest in the sport. Note that the values for non-resident sales are expressed on the secondary axis shown on the right of the graph.

Disease Monitoring in Maine's Deer and Moose

Chronic Wasting Disease

Disease Overview:

- CWD is a fatal brain disease of white-tailed deer, mule deer, caribou, moose, and elk. It is similar to mad cow disease which occurs in cattle.
- CWD occurs in wild deer populations in 2 provinces in Canada and 18 states in the U.S., states as close as Pennsylvania and New York.
- CWD has not yet been recorded as being transmissible to people. However, a human variant of the disease does exist.
- CWD can persist in the environment outside of a host for many years. Recent research has shown that the disease can uptake the disease agent and subsequently become a potential vector of CWD.
- Thus far, CWD has a 100% mortality rate in deer.

CWD Monitoring and Prevention in Maine:

- Maine has actively monitored for CWD each year since 1999, and since that time screened over 9,000 wild deer. Thus far, Maine proudly remains CWD free.
- IFW prohibits the transportation of unprocessed deer carcasses, and/or parts, into Maine from states that are not adjacent to our state.
- IFW will not transplant deer from other states into Maine.

IFW Recommends that Individuals:

- Refrain from feeding deer during the winter months, as high densities of deer within a small area can increase disease transmission.
- Contact their regional wildlife biologist or warden if an animal shows clinical signs of illness, such as loss of fear of humans, drooling, and excessive weight loss.
- Do not use urine-based lures, as CWD has been shown to be spread via bodily fluids. To the best of our knowledge, commercial lures are not currently monitored for CWD.
- Take precautionary steps, such as using latex gloves while processing the animal, and sterilize equipment after it is used. These steps will help to reduce potential transmission of the disease to humans.
- **Thus far, CWD has not been identified in a person.** Nevertheless, avoid consumption of the brain and spinal tissues.

This work is supported by volunteer assistance, the federal Pittman-Robertson Funds program, and revenue from the sales of hunting licenses.

-- Kyle Ravana

Moose

2014 Moose Harvest

Season Dates and Structure

Maine Moose hunters could hunt moose for 6 days by permit within the structure of a split season framework (September/October/November) during 2014. The September season ran from September 22nd to September 27th, while the October season ran from the 13th through the 18th. For the 5th year, a 3rd week of hunting was offered in the north country (Wildlife Management Districts [WMDs] 1-4, and 19) from November 3rd through November 8th. In 2011, WMDs 22 and 25 were added to the southern Maine moose hunt which includes WMDs 15, 16, 23 and 26. The southern Maine moose hunt runs concurrently with the November deer season from November 3rd to November 29th and opened for Maine residents on November 1st.

Moose Permits and Applicants

The annual allocation of moose permits is a function of WMD specific management goals. Moose management goals are categorized as either recreational, compromise, or road safety. Permit levels changed in 9 management districts between 2013 and 2014 providing an overall decrease of 1,015 permits. This included decreased antlerless permits in WMDs 1-5, 7 and 8 primarily in response to a severe winter tick year that resulted in increased mortality in IFW study area WMD 8. The number of moose permits allocated in 2014 was 3,095. Additional permits may be issued in a given year when permits are deferred one year due to permittee illness, armed service status, or similar situation.

During 2014, a total of 625 Antlerless-only Permits (AOPs) were allotted to 5 WMDs (1-4 and 19). The number of AOPs allocated in a given district is a reflection of a harvest level that will either grow, decline, or stabilize the district's moose population. Consequently, WMDs that can sustain only limited cow mortality are allocated relatively few antlerless permits. In contrast, WMDs that can support higher cow mortality, and still meet management objectives due to population size and structure, are allocated more permits. The southern Maine WMD moose hunt is a slight variation on this. Because of low moose densities in southern Maine, only Any-moose permits are allocated, and the season is extended to the length of the November deer season to increase the chances of a hunter harvesting a moose. The November time frame was chosen to honor recommendations by landowners who wanted the southern Maine moose season to open concurrently with the November firearms season for deer.

Permits were allocated to qualified applicants in a random computerized lottery. Overall, 53,545 people applied for a moose permit during 2014. This included 38,389 residents and 15,156 non-residents. Out of those applicant pools 7.3% of the residents and 2% of the non-residents were selected for permits.

Statewide Statistics for 2014

Overall, 2,022 moose were registered during 2014 (Table 10). Since the re-institution of moose hunting in 1980, moose season timing (split seasons started in 2002) and areas open to hunting have changed several times.

Bull Harvest

The 2014 statewide harvest of 1,599 antlered bulls during the Sept/Oct/Nov seasons marked a 13% decrease from the previous year's harvest (1,848). Among the antlered bulls taken in 2014 (and aged by cementum annuli 1,347), 179 (5%) were 1½ years old (yearlings) sporting their first set of antlers, while 302 were 2½ years old (25%), and 246 were 3½ year olds (20%). Mature bulls between 4½ to 14½ years old comprised 51% of the bull harvest.

On average, breeding bulls lose approximately 15% of their body mass during the rut. Because of this and the timing of the fall harvest, bull weights reflect a decrease in body mass from September to October. Average bull weights (yearling and older) in the 2014 harvest for September were 730 pounds versus 661 pounds (i.e., dressed weights) in the October harvest (a 9% decline). The heaviest bull weighed in at 1,056 dressed (no digestive tract, heart, lungs, or liver) and was killed in WMD 6 during the September season (7.5 years old). The largest antler spread was 63 inches on a 7.5 year old bull with 24 legal points. Among antlered bulls examined in the harvest, 20% of the bulls sported cervicorn antlers (antlers without a defined palm) and ~43% of these animals were yearlings; 12% were mature bulls (>4 years old) including the oldest at 12.5 years-old.

Antlerless Harvest

The 2014 statewide harvest of adult (yearling and older) cows decreased substantially from the 2013 harvest (384 vs. 1,013, respectively). Fewer antlerless-only permits were issued in 2014 (-640 or -56%) in response to high adult cow moose mortalities observed during the winter of 2014 in IFW's moose survival study. This reduction in permits resulted in a 62% decrease in the antlerless-only harvest. In addition to the 384 adult cows that were harvested, 39 calves (i.e., 19 males, and 20 females) were harvest for a total harvest of 423 antlerless moose for the 2014 season. This decrease included the antlerless moose taken as part of the 130 Any-moose permits issued within the southern zones. The antlerless moose harvest in the southern zones was comprised of 29 bulls, 19 adult cows and 4 calves.

Table 10. 2014 Maine moose season registered kill by WMD, season, permit type, and success rates.

WMD	Season	Permit Type	Number of Permits	2014 Registrations		WMD	Season	Permit Type	Number of Permits	2014 Registrations			
				Kill	Success Rates					Kill	Success Rates		
1	Sept.	BOP	150	128	85%	14	Oct.	BOP	35	21	60%		
	Oct.	BOP	125	86	69%				WMD Subtotals	35	21	60%	
	Nov.	AOP	100	67	67%		15	Nov.	AMP-B	7	5		
		WMD Subtotals*	375	281	75%			AMP-C	5				
2	Sept.	BOP	225	173	77%				WMD Subtotals	25	12	48%	
	Oct.	BOP	200	127	64%	16	Nov.	AMP-B	5				
	Oct.	AOP	50	40	80%			AMP-C	5				
Nov.	AOP	125	89	71%				WMD Subtotals	20	10	50%		
		WMD Subtotals*	600	429	72%	17	Oct.	BOP	20	7	35%		
3	Sept.	BOP	100	79	79%				WMD Subtotals	20	7	35%	
	Oct.	BOP	80	73	91%		18	Oct.	BOP	40	14	35%	
	Oct.	AOP	25	23	92%				WMD Subtotals*	40	14	35%	
Nov.	AOP	75	59	79%	19	Sept.		BOP	50	24	48%		
		WMD Subtotals*	280	234		84%		Oct.	BOP	50	21	42%	
4	Sept.	BOP	300	201		67%		Nov.	AOP	50	30	60%	
	Oct.	BOP	100	63	63%			WMD Subtotals*	150	75	50%		
	Oct.	AOP	50	26	53%	22	Nov.	AMP-B	0				
Nov.	AOP	150	92	61%			AMP-C	0					
		WMD Subtotals*	600	382	64%				WMD Subtotals	10	0	0%	
5	Sept.	BOP	100	86	86%	23	Nov.	AMP-B	0				
	Oct.	BOP	25	18	72%			AMP-C	3				
			WMD Subtotals*	175	148		85%			WMD Subtotals	25	3	12%
6	Sept.	BOP	100	71	71%	25	Nov.	AMP-B	4				
	Oct.	BOP	50	44	88%			AMP-C	1				
			WMD Subtotals*	150	115		77%			WMD Subtotals	25	5	20%
7	Oct.	BOP	125	77	62%	26	Nov.	AMP-B	0				
			WMD Subtotals*	125	77		62%		AMP-C	1			
			WMD Subtotals*	175	94		54%			WMD Subtotals	25	1	4%
8	Oct.	BOP	175	94	54%	27	Oct.	BOP	15	2	13%		
			WMD Subtotals*	175	94		54%			WMD Subtotals	15	2	13%
	9	Oct.	BOP	75	53		71%	28	Oct.	BOP	20	9	45%
			WMD Subtotals	75	53	71%				WMD Subtotals	20	9	45%
10		Oct.	BOP	60	27	45%				OVERALL WMD TOTALS	3,095	2,022	65%
			WMD Subtotals*	60	27	45%							
	11	Sept.	BOP	25	18	72%							
Oct.		BOP	25	11	44%								
			WMD Subtotals*	50	29	58%							
12	Oct.	BOP	35	22	63%								
			WMD Subtotals*	35	22	63%							
	13	Oct.	BOP	35	16	46%							
			WMD Subtotals*	35	16	46%							

BOP = Bull Only Permit – The holder may kill one male moose of any age.
AOP = Antlerless Only Permit – The holder may kill a cow, a calf, or a bull w/antlers shorter than its ears.
AMP = Any Moose Permit - The holder may kill any moose.
*Does not include additions to total permit allocation through deferment, hunt of a lifetime, and auction.

Moose Reproductive Data

Antlerless permits during the November season in WMDs 1-4, and 19 allowed us to collect reproductive data critical to assessing and monitoring moose population health and growth. In 2014, hunters removed and brought in 126 sets of moose ovaries for examination by biological staff. A cow’s body weight and condition have a bearing on her potential to become pregnant and on the number of offspring she will produce. Pregnancy rates of cow moose with age and weight data was normal at 80%. Typically, moose do not become pregnant until 2.5 years old. Of the cow moose examined this year, 14% of yearlings and 80% of the mature cows (2.5+ years) were pregnant.

Corpora lutea are identifiable structures within the ovaries that provide an indication of ovulation and potential pregnancy rates. Overall, there were 0.91 corpora lutea / cow for cows older than 3.5 years (>1.15 would be considered normal/ healthy). This may be an indication that moose in the northern portion of the state are near ecological carrying capacity, since the amount of available forage (food) is what allows cows to attain the body weight necessary for reproductive success. We anticipate that additional sampling of female moose will provide a clearer picture of this relationship across northern Maine, as well as regionally.

Hunter Participation, Residency and Success Rate

In 2014, 2,785 residents and 310 non-residents won permits to hunt moose. A total of 250 non-residents were successful in their hunt (81% success rate). Out-of-state hunters came from 34 states (as far away as California) and 2 provinces (Nova Scotia and New Brunswick). The majority (18.7%) of out-of-state hunters came up from Pennsylvania. Resident success rates were 61% and when combined with the outstanding success by out-of-staters, the total success rate was 65% statewide. The higher success rate of out-of-state hunters, as compared to residents, may be attributed to the higher proportion of out-of-state hunters using registered Maine Guides for their hunt. Success rates over the last 10 years have been around 80%. Conditions for September and November were seasonable; however multiple days in September and October were, yet again, unseasonably warm.

Changes for the 2015 Moose Season

In 2015, there will be 4 separate moose hunting periods in Maine. The September season will run from September 28th to October 3rd in WMDs 1-6, 11 and 19; the October season will run from October 12th through the 17th and include WMDs 1-14, 17-19, 27, and 28. In WMDs 15, 16, 23, 25 and 26, the season will coincide with November's deer season, which runs from November 2nd through November 28th. Opening day for Mainers will be on Saturday October 31st. Also for 2015, WMDs 1-4 and 19 will have an additional moose hunt in November from the 2nd through the 7th. In total, Maine's moose hunt will offer 2,740 permits for 2015.

Comprehensive Moose Management in Maine

Beginning in the winter of 2010-11, IFW began conducting aerial surveys to estimate moose abundance and composition (bull, cow and calf) across the core range of moose in Maine (roughly a line from Grafton Notch to Calais). Aerial survey data, reproductive data from female moose (ovaries), and age data from moose teeth (removed at registration stations) is providing biologists with a more complete picture of Maine's moose population (i.e., size and composition) than ever before. Biologists and regulators (e.g., Commissioner's Advisory Council) use these data to set moose permit levels to meet publicly derived management goals. Moose viewing and moose hunting are two primary goals for moose that are equally weighed for management purposes.

The size of Maine's moose population is not static and will change annually in response to many factors including birth rates of calves and the survival of adults. In the winter of 2014, the Department began an adult female and calf survival study to monitor survival rates over the next few years and more closely examine sources of mortality. This past winter 35 more calves were fitted with GPS collars as part of this ongoing research. Moose will be monitored over the next 5 years to closely investigate these important elements of the moose population.

This work is supported by volunteer assistance, the federal Pittman-Robertson Funds, and revenue from sales of hunting licenses, and a grant from the Outdoor Heritage Fund.

-- Lee Kantar

Black Bear

Maine's black bear, an iconic symbol of Maine's forests, is one of Maine's wildlife success stories. Once relegated to no more than a nuisance, the black bear has risen in stature to one of Maine's most prized animals. Today, the expansive forest of northern, eastern, and western Maine supports one of the largest black bear populations in the United States (Figure 3).

Maine's bear population is valued not only by hunters, but others who enjoy watching wildlife and appreciate Maine's wildlife diversity. On the other hand, when conflicts with people and bears do occur, both bears and people suffer. IFW strives to balance these needs by making management decisions based upon science gathered from monitoring Maine's bear population, bear harvest, and conflicts. Maine's black bear population is closely studied by Department biologists through one of the most extensive, longest running biological studies in the U.S. Over the last 40 years, Department biologists have captured and tracked over 3,000 bears to determine the health and condition of Maine's bears and estimate how many cubs are born each year.

Since 2004, Maine's bear population has been increasing and was estimated at over 30,000 animals in 2010. Hunting is the Department's primary tool for managing this thriving bear population. To meet population

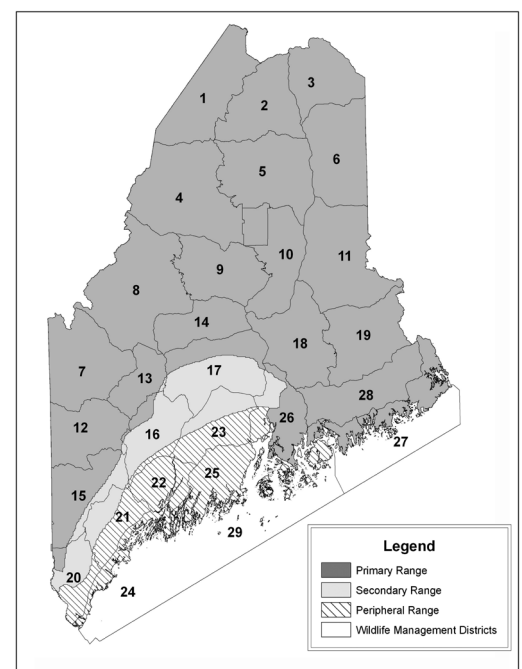


Figure 3. Maine black bear range.

objectives, a variety of traditional hunting methods are offered in Maine including trapping and hunting with bait, dogs, and still-hunting/stalking. Hunters can also take a bear while hunting deer. Over 90% of the bears killed each year is by baiting, hunting with dogs, and trapping; still-hunting/stalking accounts for less than 10% of the harvest. Even with ample hunting opportunity, success rates remain in favor of the bear, where on average 26% of hunters using bait and hounds and less than 20% using traps actually harvest a black bear. Hunters that use still hunting or stalking techniques to harvest black bears have the lowest success rates (<3%), due in a large part to Maine's dense forests.

Since 2005, the number of bears harvested each year has been below objectives leading to an increase in Maine's bear population from 23,000 black bears in 2004 to over 30,000 in 2010. Despite a large bear population, the number of conflicts between humans and black bears in Maine is lower than other northeastern states and averages about 500 complaints each year. This relatively low level of conflicts between bears and people is attributed in part to bears being more common where human densities are lowest. However, if Maine's bear population continues to grow, conflicts could rise as bears move into areas with higher human densities.

Maine's black bears are highly valued by outdoor enthusiasts and the general public. The Department of Inland Fisheries and Wildlife understands that a healthy, well managed bear population provides opportunities for everyone to enjoy. Biologists set management goals with public input through the Department's strategic planning process. Hunters in Maine are provided a variety of traditional hunting methods to meet these goals and ensure Maine's bear population continues to thrive without increasing conflicts in backyards and neighborhoods.

Last fall, for the second time in 10 years, Maine voters defeated a ballot measure that would have eliminated our most effective bear hunting methods (bait, dogs, and traps) that keeps our large bear population in check. This past legislative session, several bear hunting bills were presented to the Maine legislature. Many of these bills failed in Committee, since no additional data or information was presented that could persuade the Committee to overturn Maine voters' decision on legal bear hunting methods. This year, an updated planning document for Maine's big game species (deer, moose, bear, and turkey) will be prepared with public input where hunting methods will also be discussed. This process will help guide management of Maine's big game over the next 10 year planning period.

Living with Black Bears

The abundance of natural resources, including wildlife, is what makes life in Maine especially enjoyable. With more than 90% of Maine forested, Maine's bear population is one of the largest in the country. Despite a large population of bears, conflicts between people and bears are relatively few. However, you may disagree if you live in a community that is experiencing problems with bears. Conflicts are the greatest in the spring, when bears emerge from their winter dens. As bears search for food, they sometimes encounter food odors that attract them to backyards and neighborhoods. Once berries begin to ripen in late summer, bears return to wooded areas to forage, which reduces conflicts with people. However, when natural foods are not abundant, bears are more likely to continue to search for food provided by people. The most common complaints we receive each spring involve bears feeding at bird feeders and on garbage. Although it may seem simple to move or destroy the offending bear, if you don't eliminate food odors, more bears will continue to visit your backyard.

To avoid enticing bears to your backyard, neighborhood, or farm, the best solution is to remove/secure common bear attractants every spring before you experience problems.

All of us can take a few simple steps each spring to reduce encounters with black bears.

- Bring your bird feeders in by April 1 and do not resume feeding birds until November.
- Store bird seed in secure location, and rake and remove waste seed from the ground.
- Keep your garbage secure in a building.
- Do not bring trash to the curb until the morning of pick-up.
- Keep dumpster lids closed and locked, and if a dumpster is overflowing with garbage, call the disposal company and have the waste removed.
- Keep pet and livestock feed in a building or other secure enclosure.
- Clean or burn off outdoor grills to reduce food odors; if possible, store the grill in a building when not in use.
- Use electric fence around bee hives, and avoid setting hives close to forested edges.
- When possible keep livestock and poultry indoors at night.

Remember, if your neighbors are not taking these steps as well, then bears may continue to frequent the area.

Many people expect the Department to move bears that are frequenting backyards, communities, and agricultural areas because it provides a quick fix to a problem and is perceived as a humane response. However, trapping and moving a bear is not always appropriate or effective. Bears that are trapped and transferred to a new area do not stay where they

are released. Often these bears return to the area or create problems in new areas. In addition, moving bears puts bears at greater risk of mortality as they encounter more roads, other bears, and people. However, in some situations, it may be appropriate to move a bear to provide a temporary solution to a problem that has resulted in extensive property/livestock damage or poses a potential risk to human safety. Before the bear is moved, attractants must be removed or secured to prevent future problems.

We have revised our website and other outreach materials that provides additional information on what to do if you encounter a bear in your backyard, neighborhood, or while recreating in Maine. Please check it out at <http://www.maine.gov/ifw/wildlife/species/mammals/bear.html>.

The 2014 Black Bear Hunting and Trapping Season

The Department's management of Maine's black bears includes setting the season length, bag limit, and legal methods of hunting. We require hunters to register their bear so we can monitor harvest levels, and hunters are required to purchase a bear permit (except resident deer hunters during the firearm season). The Department can make adjustments to these regulations as needed to meet Maine's bear harvest objectives.

Currently, hunters are allowed to harvest bears during the fall using a variety of methods. The general hunting season for black bears opens the last Monday in August and closes the last Saturday in November. Hunters are allowed to hunt bears near natural food sources or by still-hunting throughout this 3-month period. Hunting bears over bait is permitted for the first 4 weeks and with the use of dogs for a 6-week period that overlaps the last 2 weeks of the bait season.

Trappers can harvest a bear in September or October. Trappers must use a cable foot snare or cage style trap and, since 2008, are required to purchase a separate permit to trap a bear. Trapping continues to be on the rise, with the number of trappers purchasing a permit to trap bears reaching a new high in 2014; 602 residents and 74 non-residents bought trapping permits and harvested 89 and 17 bears, respectively. A new law that took effect in late September of 2011 allows two bears to be harvested if one is taken by trapping. Twenty hunter/trappers harvested 2 bears during the 2014 season.

Table 11. Number of bears harvested in Maine in 2014 by Wildlife Management District (WMD).

WMD	Method of Take						Total Harvest	Archery	Guide	Resident	Non-resident
	Hunting with Bait	While Deer Hunting	Hunting with Dogs	Still-hunting ¹	Trapping	Unknown ²					
1	182	0	8	5	5	0	200	19	182	33	166
2	98	0	32	3	1	1	135	15	112	22	113
3	157	1	4	6	7	1	176	21	126	58	117
4	191	0	15	3	1	2	212	30	167	62	150
5	139	0	32	1	5	1	178	19	157	31	147
6	164	3	13	9	4	1	194	22	124	74	120
7	114	2	18	0	5	0	139	9	86	53	86
8	184	2	72	2	13	0	273	26	190	121	152
9	93	0	14	2	1	3	113	12	64	48	65
10	110	0	16	3	5	2	136	16	97	40	96
11	199	2	59	5	7	3	275	19	186	90	185
12	104	3	38	1	5	4	155	16	58	83	72
13	27	0	11	0	8	1	47	2	25	22	25
14	91	0	23	0	6	2	122	11	78	59	63
15	40	13	21	3	5	0	82	6	18	65	17
16	4	1	0	0	1	1	7	3	1	6	1
17	33	3	12	0	2	1	51	8	17	38	13
18	171	0	20	5	8	9	213	18	124	97	116
19	108	1	66	0	1	0	176	17	145	34	142
20	6	4	1	3	0	1	15	3	3	12	3
21	1	0	0	0	0	0	1	0	0	1	0
22	0	0	0	0	0	0	0	0	0	0	0
23	2	0	0	1	0	0	3	0	0	3	0
24	0	0	0	0	0	0	0	0	0	0	0
25	1	0	0	0	0	1	2	0	0	2	0
26	57	0	5	3	5	1	71	4	13	56	15
27	39	0	4	1	7	0	51	3	21	27	24
28	160	1	37	1	4	4	207	26	128	80	127
29	0	0	0	0	0	0	0	0	0	0	0
Not Reported	2	0	2	0	0	0	4	0	4	1	3
State Totals	2,477	36	523	57	106	39	3,238	325	2,126	1,218	2,018

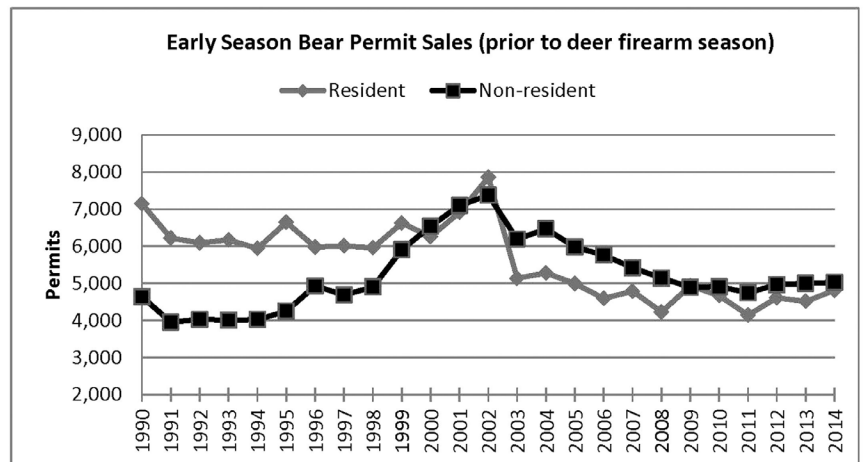
¹Still-hunting = Hunter registered the bear as not harvested with bait, hounds, or traps.

²Unknown Method = Hunter did not report the method they used to harvest their bear.

Most bears in Maine are harvested by hunting over bait. In 2014, 77% were taken over bait, 16% with dogs, 2% by deer hunters, 3% by still-hunting or stalking prior to deer season, and 2% in traps (Table 11). Few bears were harvested in central and coastal Maine (i.e., Knox, Lincoln, Waldo, Androscoggin, Cumberland, Sagadahoc, Kennebec, and York counties) where bear populations are low and hunting opportunity is limited.

The 2014 harvest of 3,238 bears is the second highest bear harvest since 2005, following a record low harvest in 2011. Many factors influence the harvest of black bears in Maine with the abundance of natural foods during the baiting season being first and foremost. The weather during the 4 week season, especially during the first 2 weeks, also impacts the final tally. Less abundant natural foods in the late summer and early fall increase bait interest and bear activity. Conversely, harvest is lower when natural foods are abundant. Because the bait harvest comprises the greatest portion of the overall harvest, it has the greatest effect on the final harvest figures. Poor natural food availability also forces bears to den early, which makes them less available to deer hunters. The 2014 deer season take was the lowest recorded in Maine (at just 36 bears) despite the large number of deer hunters (over 170,000).

Although non-resident permit holders account for just over half of Maine's bear hunters, they continue to harvest close to 2/3 of the bears taken. Most non-resident hunters hire a guide, while fewer resident bear hunters hire guides, which may account for the higher success rate of non-resident hunters (in 2014 resident success rate = 23% and non-resident success rate = 39% during the early season). In 2014, non-resident hunters harvested the majority of bears during the bait (65%) and hound seasons (64%). Hunting over bait is also the most popular method for resident bear hunters and accounted for 77% of the bears harvested by Maine residents. Although few bears are taken during the firearms season for deer, while still-hunting or in traps, Maine residents harvested the majority of bears taken by these methods (89%, 70% and 84% respectively in 2014).



Non-resident hunters became more interested in hunting black bears in Maine following the closure of the spring bear hunt in Ontario in 1999. Their interest remained high until 2003 when a rise in permit fees lowered participation by both non-resident and resident hunters (resident price increased from \$5.00 to \$25.00 and non-residents from \$15.00 to \$65.00). After this sharp decline in bear hunters in 2003 and a slight bump in bear hunting participation during the bear hunting referendum year (2004), bear hunter numbers have declined steadily until 2009 and have stabilized at around 10,000 hunters. The downward trend in participation rates was especially significant for non-resident hunters and likely the U.S. economy contributed to recent lower bear hunter participation. Since non-resident hunters enjoy a higher success rate than residents, loss of these hunters has a greater effect on the final harvest than a similar loss of resident hunters. If hunter participation does not increase, we may need to increase hunting opportunities to meet bear management goals.

Starting in 2008, trappers and non-resident deer hunters are required to purchase a bear permit to harvest a bear by trap or during deer season. Funds from these permit sales are dedicated to bear research and management. Currently, we are using these funds to age teeth from harvested black bears, which will allow us to monitor the age structure of Maine's bear population and trends in bear numbers. In 2014, 829 non-resident bear permits for deer season and 676 trapping permits were sold.

This work is supported by federal excise taxes on sporting arms, handguns, ammunition, and archery equipment (Pittman-Robertson Fund), and hunting and trapping license revenues.

-- Jennifer Vashon and Randy Cross

Canada Lynx

The Canada lynx is a medium-sized grey cat with a bobbed tail and long black ear tufts. Although similar in appearance to a bobcat, lynx have a completely black-tipped tail, longer ear tufts, and larger paws. Lynx are found primarily in northern Maine, where these large feet give them a competitive advantage in deep snow making them adept at capturing their prey. As you move southward, lynx become less common as snow depth lessens and spruce-fir forests that provide an abundance of prey transitions to hardwood forest. In fact, Maine is at the southern extent of the geographic range of Canada lynx.

Although lynx were listed as federally threatened species at their southern range limit, Maine is home to the largest breeding population of Canada lynx in the contiguous United States. Until recently, not much had changed in the historic distribution of lynx in Maine with lynx continuing to be most common north of Moosehead Lake and west of Route 11. However over the last decade, lynx have begun to expand into eastern and western Maine.



Radiocollared Canada Lynx
(Photo by IFW)

To detect changes in lynx occupancy in Maine and derive population estimates, we periodically survey areas for lynx snow tracks. During the winter of 2015, we began another snow track survey effort that will be repeated over the next 2 to 3 winters. This winter, we found lynx in more areas than previous surveys. This finding supports other indices that have indicated that Maine's lynx population has continued to increase over the last decade. After this resurvey effort is completed (tentatively 2018), we will provide an updated estimate of Maine's lynx population. Our last survey effort, in 2006, provided a conservative estimate of between 750 and 1,000 adult lynx in the core of their range in Maine.

A History of Lynx in Maine

Lynx numbers are tied to the abundance of snowshoe hare, which are most numerous in young stands of spruce and fir or in older spruce and fir forests with a dense understory of young trees. Disturbance, both natural and human caused, have played the greatest role in providing habitat for snowshoe hare and lynx in Maine. Historically, it appears that lynx have been able to persist in Maine at relatively low numbers with periods of greater abundance following forest disturbance. A review of historic records suggests that in the mid-1800s, lynx were relatively common in areas disturbed by fire that created areas of young dense habitat for their prey. As these forests matured, lynx likely became less common. The next major disturbance event that could have benefited lynx occurred during the 1913- 1917 spruce budworm outbreak. Although this was the first major spruce budworm outbreak in Maine's post settlement forest, it was not nearly the scale of the 1978-1984 budworm outbreak. The extensive clearcutting of dead or diseased trees that followed the 1978-1984 budworm outbreak created record high amounts of lynx habitat by the late 1990s. As a result, Maine's lynx population is likely at an historic high, and all indicators, to date, suggest Maine's lynx numbers continue to be on the rise with lynx expanding into new areas. As the forest matures, lynx numbers will likely decrease again, but may be resilient in a heavily managed landscape that continues to promote regrowth of valuable spruce/fir timber.

State and Federal Protection

The state has been protecting and conserving lynx for nearly 50 years, starting with the repeal of a statewide bounty and closure of all hunting and trapping seasons for lynx in 1967. Thirty years later, IFW designated lynx as a species of special concern in Maine. The special concern designation is given to species when there is some management concern but more information may be needed to determine whether additional protection is warranted. Following this designation, the State began conducting track surveys for lynx and initiated a 12-year telemetry study. Shortly after the telemetry study began, the US Fish and Wildlife Service (USFWS) listed lynx as a threatened species throughout their historic range due to inadequate habitat protection on federal lands. Although lynx were federally listed as threatened, information gathered from snowtrack surveys and telemetry studies over the last decade indicate that lynx did not meet the state's threatened or endangered listing requirements. Because they are federally listed, lynx remain on IFW's Species of Special Concern list. Currently, the USFWS is conducting a status update to determine if lynx continue to require protection under the US Endangered Species Act. If so, the USFWS is under a court order to produce a Recovery Plan for lynx by January 2018. If they no longer need protection, lynx will be delisted.

As a federally-listed species, lynx are protected from intentional and accidental take that may or may not result in the direct death of a lynx. IFW and the USFWS have been working on methods to minimize potential incidental trapping of lynx in Maine. In 2014, IFW received an incidental take permit that would allow a low level of incidental take of lynx by fur trappers (i.e., 3 dead lynx over 15 years). This plan provides measures to minimize the accidental capture of lynx in traps and mechanisms to adapt outreach and education efforts or regulatory changes if take is exceeding the permitted level. After two lynx were killed in traps set for marten and fisher last year, IFW, Maine trappers, and the USFWS have been revising Maine's trapping regulations to prevent further lethal take of lynx in traps.

From Research to Management

Biologists at IFW have been in the process of building a lynx management system that involves collecting field data, analyzing what it means, getting input from the public on management goals, and developing a monitoring plan. The process started in the winter of 1999 with the first radiotelemetry study on Canada lynx in Maine. In 2011, IFW biologists shifted their focus from acquiring field data, to applying information from this long-term study, to management and conservation strategies for lynx in northern Maine. In 2012, we prepared an assessment of lynx habitat and population levels in Maine to guide future management decisions. This document is available on the IFW's website and describes what is known about Canada lynx in the northeastern U.S.

The Lynx Assessment relied heavily on our 12-year study of lynx in northern Maine and periodic snow-track surveys. From 1999-2011, we captured and radiocollared 85 lynx and documented the production of 42 litters of kittens on a study area in northern Maine. By studying lynx for 12 years, we were able to determine what habitats lynx prefer, how much area a lynx uses, and the quality of these areas, based on the ability of lynx to survive and reproduce. Data from this study have shown that lynx and snowshoe hares thrive in the regenerating thickets of spruce and fir following logging, and that lynx can exist at high densities in northern Maine when this ideal habitat is common. Reproduction and survival data demonstrate that the studied population of lynx in northern Maine was producing an excess number of animals; thus allowing lynx numbers to increase and colonize new areas.

The spruce budworm outbreak and extensive salvage logging of spruce and fir led to an abundance of optimal foraging habitat (young spruce/fir forest cover) for lynx over the last decade. However, this level of cutting was not sustainable (e.g., ~50% of Maine's spruce and fir is classed as young forest). Future sustainable management of northern Maine's spruce/fir forest probably cannot produce similarly high levels of snowshoe hare and lynx habitat, but may result in a more stable lynx population, even if that future population has fewer animals than what currently exists. Forest management that maintains connected patches of dense, to moderately dense, young spruce/fir will benefit lynx. Conversely, forest management that converts spruce fir to other forest types, harvests younger spruce fir, or fragments lynx habitats may be detrimental to lynx. Additional studies to understand the range of habitat conditions that can support lynx, could better inform forest management recommendation and lynx conservation.

Because lynx have a competitive advantage over other predators in deep snow, predictions of warmer temperatures with less snow and more rain may cause lynx to retract northward. Consequently, efforts to maintain connectivity between neighboring lynx populations in Quebec and New Brunswick may allow lynx to persist longer in more northern portions of the state. Regardless of climate change, Maine's lynx population may never be as abundant again as it was recently. Thoughtful planning and continued monitoring is needed to ensure conservation of a potentially reduced, but more stable, population of lynx in Maine.

To learn more about lynx in Maine, visit: www.maine.gov/ifw/wildlife/management/lynx_theMaineStory.htm.

This work is supported by the federal State Wildlife Grants and Pittman-Robertson Funds programs, and state revenues from the Loon Conservation license plate, Chickadee Check-off, and sales of hunting and trapping licenses.

— Jennifer Vashon



Otter

Furbearers and Small Mammals

Overview of Trapping Season

This season was a tough one for Maine trappers. With the combination of difficult weather, dramatically low fur prices, and the emergency closure during the marten/fisher season in the lynx zones, the trappers took hits from all sides. Not surprisingly, the effects of these events are reflected in the 2014 harvest data (Table 12). With the exception of mink and grey fox, harvests for all species were lower than the previous five year averages. While there have been concerns associated with harvest declines for a number of species, this year's harvest may have been abnormally low because of the variety of pressures trappers faced this past season.

Table 12. Annual harvest of Maine's furbearing species from the 2005 to the 2014 trapping and hunting seasons.

The superscript ^L next to a number indicates that the associated year's harvest was significantly lower than the previous five year's harvest, while and asterisk (*) indicates that these figures should be viewed as only preliminary numbers. Not all harvest data were available regarding these species at the time of writing this report.

Species	14-15	13-14	12-13	11-12	10-11	09-10	08-09	07-08	06-07	05-06
Beaver	2,924*	7,841	9,063	15,769	6,976	10,765	9,119	6,357	12,635	11,094
Bobcat	111 ^L	124	205	239	305	281	407	410	344	344
Coyote	868 ^L	1,237	1,670	2,037	1,623	1,743	1,901	1,819	1,521	2,077
Fisher	653 ^L	617	1,242	925	1,207	1,078	1,456	993	1,968	1,810
Red fox	269 ^L	642	991	989	922	932	893	1,030	1,245	1,067
Grey fox	496	279	426	308	332	250	163	161	107	67
Marten	1,145 ^L	996	3,805	1,317	3,559	2,613	2,291	2,401	2,350	3,873
Mink	1,041	1,398	2,184	2,339	1,926	1,465	1,297	1,888	2,280	1,108
Otter	237*	464	646	1,234	754	696	528	493	968	1,041

New Lynx Exclusion Device Testing and Foothold Regulation Changes

With the accidental killing of two Canada lynx -- a federally threatened species -- in legally set killer-type traps in 2014, IFW will be implementing changes to its trapping regulations to further reduce the chance of killing additional lynx. Under Maine's Incidental Take Permit (Permit) for lynx, the US Fish and Wildlife Service (USFWS) allowed Maine trappers three incidental lynx mortalities in 15 years. The lethal take of two lynx last trapping season triggered IFW to take measures to reduce the rate of mortality until the Permit could be amended. To insure that lynx are adequately protected, and trapping regulations are in compliance with IFW's Permit, IFW and representatives from the Maine Trappers Association worked with the USFWS to identify improvements to trapping practices to further reduce the probability of another lynx mortality. Briefly, these changes include (for a full description of regulatory changes, please refer to Maine's trapping regulation booklet available online):

- Requiring the use of lynx exclusion devices, which fully enclose the bait and trap, when killer-type traps are set on land, except when set as blind set (i.e., set without bait) in WMDs 1-11, 14, 18, and 19.
- Modifying the current design of lynx exclusion devices to ensure a lynx can't access the trap within the exclusion device.

Many of the trapping changes that IFW will promulgate through the rule making process are being done out of an abundance of caution, rather than on evidence that these methods are currently causing problems. Briefly, these changes include:

- Eliminating the use of drags on foothold traps in WMDs 1-11, 14, 18 and 19.
- Requiring that all foothold traps be staked and have a clear catch circle in WMDs 1-11, 14, 18 and 19.
- Requiring that chains on foothold traps are center mounted with at least 3 swivels.
- Considering whether to expand the number of WMDs in which lynx exclusion devices must be used; to address the risk that dispersing lynx may be caught in killer-type traps.

Fisher and Bobcat Management

The Department has been closely monitoring the harvest and trapping success rates of fisher and bobcat for close to 10 years now, and has already taken steps to decrease the harvest pressure on fisher. Unfortunately, we have not been able to confirm that the fisher population has rebounded as a result of season and bag limit changes that have been made to date. For bobcat, harvest has declined from a high of 410, during the 07-08 season, to a new low of 111 bobcats this past season (Table 12). How much of this decline in the annual harvest rate can be attributed to an actual decline in the bobcat population or changes in trapping/hunting effort is still an unanswered question. To address questions on the population status of fisher and bobcat, we would like to gather additional biological data for these two species in the near future. For bobcats, we are interested in gathering sex and age structure information from harvested animals. For fisher, we have been discussing multiple approaches for monitoring their population status: from using cameras to identify where fisher are present across the state, to a survival study of individual animals. At this point we are still weighing different options and hope to move forward with a new study in the next year. Stay tuned.

Bat Surveys

Bats have become a species of much discussion over the past several years, mainly due to the White-nose Syndrome (WNS), the deadly disease that has devastated cave-hibernating bats. In the midst of this disease epidemic, many management agencies have been scrambling to gather more information on the distribution and abundance of bat species. The North American Bat Monitoring Program (NABat) is a multi-agency project attempting to answer questions on abundance and distribution of bats across the United States, Canada, and Mexico. This year kicked off the NABat program's first year in the U.S., and Maine was an active participant. Through the help of volunteers, the Department surveyed areas across the state (14,100 km² in total) for bats using bioacoustic equipment commonly referred to as "bat detectors". Bat detectors use special microphones and recording devices to pick-up and record the high frequency calls

that bats make when navigating and capturing food. Somewhat like birds, each species of bat has a unique call that can be used to distinguish it from other species. With the data recorded at each survey grid, wildlife biologists can access how many species of bats were present and approximately how many were detected during the survey period. By collecting this information within the same grid each year, wildlife biologists can build long-term data sets to access changes in the populations and distribution of Maine's eight bat species.

This work was supported by volunteer assistance, the State Wildlife Grants and Pittman-Robertson funds (federal programs), state revenues from the sale of hunting and trapping licenses, and special federal bat conservation grants requiring zero non-federal matching funds.

-- Cory Mosby and Wally Jakubas

New England Cottontail Rabbit

New Developments

The U.S. Fish and Wildlife Service (USFWS) will be making its final determination on whether the New England cottontail (NEC) should be listed as a federally threatened or endangered species by September 2015. Last fall, biologists and policy makers from each state where NEC occur were invited to meet with USFWS representatives to discuss the status of the NEC population and recovery efforts in their state. The USFWS reviewed this information and will make their listing determination based on the best scientific information available to them. Representatives from Connecticut, New York, and Massachusetts presented encouraging information on their NEC populations, while NEC populations in Maine, New Hampshire, and Rhode Island were not as strong. All of these states have been working together on the Rangewide Conservation Initiative for NEC. Restoration work is coordinated under the Rangewide Conservation Strategy, which includes management objectives for habitat restoration, captive breeding, release of captive bred rabbits, and public outreach. The USFWS needs to decide whether the management plans in the Conservation Strategy, and current state management efforts, provide sufficient assurances that NEC populations can be restored to secure levels. If the USFWS is satisfied with the progress of states in achieving the restoration goals set forth in the Conservation Strategy, they may choose not to list the rabbit as threatened or endangered, even though the rangewide NEC population has not been fully recovered at this time.

Landowners in Maine that are interested in managing part of their land for NEC now have a new tool that streamlines the permit process, provides assurances for no new federal restrictions on land use that might result in incidentally killing or harming NEC, and that may provide additional incentives for landowners undertaking conservation efforts for NEC. This spring, the USFWS approved Maine's application for a programmatic Candidate Conservation Agreement with Assurances (CCAA) for NEC. As of this writing, we are finalizing the landowner agreement portion of the CCAA and hope to make the CCAA generally available to landowners by fall 2015.

About the Rabbit

The New England cottontail (NEC; *Sylvilagus transitionalis*), or cooney, was once a common rabbit in Maine and ranged from Belfast to Kittery. However, as the old fields from abandoned farms reverted into mature forests, and brushy habitat was developed into residential areas, NEC populations declined markedly. Our Department closed the hunting season on NEC in 2004 and listed the species as endangered in 2006. As of the winter of 2012-2013, there were no known populations of NEC north of Portland, and less than 300 rabbits left in the state. New England cottontail now exist in three populations in Maine: 1) Cape Elizabeth / Scarborough, 2) Wells, and 3) Kittery/York/Elliott (Figure 4).

The fact that a species with a high reproductive rate, like the NEC's, is endangered raises serious questions about the status of other species that use brushy / old field habitats. There are at least 42 Species of Greatest Conservation Need that use habitats similar to what NEC require in Maine. These include species such as the Eastern Towhee, Woodcock, and box turtles. Dense shrubby habitat is rare in southern Maine and makes up less than 3% of the land base. Therefore, much of IFW's efforts, and that of its partners in NEC restoration, is targeted at creating or maintaining dense shrublands.

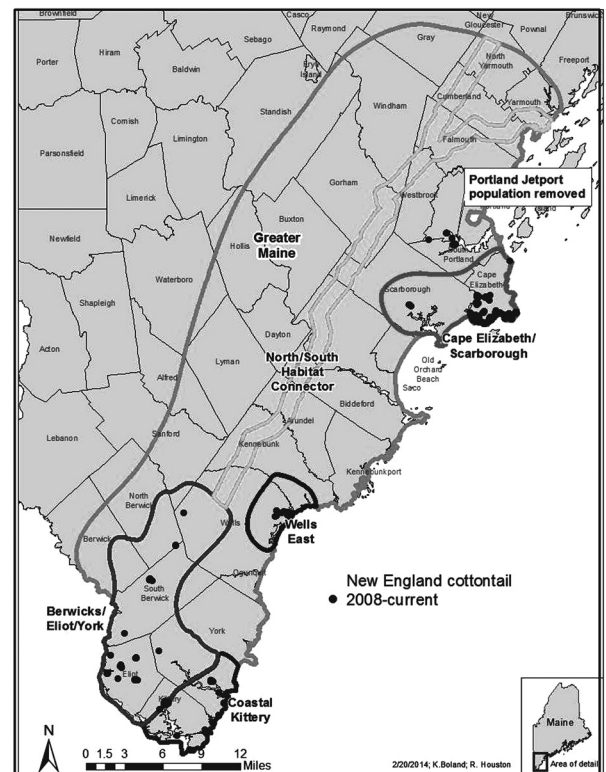


Figure 4. Maine's six focus areas and approximate location of remaining New England Cottontail (NEC) populations.

The three biggest challenges to NEC recovery in Maine are: 1) the low percentage of the land base that is composed of shrublands. This matter is further complicated by the fragmentation of the shrublands that still exist by roads and unsuitable habitat; 2) NEC numbers are very low in the state, and are found primarily in isolated populations (Figure 4), which are vulnerable to local extirpations; and 3) public perception and local regulations that limit the ability to manage land in a manner beneficial for NEC.

Management and Research Updates

Biologists and landowners in Maine have made good initial progress in meeting the habitat restoration goals set forth in the Rangewide Conservation Strategy. IFW tips its hat to its partners in the USFWS and Natural Resources Conservation Service (NRCS), and the many willing landowners who made this possible. Without the hard work of people like Kelly Boland, Kate O’Brien, and Bob Houston (USFWS); Andrew Johnson and Jeff Norment (NRCS); and many others, we would have made far less progress in restoring habitat for NEC. Our NEC restoration efforts continue to target Maine’s six focus areas (Figure 4; Table 13). Moving forward, however, we are finding it challenging to identify additional landowners in our focus areas willing to manage their land for NEC. Ideally, we would like to find additional mechanisms to secure land for long-term habitat management for NEC.

Table 13. Habitat restoration goals and progress by focus area in Maine. All units are in acres and represent protected lands (i.e., private lands under management agreement, state & federal lands, or non-governmental conservation lands). Habitat patches smaller than 5 acres in the natural habitat were not included because they are unlikely to sustain rabbits. By 2015, we had achieved 21% of our 2030 habitat goals.

Focus Area	Habitat Goal	Self-sustaining Habitat	Management Implemented	Management Planned	Totals
Berwicks, Eliot & York	1,800	189	70	50	309
Cape Elizabeth & Scarborough	1,000	78	150	75	303
Coastal Kittery	350	45	35	0	80
Wells East	350	117	92	13	222
North-South Connector*	1,015	Unk	20	66	86
Greater Maine	625	Unk	99	6	105
Total Acres	5,140	429	466	210	1,105

The heavy snows during the winter of 2014-2015 were hard on NEC in Maine and other states in New England. Over the winter, IFW and its partners conducted over 160 surveys for NEC. These surveys revealed both good and bad news. We had several sites in Scarborough that were reoccupied by NEC, but we are concerned that NEC may no longer be present at previously occupied sites in Wells.

IFW funded several NEC research projects this past year. Highlights from the constructed burrow project by Dr. Zach Olson, University of New England, include: (a.) documentation that if NEC are present in an area they will use a constructed burrow within one month after installation; (b.) observations that although constructed burrows offer thermal protection to NEC in winter, NEC appear to spend a relatively short amount of time in a burrow; (c.) seasonal monitoring that indicates that the highest frequency of burrow use occurs during the winter; and (d.) photographic documentation of NEC building tunnels through the snow to access constructed burrows. Dr. Olson speculates that these results may indicate that NECs are using burrows primarily to escape predators, especially when cover is sparse during the leaf-off seasons of the year.

One of the management needs wildlife biologists have for NEC is to be able to determine the number of rabbits in a patch of habitat or that exist on a larger landscape. We need this information to monitor NEC population trends and to determine whether a particular habitat management effort was successful in producing more rabbits. To address this need, IFW is funding research proposed by Drs. Adrienne Kovach and Thea Kristensen, University of New Hampshire. Adrienne and Thea have proposed to develop a protocol that would use the DNA from rabbit pellets, collected during winter surveys, to identify individual rabbits (i.e., genotyping). Once the genotype of a rabbit is known, a researcher can determine the frequency that a particular rabbit appeared among all the pellet samples that were collected from a site. Finally, through a process called spatial occupancy modeling, an estimate can be made on the number of rabbits in a defined area. This study was initiated spring 2015.

This work is supported by the State Wildlife Grants and Pittman-Robertson funds (federal programs), state revenues from the sale of hunting and trapping licenses, National Fish and Wildlife Foundation, Wildlife Management Institute, USFWS’ Partners’ Program, Rachel Carson National Wildlife Refuge, NRCS, and many private landowners.

-- Wally Jakubas

REPTILE, AMPHIBIAN, AND INVERTEBRATE GROUP

Maine is home to 18 species of frogs and salamanders (amphibians), 18 species of turtles and snakes (reptiles), and over 15,000 species of terrestrial and freshwater invertebrates, from beetles and butterflies to mayflies and mussels, to name just a few. Coordinating research and conservation priorities for such a diverse suite of organisms is challenging! One of the Group's highest priorities is to address the conservation needs of the large number of reptiles, amphibians, and invertebrates currently listed as Endangered, Threatened, or Special Concern (108 species). Some rare invertebrates, such as the Katahdin Arctic Butterfly and Roaring Brook Mayfly, are state or regional endemics – found nowhere else in the world but in Maine or a small area of the Northeast. Other species have only recently been discovered in Maine by our biologists including the Cobblestone Tiger Beetle and the Frigga Fritillary Butterfly. The Reptile, Amphibian, and Invertebrate (RAI) Group works to ensure that these and many other lesser known but ecologically important species remain a part of Maine's rich natural heritage.

The Reptile, Amphibian, and Invertebrate Group is one of the Department's few units devoted entirely to nongame and endangered species services and is therefore dependent on dedicated, non-general fund sources of revenue such as the Loon License Plate and Chickadee Check-off. Thank you for your support of both these critical funding sources, thus helping our Department meet its legislative mandate "*to conserve, by according such protection as is necessary..., all species of fish or wildlife found in the State, as well as the ecosystems upon which they depend*" (107th Maine Legislature, 1975).

Phillip deMaynadier, Ph.D., Wildlife Biologist and Group Leader – Phillip supervises Group activities and serves as the Department's lead biologist on issues related to vernal pools, amphibians, butterflies, dragonflies, and general policy issues related to reptile-amphibian-invertebrate conservation. He is also a Graduate Faculty member at the University of Maine's Department of Wildlife Ecology.

Beth Swartz, Wildlife Biologist – Beth serves as the Department's lead biologist on several invertebrate taxa, with recent efforts devoted to conservation of Clayton's Copper butterfly, freshwater mussels, rare mayflies, and bumble bees. Beth also helps coordinate the Department's vernal pool data review responsibilities.

Derek Yorks, Wildlife Biologist – Derek serves as the Department's lead biologist on reptile issues where he coordinates research and conservation efforts on several rare turtle and snake species. Derek is currently focused on assessing the distribution and status of Blanding's, spotted, and wood turtles in Maine and is also studying the impacts of roadways on Maine's reptiles and amphibians.

Seasonal Staff/Cooperators – The RAI Group could not address such a diverse suite of taxa without the expert assistance provided by the following professionals (in 2014-2015): Dr. Catherine Bevier, Kalyn Bickerman, Paul M. Brunelle, Dr. Ron Butler, Dr. Frank Drummond, Ken Hotopp, Dr. Cynthia Loftin, Derek Moore, Ethan Nedeau, Trevor Persons, Dr. Leif Richardson, Jeremy Shapiro, Marcia Siebenmann, Dr. Reginald Webster, and Dr. Herb Wilson.

REPTILE, AMPHIBIAN, AND INVERTEBRATE CONSERVATION AND MANAGEMENT

Amphibians and Reptiles

Overview

By eastern U.S. standards, Maine is a large and climatically diverse state. Thus, while North American reptiles and amphibians (herpetofauna) are richest at southern latitudes, Maine's relatively moderate southern and coastal climate permits a large number of species to reach their northeastern range limit in the state. Only one species, the Mink Frog, reaches the southern edge of its range in Maine (and northern New Hampshire and Vermont). There are 36 species of herpetofauna known from Maine, including 18 amphibians and 18 reptiles, one of which is extirpated (Timber Rattlesnake) and two introduced: the Mudpuppy salamander and Red-eared Slider turtle. While Maine has a lower diversity of reptiles and amphibians than most eastern states, it provides some of the most extensive and intact remaining habitat for the species it hosts, several of which are of regional and national conservation concern. Some of IFW's recent survey, research, and conservation projects directed at reptiles and amphibians are highlighted below.

Partners in Amphibian and Reptile Conservation (PARC)

IFW continues to cooperate with an initiative entitled Partners in Amphibian and Reptile Conservation (PARC). Modeled partly after the successful Partners in Flight (PIF) bird conservation program, PARC's mission is to forge partnerships among diverse public and private organizations in an effort to stem recent declines of amphibian and reptile (herpetofauna) populations worldwide. IFW regularly participates in northeastern chapter PARC meetings including the most recent 2015 annual meeting at the University of Rhode Island.



Some of Northeast PARC's projects, to date, have included a) drafting model state herpetofauna regulations, b) compiling a list of regional species of conservation concern, c) publishing management recommendations for important habitats, and d) designing guidelines for identifying Priority Amphibian and Reptile Conservation Areas (PARCAs).

Recognizing that habitat loss and fragmentation is the greatest threat to reptiles and amphibians worldwide, the PARCA project is an initiative to develop a network of focus areas in the U.S. designed specifically for the unique conservation needs of reptiles and amphibians. Areas are nominated using scientific criteria and expert review, drawing on the concepts of species rarity, richness, regional responsibility, and landscape integrity. PARCAs are a nonregulatory designation, whose purpose is to raise public awareness and spark voluntary habitat protection by landowners and conservation partners. PARCAs are not designed to compete with existing landscape biodiversity initiatives, but to complement them – providing an additional spatially explicit layer for conservation consideration. With significant support from the U.S. Fish and Wildlife Service, IFW is working closely with researchers at the University of Maine Cooperative Fish and Wildlife Research Unit (Cyndy Loftin), Tennessee State University (William Sutton), and the Association of Fish and Wildlife Agencies (Priya Nanjappa) to develop a framework for identifying PARCAs throughout the Northeast.

For more information on this or other national PARC conservation efforts, visit the PARC website at www.parcplace.org.

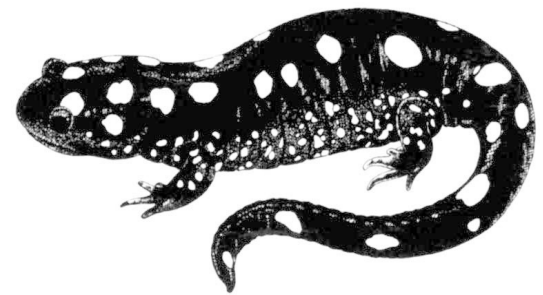
This work is supported by the USFWS Landscape Conservation Cooperative program, the federal State Wildlife Grants program, and state revenues from the Loon License Plate and Chickadee Check-off.

– Phillip deMaynadier and Derek Yorks

Maine Amphibian and Reptile Atlas Project (MARAP)

From 1986–1990, IFW, in cooperation with Maine Audubon and the University of Maine, conducted the Maine Amphibian and Reptile Atlas Project (MARAP). During a four-year period, over 250 volunteers from around the state contributed approximately 1,200 records of observations of amphibians and reptiles. This initiative culminated in the 1992 publication of the book *The Amphibians and Reptiles of Maine*. The first edition sold out within two years of publication.

By 1998, considerable new data had been compiled, and there was increasing demand for updated information on the state's amphibians and reptiles. Editors Malcolm Hunter, Jr., Aram Calhoun, and Mark McCollough revised a second edition, incorporating information from 1,300 new records into updated range maps and species narratives, and added color photographs and a CD of the calls of the frogs and toads of Maine. Copies of the updated 1999 edition of *Maine Amphibians and Reptiles* can be ordered for \$19.95 from IFW's Information Center (207-287-8000) or from the online store found on the Department's website: <http://www.maine.gov/ifw>.



Spotted Salamander

IFW continues this atlas work and maintains a comprehensive database on the distribution of Maine's 35 amphibian and reptile species (33 native and 2 exotic). Though most of this work is opportunistic, as of spring 2015 over 10,300 records from more than 760 volunteers have been logged. There is much still to learn about the distribution and ecology of Maine's herpetofauna, and we encourage members of the public to share their photo-documented observations by submitting a MARAP reporting form, available on IFW's website in the Species Information section. **Please submit observations of any of the four state-listed reptiles -- Eastern Box Turtle (Endangered), Blanding's Turtle (Endangered), Spotted Turtle (Threatened), and Black Racer (Endangered) -- as soon as possible to IFW (derek.yorks@maine.gov or call 207-941-4475).**

For more information on research, assessment, and conservation efforts for Maine's amphibians and reptiles, visit the RAI Group's webpage here: <http://www.maine.gov/ifw/wildlife/species/reptiles/index.html>.

This work is supported by volunteer assistance, the federal State Wildlife Grants program, and state revenues from the Loon License Plate and Chickadee Check-off.

– Derek Yorks and Phillip deMaynadier

Blanding's and Spotted Turtles

For over 20 years, IFW has actively researched the distribution and status of Blanding's and Spotted Turtles in Maine. Blanding's Turtles (Endangered) are 7 to 10 inches long with a yellow throat and light colored flecking on a helmet-shaped shell. Spotted Turtles (Threatened) are 5 to 6 inches in length, have yellow spots on the head, tail, and legs and a somewhat flat, yellow-spotted shell. Both species are semi-aquatic preferring small, shallow wetlands in southern Maine including pocket swamps and vernal pools. Undeveloped fields and upland forests surrounding these wetlands provide habitat for nesting, aestivating (a period of summer inactivity), and migration movements between wetlands.

Despite the attention these turtles have received, habitat loss and fragmentation continue to threaten both species in Maine. As human population and development expands in southern and coastal Maine, road mortality becomes an ever increasing threat. The turtle's shell has provided sufficient protection from predators for millions of years, but unfortunately is no match for a car tire. Both Blanding's and Spotted Turtles are long-lived animals that take a minimum of seven (Spotted) to 14 (Blanding's) years to reach reproductive age. This, coupled with low hatching success, places increased importance on adult survivorship. Recent population analyses of several freshwater turtle species indicate that as little as 2 - 3% additive annual mortality of adults is unsustainable, leading ultimately to local population extinction. In other words, losing just a few breeding adult turtles each year to road-kill may be the greatest factor threatening the persistence of Blanding's and Spotted Turtles in Maine.

IFW is currently involved in four active conservation projects benefitting Blanding's and Spotted Turtles in Maine:

- *Cautionary Road Signage Project (Turtle X-ing):* A cooperative study by the University of Maine and IFW identified high-density rare turtle areas with road-crossing hotspots. With the assistance of the Maine DOT, The Nature Conservancy, and local towns, temporary yellow warning signs are installed in strategic locations to alert motorists to the possible presence of turtles on the roadway. The signs are deployed seasonally, coinciding with the period when overland turtle movements are greatest, thus helping to maximize the signs impact by reducing "sign fatigue" by local commuters. This project is now in its 10th year.
- *Wildlife Road Watch and IFW Rare Turtle Hotspot Surveys:* Partnering with Maine Audubon and Maine DOT, Wildlife Road Watch, a volunteer initiative to report wildlife-road interactions (both alive and dead) was launched in 2010. Additionally, in 2014 IFW began monitoring for road mortality at previously documented Blanding's and Spotted Turtle crossing and road-kill sites and potentially important road-crossing sites identified in a predictive GIS model. Data generated from these efforts will help in planning future wildlife road mitigation efforts (e.g., additional signage areas, critter crossings, exclusionary fencing). In addition to contributing incidental sightings, participants may also choose to adopt a road segment for repeated monitoring. For more information on the Wildlife Road Watch program, please visit: <http://www.wildlifecrossing.net/maine>.
- *Improving Nesting Habitat at Priority Blanding's Turtle Sites:* IFW, in partnership with local land trusts, private landowners, and the U.S. Forest Service, is working to monitor, manage, and, in some cases, create or enhance nesting habitat at several of Maine's most promising Blanding's turtle sites. Time-lapse cameras are being used at nesting areas to document nesting females; data that will help biologists to manage this critical resource effectively. Most nesting sites used by this species were created by human disturbance and without periodic managed disturbance these bare gravel, sand, or soil areas are eventually overcome with vegetation. This habitat-focused effort will improve long-term viability of regionally important populations of this species in Maine. In addition to reducing the need for nesting females to travel outside interior areas of core sites, management of nesting areas may serve to enhance nest success and hatchling survival by directing females away from marginal nesting habitat such as backyards, gravel pits, and agricultural lands where eggs and hatchlings are more susceptible to human-caused disturbance and subsidized predators.
- *Status of the Spotted Turtle at the Northern Edge of its Global Range:* The State Threatened Spotted Turtle reaches the northeastern terminus of its range in the Atlantic Coastal Plain of Maine. While its distribution in York County is well understood, it has also been reported occasionally over the past four decades from an additional 26 townships in 12 additional counties across the southern half of the state. IFW is currently undertaking field surveys in an attempt to verify the presence of Spotted Turtles at a number of these locales and determine if the previously reported turtles



represent wild populations, possible released captives, or misidentifications of other turtle species. The spring of 2015 was an exciting first chapter in the search for Spotted Turtles at the edge of their range in Maine. Populations were documented in wetland habitats at a handful of sites in Sagadahoc, Lincoln, Knox, and Waldo counties, confirming that this rare turtle occurs (at least as isolated populations) across more of the state than was previously known. Much remains to be learned in the upcoming 2016 field season as we assess additional sites and search further at a few promising locations where we failed to find Spotted Turtles in 2015.

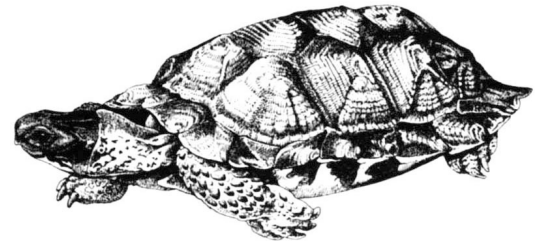
This work is supported by volunteer assistance, The Nature Conservancy, the federal State Wildlife Grants program, and state revenues from the Loon License Plate, Chickadee Check-off, the Maine Outdoor Heritage Fund, and the Maine Department of Transportation.

-- Derek Yorks

Conservation Planning and Implementation for the Wood Turtle from Maine to Virginia

The Wood Turtle is one of the state's rarest turtles, listed as Special Concern. It is a medium sized turtle (5 – 8 inches) with a distinct sculpted shell and orange coloration on the neck and legs. They are a handsome and long-lived species that is known to live at least up to 58 years of age. For much of the year, wood turtles are found in slow-moving clear-water streams with a predominantly sand or gravel substrate. During late spring and summer, they use the surrounding upland areas including forests, floodplains, meadows, and hayfields. From late fall to early spring, wood turtles hibernate underwater in sheltered areas of rivers, including deeper pool bottoms, under riverbanks, or under woody debris. No other Maine turtle species makes such extensive use of both aquatic and terrestrial habitats.

Widespread concern about the status of the Wood Turtle prompted the 2009 establishment of the Northeast Wood Turtle Working Group (NEWTWG) through the Northeast Partners for Amphibian and Reptile Conservation (NEPARC). This group, consisting of biologists, agency representatives, land managers, and others from 13 states and the District of Columbia, collaborated on a two-year status review funded by the Northeast Association of Fish and Wildlife Agencies (NEAFWA) Regional Conservation Needs (RCN) Program. In 2014, stemming from the collaborative work of the RCN, IFW and wildlife agencies in seven other states active in NEWTWG were awarded a federal Competitive State Wildlife Grant entitled *Conservation Planning and Implementation for the Wood Turtle (Glyptemys insculpta) and Associated Riparian Species of Greatest Conservation Need from Maine to Virginia*. IFW biologists began field surveys for this project in the spring of 2015 and have begun a scientific process for identifying the best Wood Turtle populations across the state. This exciting new effort is the most comprehensive study, to date, focused on this species in Maine and will help ensure a future for this important and beautiful inhabitant of Maine's wild rivers and forests.



Wood Turtle

This work is supported by volunteer assistance, the federal State Wildlife Grants program, and state revenues from the Loon License Plate and Chickadee Check-off.

-- Derek Yorks

Invertebrates

Overview

As is true globally, invertebrates dominate Maine's biota, both in terms of richness and biomass. In fact, Maine's nonmarine invertebrate species are conservatively estimated to exceed 15,000 species, or nearly 98% of the state's animal species diversity. Like most other states, Maine's legal definition of "wildlife" (any species of the animal kingdom) includes vertebrates and invertebrates, thus challenging IFW and conservation partners with a tremendous breadth and volume of species to protect and manage. One of the ways IFW triages its limited staff and program resources toward the conservation and management of invertebrates is to focus on those species and groups that are better-studied and with well documented patterns of decline or imperilment. Some examples of recent survey, research, and conservation projects directed at Maine's inland terrestrial and aquatic invertebrates are highlighted below.

Bumble Bees: Native Pollinators in Trouble

Bumble bees are one of our most valuable pollinators of both wild and cultivated flowering plants. Their early spring emergence and "buzz pollination" method are especially effective for important Maine crops like apples, blueberries, cranberries and tomatoes. Unfortunately, over the past 10-15 years, some species of native bumble bees have drastically declined throughout their ranges and several have all but disappeared. Habitat loss, diseases and parasites introduced with commercially raised bumble bees, pesticides, and intensive agricultural practices may all play a role in bumble bee declines worldwide.

Because of the high level of concern for this group of important insects, IFW recently collaborated with NatureServe (<http://www.natureserve.org/>) to develop a list of bumble bee species (*Bombus* spp.) native to Maine and rank their current conservation status in the state. Since there is few collection data for Maine, especially from recent years, this was not an easy task! However, thanks to a small number of past and present researchers and avid collectors, we were able to determine that 17 of the 47 species of bumble bees native to the United States have been documented in Maine (Table 14). Of those 17 species, three – the Rusty-patched Bumble Bee, Ashton’s Cuckoo Bumble Bee, and American Bumble Bee – have not been collected in years and may be extirpated. Most species have so little collection data that it was impossible to determine their current status in Maine. Only six to eight species appear to have stable or increasing populations for the present time.

Table 14. Bumble bees of Maine.

Rusty-patched Bumble Bee	<i>Bombus affinis</i>
Yellowbanded Bumble Bee	<i>Bombus terricola</i>
Brown-belted Bumble Bee	<i>Bombus griseocollis</i>
Red-belted Bumble Bee	<i>Bombus rufocinctus</i>
Ashton’s Cuckoo Bumble Bee	<i>Bombus ashtoni</i>
Lemon Cuckoo Bumble Bee	<i>Bombus citrinus</i>
Fernald’s Cuckoo Bumble Bee	<i>Bombus fernaldae</i>
Indiscriminate Cuckoo Bumble Bee	<i>Bombus insularis</i>
Two-spotted Bumble Bee	<i>Bombus bimaculatus</i>
Common Eastern (Impatient) Bumble Bee	<i>Bombus impatiens</i>
Confusing Bumble Bee	<i>Bombus perplexus</i>
Sanderson’s Bumble Bee	<i>Bombus sandersoni</i>
Tri-colored Bumble Bee	<i>Bombus ternarius</i>
Half-black Bumble Bee	<i>Bombus vagans</i>
Northern Amber Bumble Bee	<i>Bombus borealis</i>
Yellow Bumble Bee	<i>Bombus fervidus</i>
American Bumble Bee	<i>Bombus pensylvanicus</i>

In order to get a better understanding of the diversity, distribution, and conservation status of Maine’s native bumble bee fauna, IFW applied for and received two grants in 2014 to fund a statewide atlas project. Similar to the Maine Butterfly and Maine Damselfly and Dragonfly surveys, the *Maine Bumble Bee Atlas* will enlist the aid of citizen volunteers from all over the state to help the Department collect valuable data on what species are present, where they occur, what habitats they are using, and how abundant they are. This 5-year project was initiated in the spring of 2015, when over 80 citizen scientists were trained by IFW and the University of Maine in a standardized survey protocol. Results of the first year of data collection should be available during the winter of 2015-2016. Additional volunteers will be trained during each year of the project. For more information about the Maine Bumble Bee Atlas, visit the project website at <http://mainebumblebeeatlas.umf.maine.edu/> or Facebook page at <https://www.facebook.com/MaineBumblebeeAtlas>.



This work is supported by the federal State Wildlife Grants program, the Maine Outdoor Heritage Fund, state revenues from the Loon License Plate and Chickadee Check-off, volunteer assistance from citizen scientists, and in-kind contributions from the University of Maine at Orono and Farmington.

-- Beth Swartz

A Conservation Status Assessment of the Dragonflies and Damselflies for Maine and the Northeastern United States

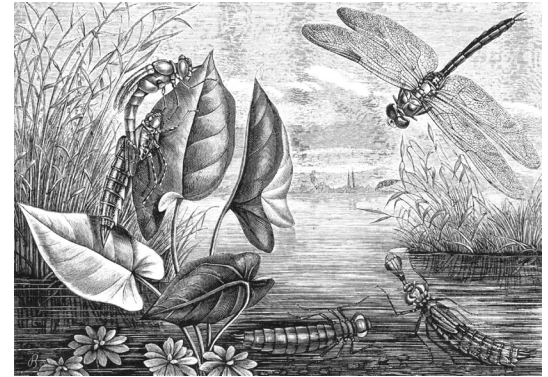
Insects in the Order Odonata, damselflies and dragonflies, are a conspicuous component of Maine’s wildlife diversity, as well as valuable biological indicators of freshwater ecosystem integrity. Presently, 158 species have been documented in the state, comprising nearly 36% of the total North American fauna. Northeastern North America is recognized as a regional hotspot for odonate diversity and several of Maine’s species are of national and global conservation concern. To better understand the vulnerability of northeastern damselflies and dragonflies to historical and current threats, IFW recently completed a regional conservation assessment of Odonata and their habitats in cooperation with experts in New Hampshire (NH Audubon Society) and New York (NY Natural Heritage Program).

IFW and partners developed and applied a prioritization framework for 228 species of dragonflies and damselflies occurring in the northeastern U.S. using data from over 248,000 records shared by experts from Virginia to Maine. Specifically, we calculated a single regional vulnerability rank (R-rank) reflecting each species’ degree of relative extinction risk in the Northeast. The R-rank was calculated based on five factors: three rarity factors (range extent, area of occupancy, and habitat specificity), one threat factor (vulnerability of occupied habitats), and one population trend factor (relative change in range size), and ranged from R1 (most vulnerable) to R5 (least vulnerable). We combined this vulnerability rank with an analysis of the degree of endemism (% of the species’ US and Canada range within the Northeast) as a proxy for regional responsibility, thereby deriving a list of species of combined vulnerability and regional management responsibility. Overall, 18% of the northeastern region’s odonate fauna is imperiled (R1 and R2), of which

eight species are found in Maine including two state-listed species: Boreal Snaketail (Threatened) and Ringed Boghaunter (Threatened). Among freshwater habitats, peatlands (bogs and fens), low gradient streams and seeps, high gradient headwaters, and larger rivers host a disproportionate number of the region's imperiled Odonata.

This assessment can be used to inform the strategic allocation of limited state and federal conservation resources and help foster collaboration across state lines to conserve regionally at-risk Odonata. We also anticipate this research will help guide and standardize conservation assessments of other invertebrate taxa. Finally, we recommend that a regional damselfly and dragonfly conservation working group be formed to help standardize protocols for surveys, monitoring, habitat protection, and education, thereby developing a framework for a coordinated comprehensive conservation plan for northeastern Odonata.

Contact Phillip deMaynadier (phillip.demaynadier@maine.gov) to receive a copy of the northeastern conservation assessment of Odonata, or to learn more about IFW's efforts to conserve the state's damselfly and dragonfly fauna.



Dragonfly Life Cycle

Funding for this work comes from a Northeastern Regional Conservation Needs grant, the federal State Wildlife Grants program, and state revenues from the Loon License Plate and Chickadee Check-off.

-- Phillip deMaynadier

The Maine Butterfly Survey: Keeping Track of Scaled Jewels

Juniper Hairstreak, Clayton's Copper, and Spicebush Swallowtail are just some of the state's rarest butterflies that are both colorful in name and on the wing. In an effort to improve our knowledge of these and other priority butterflies, IFW is actively studying the group during statewide regional surveys. Attractive and ecologically important, butterflies have garnered increasing attention from scientists and the general public as sentinels of habitat change. By documenting the distribution and status of the state's butterfly fauna, IFW hopes to improve its understanding of the group and prioritize conservation efforts towards those species most vulnerable to decline and potential state extinction.

In support of this goal, IFW received a grant from the Outdoor Heritage Fund in 2002 to contract a professional lepidopterist, Dr. Reginald Webster from New Brunswick, to help assemble a comprehensive assessment of the state's butterfly fauna. Drawing from published literature and specimen records located in museums and amateur collections throughout the Northeast, Reggie helped IFW develop the first baseline atlas and database of Maine's butterfly fauna. The baseline atlas project compiled nearly 9,000 records and added 11 previously undocumented butterflies to the state list, which now stands at 123 species. Of special note is the relatively high proportion (~20%) of Maine butterflies and skippers that are extirpated (5 species) or state-listed as Endangered, Threatened, or Special Concern (19 species) -- a pattern consistent with global trends elsewhere for the group. Contact IFW to receive an updated checklist of the butterflies of Maine (phillip.demaynadier@maine.gov) or visit <http://mbs.umf.maine.edu/Publications.htm> to download a pdf copy of Maine's first baseline butterfly atlas.

Finally, we are excited to announce that a statewide volunteer butterfly atlas that took flight in 2007 has been extended through 2015. Sponsored by IFW, in partnership with the University of Maine at Farmington (Dr. Ron Butler), Colby College (Dr. Herb Wilson), and Dr. Reginald Webster of New Brunswick, the Maine Butterfly Survey (MBS) is a multi-year, statewide, volunteer survey effort. Following in the tradition of previously successful state-sponsored wildlife atlas projects, including the Maine Damselfly and Dragonfly Survey, data generated from the MBS comes primarily from trained citizen scientists. The survey will help fill information gaps identified during the baseline assessment on butterfly distribution, flight seasons, and habitat relationships for one of the state's most popular insect groups. To become involved in this project or to learn more about Maine's butterflies, contact the volunteer coordinator, Dr. Herb Wilson, at whwilson@colby.edu, or check the MBS website at: <http://mbs.umf.maine.edu>.



Funding for this work comes from volunteer assistance, The Nature Conservancy, the federal State Wildlife Grants program, and state revenues from the Loon License Plate, Chickadee Check-off, and the Maine Outdoor Heritage Fund.

-- Phillip deMaynadier

Rare Mayflies

Mayflies, or “shadflies” as they are often called, are a diverse group of insects with over 160 species found in Maine. Some species inhabit lakes and ponds, but most live in the flowing waters of streams and rivers. Belonging to the Order “Ephemeroptera” – named for the short lifespan of the winged adults – mayflies spend nearly their entire lives underwater, where they play a significant role in the food webs of aquatic ecosystems. Often abundant, the nymphs are a major consumer of algae and decomposer of plant material, and, in turn, provide a high quality food source for many more visible stream predators. Anglers have long recognized that a good mayfly stream is likely a good trout and salmon stream as well. The most popular “flies” tied by fly-fishers, to mimic their quarry’s natural prey, are modeled after the different life stages of the mayfly.

While most of Maine’s mayfly species are widely distributed and relatively common, some are much rarer. Maine currently lists two species of mayfly as Threatened. The Roaring Brook Mayfly holds the distinction of being among the rarest in the world. For many years, it was only known from a single adult specimen collected on Mt. Katahdin in 1939, until surveys, conducted by IFW in 2003, confirmed the species was still present on the mountain. Since then, IFW has surveyed approximately 160 streams and documented a total of 14 where the mayfly occurs. All of these sites are clustered in the mountains of central and western Maine (Figure 5). Other researchers have also collected a specimen in the Green Mountains of Vermont and another in the White Mountains of New Hampshire. While we now know the Roaring Brook Mayfly is not confined just to Mt. Katahdin, it does appear to be New England’s only endemic mayfly - restricted to cold, undisturbed, high-elevation streams of the northern Appalachian Mountain Range.

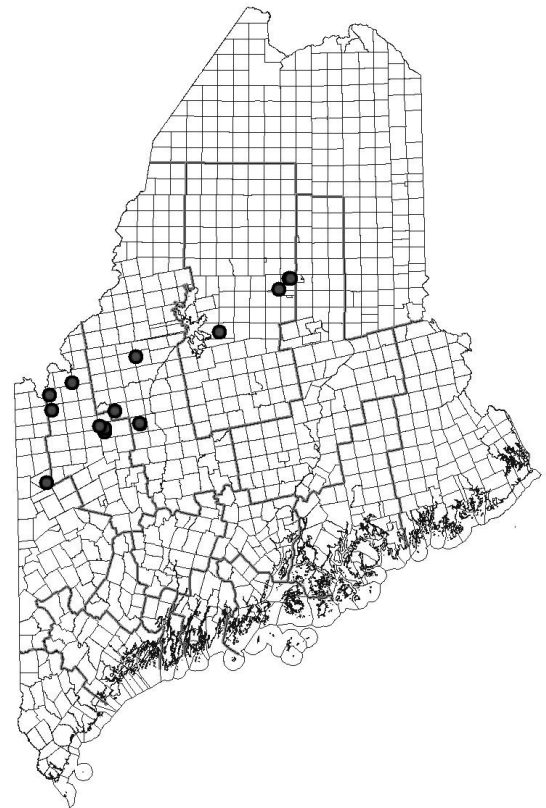


Figure 5. Distribution of Roaring Brook Mayfly in Maine.

The Tomah Mayfly is a unique insect, once thought to be extinct. It was rediscovered in Tomah Stream (Washington Co.) in 1978 and has since been documented at 18 sites distributed across northern, eastern and central Maine and at least one site in New York. The nymphal stage of the Tomah Mayfly, unlike other species of mayfly, is carnivorous - preying largely upon other mayfly nymphs. This species depends on highly productive, seasonally-flooded, sedge meadows along large streams or rivers to complete its life cycle. Although sedge meadows are not an uncommon habitat type in Maine, the Tomah Mayfly is only known from a limited number of sites.

In addition to these two Threatened species, 13 other mayflies are considered Special Concern in Maine. Many of them are only known from one or two sites, but comprehensive surveys have never been done. To help plan for future surveys, the Department has contracted mayfly expert Marcia Siebenmann to document all previous survey effort for Maine’s state-listed and Special Concern mayfly species. Over 35 years of data are being entered into a database that will aid in tracking known occurrences and coordinating where to search for new populations of these uncommon insects.

This work is supported by the federal State Wildlife Grants program, and state revenues from the Loon License Plate and Chickadee Check-off.

-- Beth Swartz

Brook Floater

Maine is home to 10 species of freshwater mussels, three of which are listed as Threatened under the Maine Endangered Species Act (Table 15).

One of those three, the Brook Floater, has been the focus of intensive survey efforts by IFW over the past few years. This species has declined throughout its Atlantic Coast range and is listed as Endangered or Threatened in nearly every state where it still occurs. In most locations where it is found, it is observed in very low densities with little evidence of recruitment. One reason for the Brook Floater’s decline is the species’ preference for clean, undeveloped and undammed riverine habitat. In Maine, its stronghold is in streams and rivers of the Penobscot River watershed, but it also occurs in the St. George River, lower Kennebec River watershed, and several Downeast and midcoast rivers. During the past four years, the Department has focused on intensively surveying streams and rivers where the Brook Floater has been

documented in the past. Many of these sites have not been visited for 20 years, so little is known about the species' current status at each. IFW has contracted Ethan Nedeau (Biodiversity LLC), a mussel biologist with vast experience studying Brook Floaters across their range. So far, Ethan has surveyed 15 rivers and found some interesting results. At Maine's only southern occurrence, the Pleasant River in Cumberland County, severe erosion and sedimentation likely caused by adjacent land use have nearly extirpated the species in that river. At the other end of the state, far Downeast in the Dennys River (Washington Co.), Ethan spent three days looking and only found one live animal. In the St. George River, where IFW always presumed the population was healthy based on numbers observed, Ethan found relatively good numbers but they were all old animals with little evidence of reproduction. Conversely, some sites like Kenduskeag Stream and Marsh Stream appear to have relatively large, stable populations. The Passadumkeag River is a gem for Maine's freshwater mussels – not only does it host a robust population of Brook Floaters, but it is one of the state's few rivers where all 10 mussel species can be found. At each site visited, Ethan is documenting the Brook Floater's population density and size, as well as microhabitat use and potential threats. In 2015, he will be surveying the lower Mattawamkeag River and several of its tributary streams, the West Branch Union River, and Wesserunsett Stream. This information will contribute to a regional assessment of the Brook Floater's conservation status -- a collaborative project between IFW and 12 other northeastern states.

Table 15. Freshwater Mussels of Maine.

Eastern Pearlshell (<i>Margaritifera margaritifera</i>)	
Eastern Elliptio (<i>Elliptio complanata</i>)	
Triangle Floater (<i>Alasmidonta undulata</i>)	
Brook Floater (<i>Alasmidonta varicosa</i>)	THREATENED
Eastern Floater (<i>Pyganodon cataracta</i>)	
Alewite Floater (<i>Anodonta implicata</i>)	
Creeper (<i>Strophitus undulatus</i>)	
Yellow Lampmussel (<i>Lampsilis cariosa</i>)	THREATENED
Eastern Lampmussel (<i>Lampsilis radiata radiata</i>)	
Tidewater Mucket (<i>Leptodea ochracea</i>)	THREATENED

More information on Maine's mussels can be found in *The Freshwater Mussels of Maine* (Nedeau et al. 2000), available through the Department's online store (<http://www.mefishwildlife.com/>) or Information Center (207-287-8000).

This work is supported by the federal State Wildlife Grants program, and state revenues from the Loon License Plate and Chickadee Check-off.

-- Beth Swartz

Special Habitats for Reptiles, Amphibians, and Invertebrates

Pitch Pine Woodlands and Barrens

Pitch Pine woodlands and barrens are lightly forested upland areas with dry, acidic, often sandy soils. Pitch pine, red pine, scrub oak, blueberry, huckleberry, and/or bluestem grasses are commonly among the sparse vegetation of this unique and globally rare natural community. It is estimated that over half of the state's original pine barren acreage has been lost to residential and commercial development, agriculture, and gravel mining. Many dry woodlands and barrens also require periodic fire to prevent succession to a more common, closed-canopy white pine/oak system; fire is a natural disturbance that is now short-circuited by habitat fragmentation and fire suppression.

Once viewed as unproductive wastelands, Maine's few remaining pine woodlands and barrens are now recognized as areas of exceptional wildlife value, providing habitat for a variety of highly specialized plants and animals. Several rare and endangered species persist in the State's remaining intact barren communities, mainly in the towns of Kennebunk, Wells, Waterboro, Shapleigh, Hollis, and Fryeburg. These unique habitats are especially rich in rare butterflies and moths, hosting species that feed on the specialized barrens vegetation, such as Edwards' Hairstreak (Endangered), Sleepy Duskywing (Threatened), Cobweb Skipper (Special Concern), and Barrens Buck Moth (Special Concern). In fact, the number of Maine butterflies and moths associated with just Pitch Pine Woodlands and Barrens exceeds the number of total breeding bird species statewide. Other rare species associated with Maine's barrens include Black Racers (Endangered), Grasshopper Sparrows (Endangered), Upland Sandpipers (Threatened), Short-eared Owls (Threatened), New England Cottontail (Endangered), and Northern Blazing Star (a Threatened plant). To learn more about this and other rare natural communities in Maine, go to: <http://www.maine.gov/doc/nrimc/mnap/features/community.htm>.

Funding for wildlife surveys and conservation of barrens habitat comes from The Nature Conservancy, the federal State Wildlife Grants program, and state revenues from the Loon Conservation Plate, and Chickadee Check-off.

-- Phillip deMaynadier

For more information on other important habitats for reptiles, amphibians, and invertebrates including Vernal Pools, Riparian Sedge Meadows, and Marshes and Shrub Swamps, see other recent annual reports here: http://www.maine.gov/ifw/wildlife/reports/research_management.html.

FISH GROUP

Maine is home to about 51 native species of freshwater and diadromous fishes and about 17 species that are considered to be non-native to the state. The issues and needs associated with such a diverse assemblage are broad. Hence, the Fish Group tends to focus on issues and needs complimentary to the Fisheries Division. Group members are actively involved in many aspects pertaining to native fish conservation, aquatic habitat restoration, inland commercial fisheries management, invasive fish control and remediation, and fishery resource data management, landscape analysis and mapping.

The Fish Group coordinates and actively participates in a variety of collaborator and partnership-driven efforts, such as active stream and riparian habitat restoration, large-scale river connectivity projects, inventory of unsurveyed habitats, and Northeast regional aquatic resource conservation efforts. The Group also collaborates and coordinates a variety of on-going research projects with academic researchers, conservation organizations, and other state and federal agencies.

Merry Gallagher, Fishery Research Biologist and Group Leader – Merry supervises Group activities and is a stream ecologist with expertise in stream survey methodology, native fish ecology, and landscape/GIS data analysis. She oversees statewide efforts to survey and assess remote ponds and coastal stream habitats, documents wild brook trout populations, and improves the general knowledge regarding the distribution of Maine's native fishes. She is also integral to managing Maine's inland commercial fisheries, including baitfish. Merry represents Maine and IFW on a variety of committees and Northeast partnership efforts, such as the Eastern Brook Trout Joint Venture, the Northeast Fish and Wildlife Diversity Technical Committee, and the Maine Stream Connectivity Work Group.

Kevin Gallant, Fishery Specialist – Kevin assists with a variety of fisheries research projects statewide and most of the Group's data collection efforts. The primary focus is on documenting wild brook trout populations in all habitat types, but all freshwater fish species encountered are recorded. Kevin's primary projects this year have included the Remote Pond Survey Project and assessing coastal brook trout. Kevin is also a member of IFW's Black Bass Committee and a certified pesticide applicator and is integral to many IFW chemical reclamation projects.

Tyler Grant, Contractor – Tyler coordinates the field collections of fish species for research projects, including the Sea-run Brook Trout Project and the Remote Pond Survey Project. He assists in maintaining the stream survey, sea run brook trout, and commercial fishery databases, and helps fill data and fish collection requests that come to the Fish Group. Tyler is also involved in monitoring 'chop and drop' habitat restoration projects statewide and invasive fish species monitoring projects.

Cooperators - The Fish Group could not accomplish all that we do without the ever present assistance from our collaborators, cooperators, and volunteers. We graciously thank the following dedicated organizations and individuals for your continued assistance: IFW Regional Fisheries staff, Sally Stockwell, Emily Bastian, Jeff Reardon and the cadre of volunteers (Maine Remote Pond and Coastal Stream Survey Project), Michael Hopper and Geof Day (Sea Run Brook Trout Coalition), Dwayne Shaw (Downeast Salmon Federation), Dr. Michael Kinnison, Wes Wright, Dr. Joe Zydlewski and their students (UMaine), Slade Moore, Claire Enterline, Keith Kanoti, Jed Wright, Serena Doose, Alex Abbot, Scott Craig, Josh Royte, Barbara Charry, Jacob Aman, Ben Naumann, Jeff Norment, Pat Sirois, Bruce Connery, and the many volunteers and private land owners who have worked with us over the last year.

FISH CONSERVATION AND MANAGEMENT

Northern Pike in Pushaw Lake: A Case Study in the Trials and Tribulations of Invasive Species Control

On August 7th of 2003, an angler reported that he caught and released a northern pike (*Esox lucius*) in Pushaw Lake that weighed approximately six pounds. The following summer, the same angler reported catching another pike that was 19" long in approximately the same location as the first reported catch. On January 4th, 2005, a 656mm (25.8") 1740g (3.8 lb.) female pike was caught in the north end of the lake in the general vicinity of Mags Ledge. That pike was kept by the angler and brought to the Enfield Fisheries Office, where it was confirmed to be a northern pike. This was the first known occurrence of this invasive species within the Penobscot drainage and there is grave concern about this species colonizing other parts of the Penobscot River system as well as its effects on the recovery effort for endangered Atlantic salmon. Since then, efforts have been underway to monitor and suppress the population as much as possible.

Northern pike (Figure 6) are an aggressive, rapidly growing, and highly reproductive fish. Adult pike spawn in early spring, generally around ice-out when water temperatures range from 4-10°C (40-52°F). Female pike will produce around 9,000 eggs per pound of body mass. That compares to around 700 eggs per pound for an Atlantic salmon, or about 500 eggs total for a 10 inch brook trout. Eggs hatch in about 10-14 days and larval pike convert to a predominately fish diet within 30 days post-hatch or at around 2 inches in length. Their growth is rapid, sometimes reaching 10-15 inches in their first year, and growing up to 8 inches per year after that until they sexually mature at 3 to 4 years-old. As pike mature, their rapid growth rate, predatory nature, and few natural predators contribute to generally high rates of survival. As such, their effects on the local fish community can be quite devastating.

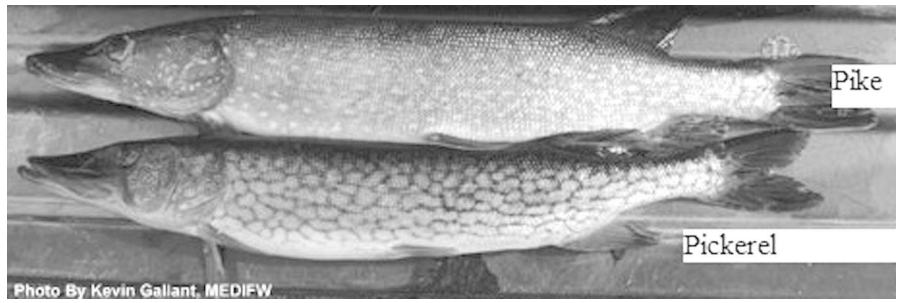


Figure 6. A Northern Pike next to a Chain Pickerel. Note the distinctive chain patterning on the pickerel, as well as the black line under the eye.

In the winter of 2006, following the confirmation of pike in Pushaw Lake, Regional fisheries staff conducted a creel survey to help determine the extent of the population. Two hundred and ninety-six fishing parties consisting of 947 anglers were checked at Pushaw Lake during the 2006 winter creel survey. Eleven pike were caught by anglers, eight of which were kept, one was released by the angler, and two were radio-tagged and released by fisheries biologists in order to identify pike spawning areas (Figure 7). The radio-tagged fish were monitored weekly for most of the winter and increasingly as spawning time approached. The two radio-tagged pike spent most of the winter near a deep area known as Mag's Ledge, before moving into the inlet spawning area on the north end of the lake in late March.

Taking advantage of an early ice out in 2006, biologists deployed fyke nets in the inlet in an effort to capture and remove as many pike as possible (Figure 8). Fyke nets, often called trap nets, are a passive capture method that collects fish as they swim through an area and holds them in a collection box until the net is tended. The design of the net allows for very minimal mortality of captured fishes. Using the radio-tagged pike locations as a guide for where likely spawners were congregating, three trap nets were deployed in 2006 and a total of 14 pike were captured. Of those, 13 were female and only one was male. Cleithra, a bone of the gill and pectoral region, collected from the pike to determine the age of the fish revealed these individuals to be between 2 and 8 years-old showing that successful reproduction was likely already occurring in the lake.

Following the initial work of 2006, IFW and the Department of Marine Resources formed a Pushaw Lake Northern Pike Working Group and met several times to discuss the possible options for eradication or control of this invasive

species from Pushaw Lake and ultimately, the Penobscot River drainage. Several options were discussed, including chemical reclamation of the lake, seasonal drawdowns of the water level, construction of fish weirs, or installation of electric fish exclusion devices. In the end it was decided that many of these options would be prohibitively expensive, and would not likely result in the complete eradication of the pike. Hence, suppression of the population was determined to be the best method to help slow the dispersal of pike into the Penobscot River and beyond to other parts of the watershed. The Penobscot River watershed encompasses 269 surveyed lakes and ponds totaling 189,486 surface acres, and 4,753 miles of brooks, streams, and rivers which include many valuable and historical fisheries to be impacted by the introduction of pike. Over the next few years, many methods of population suppression were attempted. Experiments were conducted testing the effectiveness of gillnets, seines, and electrofishing boats, but the spring trap netting was by far the most successful, efficient and cost effective.



Figure 7. Fisheries biologists surgically implant a radio telemetry tag into a Northern Pike.

IFW has annually continued the pike removal effort since 2007 (Table 16). The number of nets used and the geographic area that has been trapped has varied greatly over the years. At one point a total of 15 nets were deployed, stretching from the inlet of Pushaw Lake all the way down Pushaw Stream, into Mud Pond, and even the Stillwater River (Figure 9).

Very few pike were caught in areas downstream of the lake, so the number of nets utilized was reduced in 2013 to concentrate effort on the inlet and the upper reaches of Pushaw Stream. 2013 was, by far, the most successful year in terms of both total catch and catch rate (Table 16). 178 pike were caught in the Pushaw Lake system, likely due to a couple of reasons. First, the ice melted reasonably early that year and allowed us to set the nets before the pike got into their spring spawning locations. Second, we set nets farther up into the inlet than had previously been attempted. This new net placement resulted in a large increase in the number of fish caught. Third, the spring of 2013 was very dry and the water receded quickly, reducing the spawning area that the pike could use, eliminating many of the travel channels through the marsh. This allowed us to move the nets into positions which could catch pike very efficiently while reducing the chances for pike to evade the nets (Figure 10).

In 2014, it was determined that about 90 percent of the pike that were trapped were coming from the inlet rather than Pushaw Stream, so the decision was made to concentrate effort near the lake. The number of nets deployed was reduced, targeting only the spots which had produced high catch numbers in previous years. The spring of 2014, however, was very cold, and the ice didn't recede enough to allow netting until mid-April. The late ice-out and the high water that persisted throughout the trapping season contributed to a much lower total catch, but a very high catch rate. The system was further refined in 2015 with a reduction again of the number of nets being used. 2015 was also a very cold year and again the ice persisted until mid-April. Reducing the number of nets used, however, resulted in an even higher catch rate, and nearly the same catch numbers as in 2014. The spring trapping is scheduled to continue in the spring of 2016. Due to the increasing numbers of anglers catching large numbers of pike in Pushaw stream, netting will likely recommence in that area.

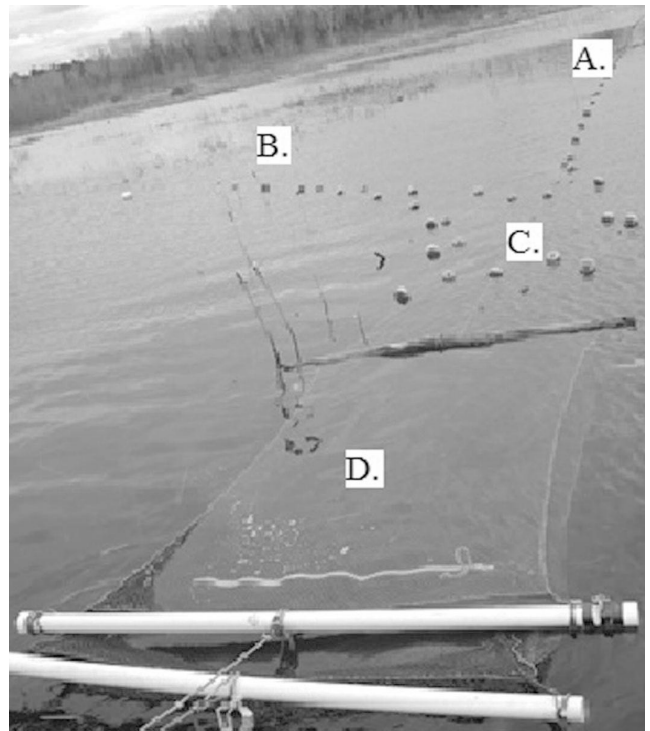


Figure 8. A fyke net deployed in the Pushaw Lake inlet showing: A. The long lead which reaches toward shore, B. The wings which help guide the swimming fish, C. The funnel area which the fish can swim into, but cannot easily swim out of, and D. The holding box where the fish can be collected through the zippered opening.

Over the ten years that the trap-netting project has been in place, pike have managed to colonize all of the Pushaw Lake system, having been confirmed in Little Pushaw Lake and Mud Pond and throughout Pushaw Stream. They have also been confirmed in lower Kenduskeag Stream, and the lower Penobscot River. In 2015, a pike was captured and killed at the newly installed fish lift on the Penobscot River in Milford. This is the furthest upstream that a pike has been confirmed, though unconfirmed angler reports allude to their presence higher in the drainage. While the pike have managed to colonize most of the habitat available to them currently, they have been limited to a relatively small area in the lower Penobscot watershed. Improved fishways that exclude pike but allow other species like Atlantic salmon, shad and alewives to pass and pike population reduction through spring trap-netting seems to be slowing down the spread,

and keeping the population density relatively low.

Table 16. A ten year summary of the pike caught by spring trap-netting in the Pushaw Lake system.

Pushaw Lake Spring Trapnetting								Males			Females		
Year	Start Date	End Date	# Nets	# Net Days	# Pike	# Pike/Net Day	Average Length (Inches)	Average Weight (Pounds)	Max Weight (Pounds)	Average Length (Inches)	Average Weight (Pounds)	Max Weight (Pounds)	
2006	3/29/2006	4/27/2006	3	90	14	0.16	20.3	1.6	1.6	28.0	5.3	11.5	
2007	4/9/2007	4/27/2007	3	57	24	0.42	17.0	1.0	1.0	30.4	7.5	13.4	
2008	4/6/2008	4/24/2008	4	76	5	0.07	19.8	1.9	1.9	24.7	3.2	4.9	
2009	4/6/2009	4/29/2009	4	96	19	0.20	18.0	1.4	1.9	27.9	5.4	12.3	
2010	3/22/2010	4/17/2010	7	198	38	0.19	20.2	1.9	4.0	26.4	5.1	14.0	
2011	3/29/2011	4/21/2011	15	257	78	0.30	23.9	3.5	11.9	27.8	5.5	16.8	
2012	3/16/2012	4/13/2012	15	316	71	0.22	20.9	2.5	6.0	28.0	5.9	12.1	
2013	4/1/2013	4/22/2013	8	168	178	1.06	18.8	1.5	5.0	21.9	3.1	13.2	
2014	4/14/2014	5/5/2014	5	84	35	0.42	22.2	2.7	6.4	26.0	4.5	10.4	
2015	4/15/2015	5/6/2015	3	60.5	34	0.56	22.8	2.9	6.6	32.2	8.6	18.7	

New research being conducted by the University of Maine using environmental DNA technology looks promising to be able to more accurately determine if pike currently extend above Milford. Environmental DNA testing detects excreted fish DNA in the water to confirm species presence while fish numbers are quite low

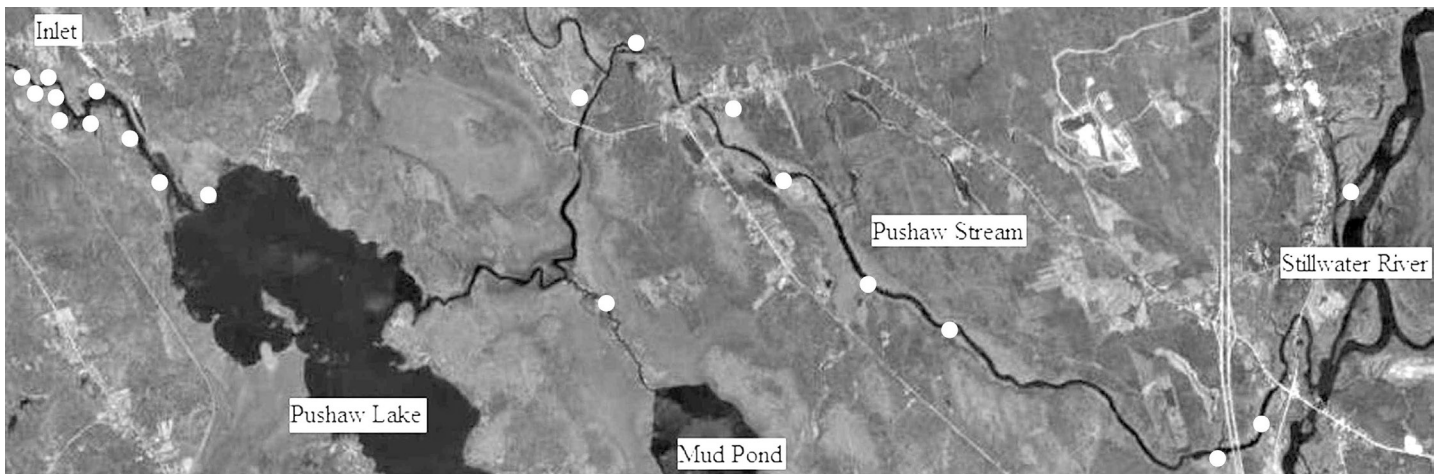


Figure 9. All the locations where trap nets have been deployed from 2006-2015 to catch pike.



Figure 10. Fisheries Specialist Kevin Gallant with two pike caught in Pushaw Lake inlet in 2013.

and unlikely to be detected by current capture methods. Environmental DNA testing is a powerful tool fisheries managers can use to rapidly determine the presence of an undesirable fish species and potentially allow for immediate action to eradicate or suppress. In addition, we feel that on-going public outreach and education highlighting the dangers of introducing a top level predator into a novel ecosystem has helped to eliminate any new illegal stockings of pike within the Penobscot River system.

Anglers fishing in the Penobscot River system can assist us by harvesting any pike caught in the drainage. Any suspected pike caught, especially in areas not mentioned in this report as having confirmed populations, can be brought to a regional IFW office to be confirmed as a pike and documented as a new occurrence. This documentation will help us to stay ahead of their movements and concentrate our removal efforts where they will be the most effective. Eradicating pike from the system will likely never happen, but the management goal of suppressing the population and slowing down their progression through the river system in order to protect valuable and historical fisheries upstream has so far been successful, and will continue.

-- Tyler Grant

Baitfish Dealer Inspections: One Strategy to Minimize the Risk of Illegal or Inadvertent Fish Species Introductions

While the Department of Inland Fisheries and Wildlife (IFW) has been conducting Baitfish Dealer Inspections most years since the 1990s, the goal was to increase our level of effort from 10% to 25% of all license holders statewide in 2015. This included all Live Bait Retail, Baitfish Wholesale, and Smelt Wholesale license holders. This year, there were 446 licenses issued (through 2/3/2015; Table 17). Of those, Department biologists and game wardens inspected 173 license holders (38.8%). License holders are chosen at random (with an emphasis on dealers who haven't been checked recently) and can be visited yearly or multiple times per year. These inspections consist

of license checks, as well as making sure all fish on site are legal baitfish. Biologists document all species present and ask a few other questions including prices, where bait is stored, bait disposal, etc. This year we found 8 dealers operating without a license or without the proper license. We also found 2 dealers with illegal bait species on the premises (both were sticklebacks, were not for sale, and were in the process of being culled). These cases were handed over to the warden service for further investigation, if necessary.

Inspections allow biologists and wardens to communicate with the dealers to ensure that only legal baitfish species are available to the public. At this time, biologists and wardens often field questions about fish identification, private pond stocking permits, game fish stockings, the proper disposal of extra bait, rules, and laws. This provides a great opportunity for public education, as these dealers are in direct contact with many of Maine's anglers. All of this will hopefully continue to minimize the chances of unwanted species being spread throughout the state in bait buckets.

One emphasis for this year was to make sure all dealers were planning to dispose of any leftover bait in a legal fashion. It is illegal to dump unused live baitfish into any Maine water, public or private. One can obtain a Private Pond Stocking

Table 17. Recent Summary of Baitfish Dealer Inspection Effort and Results (2010-2015).

Year	# Licenses as of February 3 rd each year	# Licenses Inspected	Percentage	# Illegals Found	# Total Infractions
2010	522	61	11.69%	0	5
2011	455	75	16.48%	0	5
2012*	488	0	0.00%	0	0
2013	475	83	17.47%	0	6
2014	421	96	22.80%	1	4
2015	446	173	38.79%	2	8

*No inspections were conducted in 2012

Permit to allow leftover baitfish to be held in one's private pond for future use. Another emphasis for 2015, regarded the commercial sale of amphibians. It is currently illegal to sell amphibians for use as bait in Maine without a commercial permit from IFW. Two dealers were found to be selling amphibians without the proper permit in hand and were warned by the warden service and encouraged to pursue the permitting procedure in order to continue dealing amphibians for use as live bait.

IFW is currently reworking the legal baitfish species list to reflect what we know about these species. Three species have recently been removed from the list of legal baitfishes (Creek Chubsucker, Bridle Shiner, and Longnose Dace). These species are rare in the State of Maine, are not known to be used as bait by anglers, and have never been detected as being actively dealt in the baitfish commercial fishery. Others are being evaluated to determine their status and degree of use in the fishery. The current list of legal baitfish consists of Blacknose Shiner, Common Shiner, Emerald Shiner, Golden Shiner, Spottail Shiner, Blacknose Dace, Finescale Dace, Northern Redbelly Dace, Pearl Dace, Creek Chub, Lake Chub, Eastern Silvery Minnow, Fathead Minnow (Figure 11), Fallfish, Longnose Sucker, White Sucker, Banded Killifish (Figure 12), Mummichog, American Eel, and Rainbow Smelt. Table 18 shows the number of occurrences in Baitfish Dealer Inspections from 2001-2014 (744 total inspections). Several of the legal baitfishes have never shown up in an inspection. Table 18 also includes the illegal species found during inspections. Most were not for sale and found in sorting tanks or, as in the case of the northern pike, were on display by the dealer and technically not for sale.

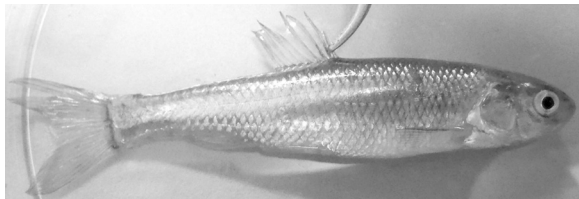


Figure 11. A Fathead Minnow (*Pimephales promelas*).

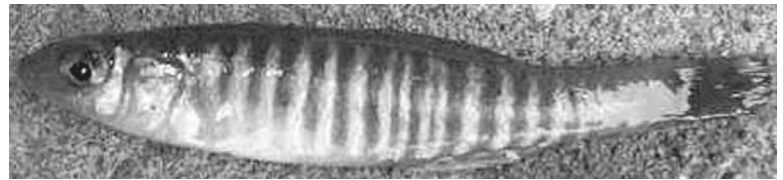


Figure 12. A Banded Killifish (*Fundulus diaphanous*).

IFW will continue to monitor all baitfish dealers in the future. Remember, it is illegal to stock any live fish in the State of Maine without a specific permit for that action. It is also illegal to transport live fish without a permit except for legal baitfish by a recreational angler. It is illegal to dump unused baitfish into any waterway. To report any information on an illegal introduction please call: 1-800-ALERT-US(253-7887) In-State or (207) 287-6057 Out-of-State. Rewards are often available for information that leads to a conviction. There is a \$10,000 fine for the conviction of illegal fish stocking. Please help keep Maine's waters free of illegally introduced species!

-- Kevin Gallant

Table 18. Species detected during inspections from 2001-2014 (illegal species are in bold).

Species	# of Occurrences	Species	# of Occurrences
Golden Shiner	678	Blacknose Dace	21
Rainbow Smelt	360	Lake Chub	14
White Sucker	340	Pearl Dace	10
Common Shiner	183	Brown Bullhead	4
Eastern Silvery Minnow	95	Longnose Sucker	5
Fathead Minnow	97	Stickleback	4
Northern Redbelly Dace	89	Black Crappie	1
Fallfish	55	Northern Pike	1
Banded Killifish	44	Pumpkinseed Sunfish	1
Finescale Dace	34	Rudd	1
Mummichog	33	Yellow Perch	1
Creek Chub	32		

FISHERIES MANAGEMENT SECTION

Maine is blessed with over 5,800 lakes and ponds one acre or more in size, totaling nearly one million acres, and about 36,000 miles of rivers and streams. In the early 1950s, the Legislature and Maine's Department of Inland Fisheries and Wildlife created the Fisheries and Hatcheries Division to manage this vast inland fishery resource, an asset that is now estimated to add over \$300 million annually to the state's economy. This Division is responsible for protecting native fish species and their critical habitats, while providing a diversity of opportunities for Maine's angling community. A staff of 24 fishery biologists in the Fisheries Section works from seven Regional Headquarters, Bangor, and Augusta to achieve these objectives.

Progressive fisheries management emphasizes the protection of native, self-sustaining populations, along with carefully considered stocking programs to maximize fishing opportunities in all areas of the state. Our Fisheries Section receives national acclaim for its efforts to protect native species, while making Maine a destination for serious anglers. Below are just a few examples of the work our fisheries biologists are conducting in support of this state's incredibly rich and diverse freshwater resources.

-- Dave Boucher

Fisheries Management Section Supervisor

REGIONAL FISHERIES MANAGEMENT

Bioconcentration of Phthalates in Lake Trout Resulting from Ingestion of Soft Plastic Lures

Soft plastic lures (SPLs) are popular tackle among many sport fisheries in North America. In Maine, SPLs are used frequently in the bass fishery and are often lost to the aquatic environment during active fishing. Discarded SPLs have been documented extensively in many Maine lakes (Figure 13) and the ingestion of these SPLs by salmonids is a growing



Figure 13. Soft plastic lures collected from a Maine pond.

concern by anglers and fisheries managers (Figure 14). Plasticizers, such as phthalates, are low-molecular-weight polymers. Phthalates are frequently used in soft plastics and are used to render SPLs flexible. The negative effects of phthalates on both terrestrial and aquatic organisms have been well documented. Based on the chemical constituency of SPLs, the ubiquity of SPLs as discarded fishing tackle in Maine lakes and ponds, and the well-documented environmental and human health impacts from phthalate esters, we developed a study to determine: 1) the chemical constituency of SPLs, including identification of phthalate esters; and 2) the bioconcentration of phthalates in fish tissue commonly consumed by humans. Hatchery lake trout (togue) broodstock were separated and maintained at the Governor Hill Hatchery in Augusta, ME. Two treatment groups and one control group were established. One treatment group was force-fed SPLs advertised as not containing phthalates. The other treatment group was force-fed SPLs with no distinction regarding phthalates. The control group was not fed any SPLs.

Post-SPL feeding, all treatment and control groups were fed a maintenance diet during the duration of the 4-month study. The same brands of SPLs that were used in each of the two treatment groups were provided to the University of Maine Orono for chemical analyses to determine the presence of phthalates via gas chromatography/mass spectrometry. Four months post- SPL feeding, all study fish were provided to the lab and edible fish tissue (i.e. filets), blood, and livers were analyzed for the presence and concentration of phthalates. The study is currently ongoing. Determining the chemical constituency of SPLs and whether key ingredients (i.e. phthalates) bioconcentrate in edible fish tissue will enhance our understanding of the possible effects of ingested SPLs by salmonids in Maine's lakes and ponds.

-- Dana DeGraaf
Coldwater Fisheries Biologist

concern by anglers and fisheries managers (Figure 14). Plasticizers, such as phthalates, are low-molecular-weight polymers. Phthalates are frequently used in soft plastics and are used to render SPLs flexible. The negative effects of phthalates on both terrestrial and aquatic organisms have been well documented. Based on the chemical constituency of SPLs, the ubiquity of SPLs as discarded fishing tackle in Maine lakes and ponds, and the well-documented environmental and human health impacts from phthalate esters, we developed a study to determine: 1) the chemical constituency of SPLs, including identification of phthalate esters; and 2) the bioconcentration of phthalates in fish tissue commonly consumed by humans. Hatchery lake trout (togue) broodstock were separated and maintained at the Governor Hill Hatchery in Augusta, ME. Two treatment groups and one control group were established. One treatment group was force-fed SPLs advertised as not containing phthalates. The other treatment group was force-fed SPLs with no distinction regarding phthalates. The control group was not fed any SPLs.



Figure 14. Angler-caught brook trout with ingested soft plastic lures in stomach.

Contribution of Fall-Stocked Brown Trout to a Winter Fishery: A Comparison of Trout Stocked in October and December

Fall yearling brown trout, 12 to 14 inches in length, are stocked annually in Maine lakes and ponds to create year-round recreational fishing opportunities where indigenous salmonids do not perform well. These lake-stocked brown trout are typically released at a size below the minimum legal harvest length of 14 inches, with the expectation of post stocking survival and growth to create a multi-age class fishery.

Hatchery personnel at the New Gloucester Hatchery report the vast majority of fall yearling brown trout (age 1+) are sexually mature at time of stocking. Not surprisingly, pre-spawn, post-stocked brown trout often concentrate in areas of shallow moving water (inlets/outlet) in preparation for spawning. Furthermore, staff biologists have observed injuries to recently stocked trout captured in fall-set trap nets, including visual observations of nearby fish predators. It was hypothesized that a delay in stocking until after the urge to spawn had lapsed would reduce shallow water swimming behavior, reducing their susceptibility to predation and loss from the fishery. Lake-stocked brown trout are typically released in October, but over a three year period on four study waters half the scheduled stockings were planted in October and the remaining half released in December. Trout associated with each stocking were differentially marked (fin clipped) to support field identification and comparison. Brown trout survival and recruitment to the fishery were evaluated using recreational angler harvest data collected during the month of January over three consecutive years (2008, 2009, and 2010) on Sabbathday and Crystal lakes. A robust sample obtained from Sabbathday Lake ($n^{\text{fish}} = 130$) and a smaller sample obtained from Crystal Lake ($n^{\text{fish}} = 29$) supported detailed analysis for this investigation. Brown trout data collected during this investigation was incidental to data collected during a statewide assessment of catchable brook trout. Two other waters included in this investigation (Middle and Upper Range ponds) were sampled with gill nets and trap nets in 2009 and 2010. In addition, an abbreviated angler survey was conducted in January of 2010 to increase sample size. These efforts yielded a small sample (Middle Range: $n^{\text{fish}} = 4$, Upper Range: $n^{\text{fish}} = 5$) - unsuitable for statistical analysis, but they are included in this report nonetheless. A total of 179 study brown trout were examined across all four study waters and data collection methods. Seventy-three percent of the total sample was collected on Sabbathday Lake; 59% originated from the December stocking and 41% originated from the October stocking. On Sabbathday Lake mean angler party harvest

rates for December-stocked trout (0.017 legal brown trout per hour, $n^{\text{angler interviews}} = 448$) were 1.5 times higher than October-stocked trout (0.011 legal brown trout per hour, $n^{\text{angler interviews}} = 448$; Figure 15). This difference was statistically significant (Wilcoxon Rank sum, 2-sided, $p=0.0174$). An examination of age classes present in the harvest revealed a higher percentage of each cohort was comprised of December-stocked fish; on average, 39% more holdovers were December-stocked trout. December-stocked trout contributed 25% more to the harvest of three and four year old brown trout, which are the oldest and largest in the fishery. This difference was also found to be statistically significant ($X^2 = 33.802$, 1 d.f.; 2 sided $p < 0.0001$).

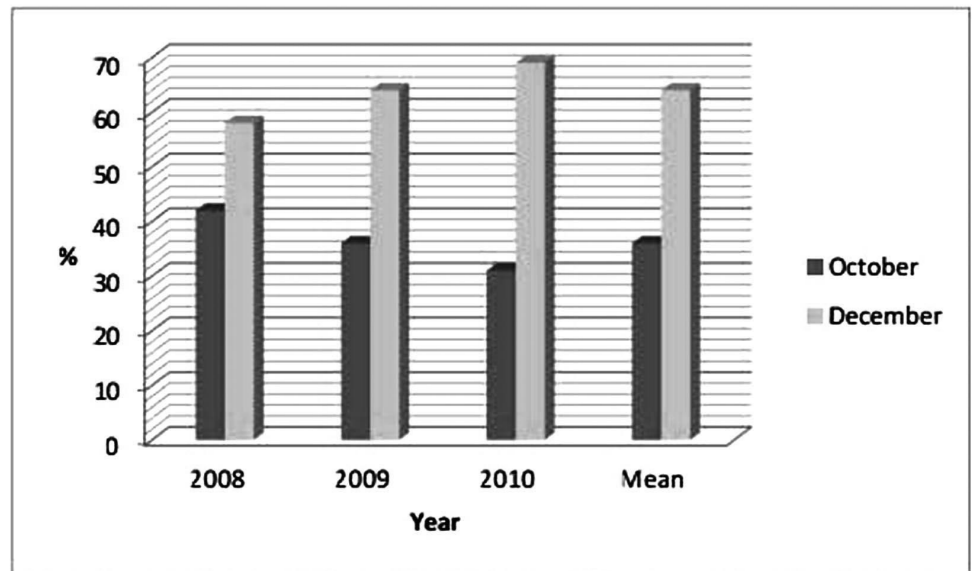


Figure 15. Percent of Harvest by Month and Year Stocked, Sabbathday Lake.

No statistically significant differences reflecting month stocked were found on Crystal Lake, although a relatively small sample size reduced confidence in the analysis. Physical differences in lake hydrology and attraction flows may have influenced the vulnerability of newly-stocked brown trout to predation and out migration, and may have accounted for differing results on Sabbathday and Crystal lakes.

-- Francis C. Brautigam
Regional Fisheries Biologist, Sebago Lake Region

Maine's Brook Trout Stream Monitoring Project: Trends in Abundance and Size Quality of Stream-Dwelling Brook Trout (1990-2014)

In 1990, the Maine Department of Inland Fisheries and Wildlife (IFW) began a statewide, long-term brook trout (*Salvelinus fontinalis*) stream monitoring (TSM) project in order to assess brook trout populations in select sample streams. This effort aimed to help the Department better understand stream brook trout populations, assist in species planning, and analyze the potential impacts of more restrictive fishing regulations implemented in 1992.

Originally, seven long-term index sites were chosen for the TSM based on select criteria, but many additional streams were also chosen for shorter-term monitoring throughout the project's duration (1990-2014; Figure 16). Index sites averaged 370 ft. in length, 16.7 ft. in wetted width, and were electrofished annually using 3-pass depletion sampling with backpack electrofishers to estimate brook trout abundance and size quality (Figure 17).

For 29 study streams, the Mann-Kendall (M-K) trend analysis determined that, while 11 trout populations trended upwards, 16 trended downwards, and two had no trend, only three streams exhibited statistically significant trends (Big Brook and North Branch Fox Brook in Region G – upward trend; Rome Trout Brook in Region B – downward trend; Table 19). The M-K analysis for the percent of legal brook trout ($\geq 6''$) determined that while 15 sites trended upwards, 12 trended downwards, and two had no trend, only one stream exhibited a statistically significant trend (Branch Brook in Region A – upward trend).

Study streams that exhibited significant trends were impacted by several different environmental, social, and/or cultural variables. The overall lack of significant trends

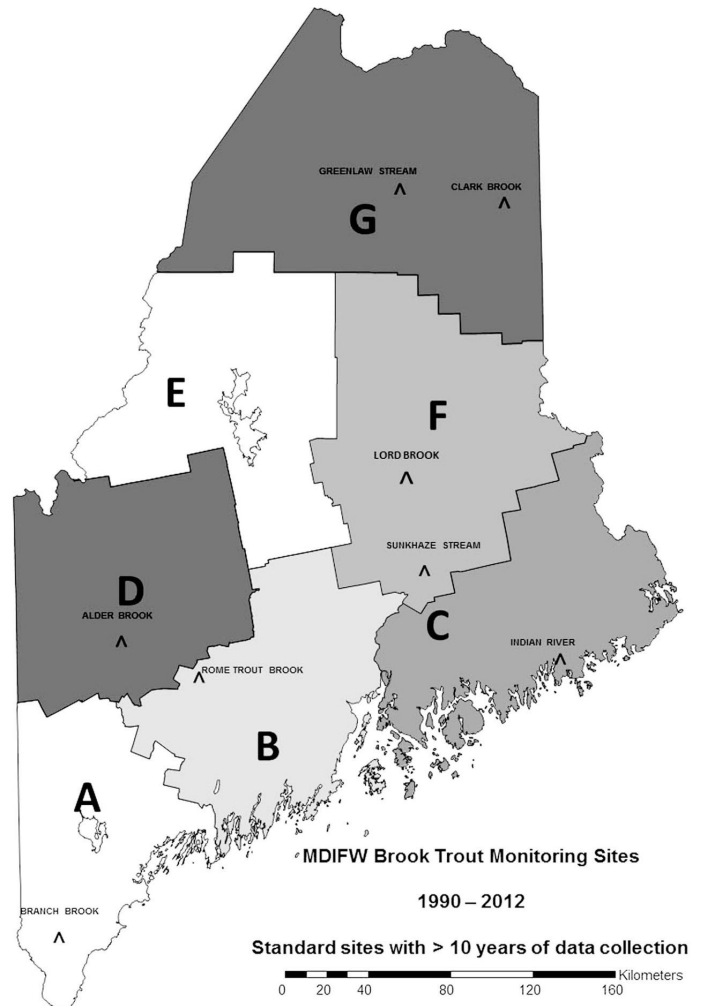


Figure 16. Brook trout stream monitoring index sites.

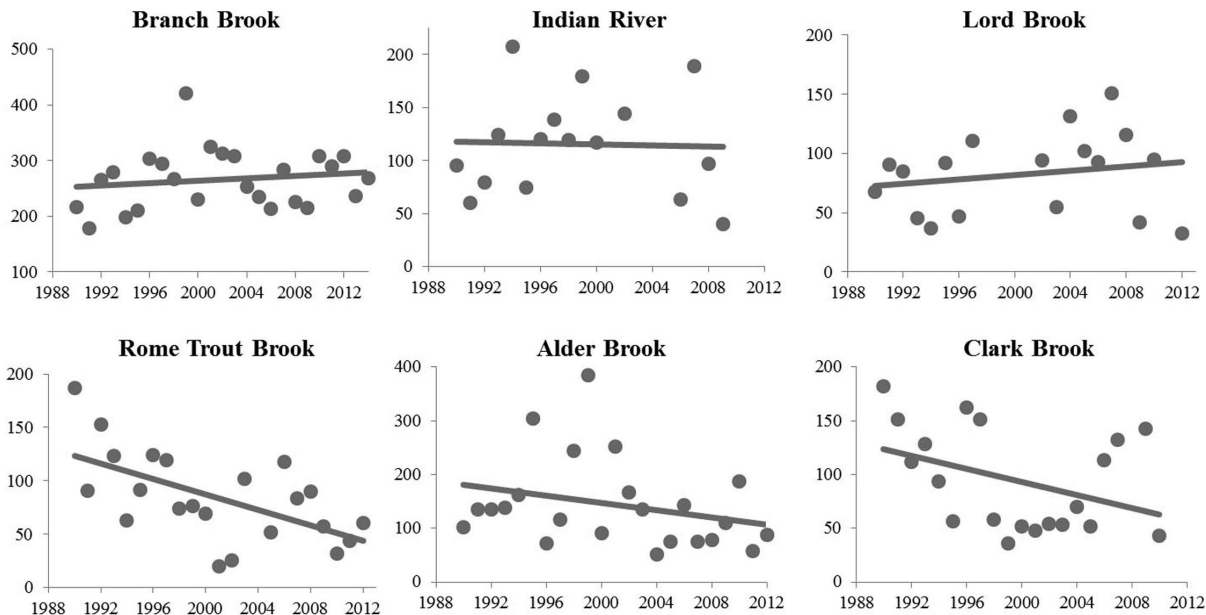


Figure 17. Brook trout population abundance estimates based on 3-pass depletion backpack electrofishing for 6 long-term brook trout monitoring stream reaches by year.

Table 19. Regional brook trout monitoring streams with watcode, years samples, and number of years surveyed.

<u>STREAM</u>	<u>REGION</u>	<u>WATCODE</u>	<u>YEARS SAMPLED</u>	<u>NO. OF YEARS</u>
Branch Brook	A	022002	1990-2014	25
W. Branch Tenmile River	A	03204101	1990-93, 2000-04	9
Worthley Brook	A	08602304	2005-12	9
Back Brook	A	032027	1990-93, 2000	5
Shepards River	A	032045	1999-2000, 2002-04	5
Emerson Brook	A	0320301503	1995-98	4
W. Branch Nezinscot River	A	08603415	-	1
Rome Trout Brook	B	093038071103	1990-2003, 2005-12	22
Hope Brook	B	139008	1990-93	4
Martin Stream	B	08603410	1990-92	3
Indian River	C	356004	1990-2000, 2002, 2006-09	16
Little Mopang Stream	C	37302202	1990-94	5
Haynes Brook	C	2610180403	1990-93	4
Mill Stream	C	418003	1991-93	3
Alder Brook	D	0860722302	1990-2012	23
Bigelow Brook	D	2100534107	1990-95, 1997-99	9
Lemon Stream	D	0930403101	1990-93	4
South Bog Stream	D	086175101301	1990-93	4
Fillibrown Brook	D	09306911	1990-93	4
Abbott Brook	D	08616808	2006-07	2
Cold Stream	D	093108	2004-05	2
Chandler Mill Stream	D	09306958	2008-09	2
Michael Stream	D	093077050503	2010-11	2
Phelps Brook	D	086089140101	2012	1
Squaw Brook	E	093129	1990-93, 1995, 1997, 2002	7
North Brook	E	210053202221	1990-93, 1998	5
Lord Brook	F	21005018	1990-97, 2002-10, 2012	18
Sunkhaze Stream	F	210038	1990-95, 1997-98, 2000	9
Salmon Stream	F	210068	1990-93	4
Clark Brook	G	42711118	1990-2007, 2009-10	20
Greenlaw Stream	G	4271354902	1990-2001	12
Big Brook	G	42709607	1991-96, 1999, 2000, 2009	9
Hockenhull Brook	G	42713506	1991-1995, 1999, 2001	7
McConnell Brook	G	4271354904	1991-96, 2003	7
B Stream	G	42709615	1991-93, 1997-98, 2009	6
West Hastings Brook	G	2100724014	1990-93, 1995	5
North Branch Fox Brook	G	4272165301	1990-93, 2002	5

based on monitoring data indicate that most of Maine’s stream trout populations are likely more heavily governed by environmental factors than changes in fishing regulations. The findings from this long-term dataset will help guide brook trout management in streams and allow IFW biologists to focus limited resources on stream monitoring efforts likely to provide data most useful for research and management applications.

We recommend a shift in the focus of IFW’s trout stream monitoring moving forward. Monitoring should continue similar to past efforts in only the longest-term (10+ year) brook trout monitoring sites, and at less frequent intervals – perhaps once every third year. Effort previously spent on other TSM sites should be used to collect less intensive data, but on a broader scale, with a focus on characterizing brook trout distribution and abundance in more streams, and among more reaches of individual streams. Additional data such as presence/absence of fish species, species distribution, and rudimentary habitat and road crossing characteristics should be included in future trout stream monitoring efforts. New stream survey methodologies could be developed regionally based on data needs and program objectives.

-- Wes Ashe and Dana DeGraaf
Fisheries Biologists

Fish Production Report, 2014

The Hatchery Section stocked 1,383,956 fish weighing a total of 399,852 pounds during 2014 (Table 20). This represents the second highest yearly total pounds of fish ever produced for our statewide stocking program, only slightly less than the previous record of 413,336 pounds in 2013. Fish were stocked from our eight state fish hatcheries and rearing stations: Wade Hatchery in Casco, Dry Mills Hatchery in Gray, Ela Rearing Station in Embden, Cobb Hatchery in Enfield, Governor Hill Hatchery in Augusta, Grand Lake Stream Hatchery, New Gloucester Hatchery, and Palermo Rearing Station. Supplemental fish were again provided from the Dead River Hatchery where fry were transferred for further grow-out into this satellite facility for a return of 10,241 fish weighing 5,146 lbs.

Table 20. Stocking by Species, 2014.

Species	# of Fish	Lbs
Brook Trout	1,033,912	258,351
Brown Trout	149,220	77,916
Landlocked Salmon	112,223	26,360
Splake	40,066	17,368
Rainbow Trout	38,147	13,007
Lake Trout	10,388	6,850

-- Todd Langevin
Superintendent of Hatcheries



Egg Jars at the Governor Hill Fish Hatchery (Photo by IFW)

WILDLIFE MANAGEMENT SECTION

The Wildlife Management Section is comprised of seventeen Regional Wildlife Biologists, a Wildlife Biologist liaison with the Bureau of Parks and Lands (BPL) and two staff Foresters within the Lands Management Program.

Earlier this year, the Wildlife Management Section was brought to full capacity after two staff members were added. Leigh "Eric" Hoar has joined the Department to lead the Lands Management Program, based out of Sidney, Maine. Eric previously worked for the Bureau of Parks and Lands as a Forester and has extensive forest and habitat management experience. Additionally, an existing vacancy in the Region C (Jonesboro) office was recently filled in April with the hiring of Sarah Spencer of Old Town, Maine. Sarah comes to the Department with a varied background in seabird restoration and both forest and wildlife habitat management; a skill set which will be a vital asset to the work program Downeast.

Truly comprehensive in the scope of the work program, the Regional Wildlife Management program touches on all aspects of the Department's approach to wildlife management. For most of the public, the Regional Wildlife Biologists are the main point of contact for wildlife issues in the State and serve as an important conduit for information both coming into the Department and conveying information to the public.

The Wildlife Management Section work program encompasses biological data collection for species management purposes, planning and implementation of wildlife habitat management on state and private lands, environmental review of development projects, development of statewide regulatory recommendations, administration of the Animal Damage Control Program, working with wildlife rehabilitators, and providing technical assistance and public outreach.

Wildlife habitat management is an important function of the Department, whether it is on state or private lands. The Wildlife Management Section is responsible for management of Department-owned Wildlife Management Areas (WMAs), which are located throughout the State. The WMAs are available for hunting, fishing, trapping, and other non-consumptive uses. We've recently undertaken an outreach effort to increase awareness of these properties to inform the public about where these properties are located, what recreational opportunities can be found on them, how to access them, and the management undertaken by the Department to improve and maintain habitat. The following information presents a few of the WMAs throughout the State. I would encourage you to get out and explore these areas, use them for outdoor recreational opportunities, and provide us your feedback.



You can find additional information, including maps, on our website at:
http://www.maine.gov/ifw/wildlife/land/department/wma_maps.html

-- Ryan Robicheau
Wildlife Management Section Supervisor

REGIONAL WILDLIFE MANAGEMENT

Region A

The Kennebunk Plains Wildlife Management Area (WMA) is an exceptional 1,758-acre property located in the town of Kennebunk. It is composed of 650 acres of sand plain – grassland community, representing the largest contiguous unit of this type in southern Maine. The remainder of the property is upland forest with black, white, and red oak, red maple, white and red pine, and some ecologically rare pitch pine – scrub oak barren. Kennebunk Plains WMA is recognized for the large number of state-listed rare, threatened, and endangered flora and fauna co-occurring at the same location, an anomaly in southern Maine where land is highly vulnerable to development. Species such as the state endangered grasshopper sparrow, black racer, and Edward's hairstreak, as well as state threatened upland sandpiper, northern blazing star, and sleepy duskywing coexist with other uncommon species that are dependent on the unique blend of open expanses and pitch pine – scrub oak woodland.

Kennebunk Plains was a commercial blueberry operation from the 1940s to 1989. Grasshopper sparrows were identified in 1984 and, thus, became the flagship species for management of Kennebunk Plains WMA upon state acquisition in 1990. Through tremendous efforts by The Nature Conservancy (TNC) and other partner organizations, the first purchase of 1,041 acres was made using the Land for Maine's Future Fund. Over the past decades, more land has been acquired as mitigation for habitat loss of black racers.

Management at Kennebunk Plains is considerably different than at other IFW WMAs, with intensive prescribed burns being the most common tool used to retain a rotation of varying aged grasslands for grasshopper sparrows and other dependent species. TNC owns the adjacent 120-acre Wells Barrens and maintains a lease, allowing for the management at Kennebunk Plains through mowing, fire, and manual cutting. Rotational burns have been conducted annually from 1993 to the present via a mutual agreement between TNC and IFW, perpetuating the grassland portion of Kennebunk Plains WMA. Small timber management efforts began in 2002 to include scrub and brush enhancement for black racers and New England cottontails, and IFW has future plans for larger cuts to convert some of the surrounding upland habitat to grassland. Currently, the largest concentrated populations of black racers and grasshopper sparrows in the state are located at Kennebunk Plains WMA.



A Prescribed Fire (Photo by Scott Lindsay)



Black Racer Snake (Photo by Jonathan Mays)

Access to Kennebunk Plains WMA is easy, with two small parking areas located directly off of Route 99, just a short 10-minute drive from the Maine Turnpike in Kennebunk. There is also a small parking area off of the Maguire Road at the southern portion of the unit. Trails and dirt roads are numerous from all access points and are popular with dog walkers (on leash, of course), birders, and those simply wanting to enjoy this special place. Since management at Kennebunk Plains is focused primarily on grassland birds and black racers, vehicular access and public use is regulated from June to August. As expected, from the diversity of rare species, nature lovers abound here in the spring and summer hoping to observe upland sandpipers, brown thrashers, prairie warblers, eastern meadowlarks, and vesper, field, and grasshopper sparrows, or to, perhaps, luck out and catch a fleeting glimpse

of a black racer zipping through the brush. Come August 1st, blueberry pickers amass in numbers to fill their buckets of Maine's signature fruit. Whatever one's preferred activity, Kennebunk Plains WMA is undoubtedly a jewel of IFW wildlife management areas for its unique diversity of nature.

-- Brad Zitske

Assistant Regional Wildlife Biologist

Region B

Region B in Central Maine contains twenty-three separate Wildlife Management Areas that comprise close to 30,000 acres of land, available for both consumptive and non-consumptive users to enjoy. With this land, comes the responsibility of land ownership and maintenance. Each spring and summer season brings new opportunities to improve the infrastructure of our Department properties.

This year, as in other years, we will grade miles of road and replace numerous culverts to improve the road systems at the Frye Mountain WMA in Montville and the Earle Kelley WMA in Dresden. After the nesting season is complete, hundreds of acres of small fields will be mowed to maintain valuable habitat. Fields at the Green Point WMA in Dresden, Wilmot Brook WMA and Steve Powell WMA in Richmond, Frye Mountain WMA in Montville, Merrymeeting Bay WMA in Bowdoin, and R. Waldo Tyler WMA in Thomaston will receive their annual hair cut to improve habitat conditions for wildlife. Of particular note, will be miles of road-side vegetation that will be removed at the Frye Mountain WMA in Montville in order to improve road conditions at one of the Department's most spectacular properties.

Several of our WMAs contain water control structures that require management. Placing and removing the flashboards to maximize habitat conditions for waterfowl, signals the beginning of Spring and the end of Summer at the James Dorso WMA in Searsmont, Madawaska Bog WMA in Palmyra, and the Earle Kelley WMA in Dresden. WMAs with gated access must be opened and closed, as necessary, to maintain the integrity of the road system and to mark the passing of the seasons.

All of our Department properties require upkeep to optimize their wildlife habitat potential, which is our primary management objective. The fact that these improvements allow the public to have an easier and more enjoyable experience is a good secondary benefit to this effort.

-- G. Keel Kemper

Regional Wildlife Biologist

Region C

Over the past decade or two, the amount of land and associated flowages and wetlands under Department ownership in Region C has significantly increased due to State, federal, and privately funded land conservation initiatives. Region C personnel are responsible for overseeing land areas managed as Wildlife Management Areas (WMA), WMA Units, or land parcels, totaling approximately 6,300 acres. An additional 5,161 acres of private lands downeast, with restrictive conservation easements that the Department holds, are also routinely monitored.

Lyle Frost WMA is one such management area. Acquired in 1949, the WMA is located in eastern Hancock County in the towns of Eastbrook and Franklin. It encompasses over 1,800 acres, of which 658 are flowage (Scammon Pond) primarily managed for the production of waterfowl. As is the case with most of the Department's waterfowl production areas, duck boxes are maintained to offer supplemental nesting locations.

The nearly 1,200 acres of upland surrounding the flowage are managed for numerous wildlife species, with a focus on maintenance and enhancement of winter shelter for deer. Woodcock and grouse production, as well as bear and snowshoe hare habitat, is also a focus of management. A recent timber harvest, enhancing habitat for these wildlife species, was completed in 2013, which included construction of winter access roads and upgrade of existing access points. There are two small fields that are also maintained for herbaceous browse.

The WMA abuts Sugar Hill Road in Eastbrook, where the dam creating Scammon Pond is located. Additional access onto the WMA is established off the Macomber Mill Road, heading down the east side of Scammon Pond.

-- Tom Schaeffer
Regional Wildlife Biologist

Region D

This winter 10 duck boxes were erected on the Black Brook Flowage Wildlife Management Area in Pierce Pond Township, Somerset County. The new homes are expected to attract nesting wood ducks and hooded mergansers shortly after ice-out in May. Both species require natural cavities to nest and hatch out young. Supplementing a limited number of natural cavities with strategically placed nest boxes has been a hugely successful wildlife management technique for many decades.

Flowage rights to Black Brook flowage and the original dam site were purchased by IFW in 1990, thus creating the Black Brook Flowage Wildlife Management Area (BBF WMA). Though having unique and valuable wetland habitat values when purchased, the long-term plan for the property was to replace a non-functioning former log-driving dam in order to increase the percentage of shallow open water within the wetland complex. This would enhance the area for waterfowl, wading birds, and other wildlife. This walk-in WMA is nearly 700 acres large and lies 19 miles northwest of Bingham. The purchase and subsequent plans to increase water levels were intended to offset some of the wetland impacts associated with the storage and water releases associated with the operation of the hydroelectric dam on Flagstaff Lake. Funding plus a complex permitting process required to erect and operate a new water control structure on BBF WMA have proven difficult to navigate. So, current plans are to recognize that the peat-bog-dominated wetland complexes has wildlife value "as-is", even though only about 14% of it has shallow, open water for waterfowl and wading birds. We delayed erecting nest boxes until a water control structure was built, but facing reality, we decided it was time to deploy waterfowl nest boxes where open water occurs and did so this winter.

We have found that placing boxes on steel posts increases both use and maintenance efficiency. Boxes placed on trees require constant vegetation management around the boxes, and sometimes have squirrel issues. Since we replace the shavings each year, make any needed repairs, and monitor use, it is much faster to do maintenance in the winter when you can ride right up to the box on a snowmobile, hauling supplies and tools in tow. Another advantage in putting boxes over water is reduced predator risk, as well as allowing young waterfowl to plop out onto water and quickly swim off with mom upon hatching.

We like using salvage channel post which is donated to us by the Maine Department of Transportation in Dixfield. These are easily



Biologist Chuck Hulsey and Technician Paul Campbell Apply Predator Guard to Duck Box (Photo by Eldon McLean)

installed during the winter. Posts had to be 10-12 feet long, or sections added to accommodate a few feet of water and many more feet of loose peat-bottom substrate. We selected and flagged the post locations the previous fall. Between regional wildlife biologist Bob Cordes and I, Fisheries and Wildlife Technician Paul Campbell, and long-time volunteer Eldon McLean of North Anson, we were able to install 10 boxes this winter. We'll add more boxes if usage reaches 75%.

If you would like to visit this WMA, take the Long Falls Dam Road from Route 16 in North New Portland. Travel north through Lexington and Highland Townships. In Carrying Place Town Township, look for a dirt road by that name on the right. There will also be a sign for Cobb's Pierce Pond Camps. There is an intersection a few miles in from the paved road. Turn left onto the North Bowtown Road. Travel less than a mile and look closely for a trail on the right. It is safe to pull over on the far side of the North Bowtown Road and park, but keep in mind that there is often log truck traffic on all those roads. Travel slowly and park well off the road surface. There are no improvements as IFW owns only the flowage rights, but none of the land around or near the flowage. It is about a one-quarter mile walk into the old dam site where it is easy to launch a kayak or canoe.

-- Chuck Hulsey
Regional Wildlife Biologist

Region E

The Delano Wildlife Management Area (WMA) is located about 4 miles north of the town of Monson along the eastern side of Rte. 6/15. This 589-acre WMA wraps around Spectacle Pond, which is the only roadside pond visible between Monson and Greenville (see Map 41 of the DeLorme, E3).

Far and away, the most significant use of this WMA is by hikers that are hiking the Appalachian Trail (AT). The AT travels through the southern portion of this WMA and receives substantial use by both through-hikers and day-hikers between the months of May and October. A parking lot along Rte. 6/15 to accommodate day-hikers and family/friends resupplying through-hikers is considered to be the last stopover point for those through-hikers in route to the top of Mt. Katahdin. The trail crosses the outlet (Goodell Brook) to Spectacle Pond and a small trail off the AT leads interested parties to Goodell Falls, a small, easy and scenic feature along the brook. The AT is also used by fishermen to access Bell Pond (at the northeastern corner of the WMA) and by hunters that are trying to access the eastern portion of this property.

The Department is currently in the early phases of implementing a habitat management plan for the property, which will consist of timber harvesting to promote softwood shelter, hard mast production, and improving forest stand health. The project will be implemented on the ground this coming winter and will enhance the habitat values of the WMA, diversify the structure of the forest, and improve the ability for folks to utilize the WMA.

-- Scott McLellan
Assistant Regional Wildlife Biologist

Region F

Region F has been working away at various projects associated with the Pond Farm WMA. The 409-acre shallow freshwater marsh with 40 acres of upland buffer is located in Howland and is one of the Department's oldest WMAs. It is also mapped as a High Value Waterfowl/Wadingbird Habitat.



Goose Pasture (Photo by Mark Caron)

Recent work at the WMA has focused on establishing a 4-acre food plot in what has been referred to as 'the goose pasture'. This field, which abuts the wetland, was established in the 1980s. Beginning in 2014, an effort was made to plant the field to herbaceous forage that would benefit a wide variety of upland and wetland-dependent wildlife species, but with the focus of providing nesting habitat and forage for the waterfowl that utilize the wetland. It has been challenging to establish the food plot due to poor soils, but we are slowly making progress. The site is limed and fertilized twice annually and spot-seeded, as needed, after the initial planting. Adjacent to the goose pasture, we conducted a 'feathering of edges' to create a transition layer between field and forest. The goal was to create nesting opportunity in what is now brushy habitat.

Another development that was a long time in coming was the establishment of wild rice in the wetland. Periodic



Pond Farm Duck Boxes (Photo by Mark Caron)

efforts over the years failed to get the rice established. The most recent efforts of a few years back seemed to have finally worked, as the rice is now firmly established throughout a portion of the shallow open water habitat. Wild rice is a food favorite of dabbling ducks and other aquatic wildlife. Our 'dabblers' (and some 'divers') also benefit from the 17 duck boxes that are located throughout the wetland habitat. These boxes are maintained annually during the winter, and Region F biologists also leg-band nesting hens that are utilizing the boxes in May.

-- Mark A. Caron

Regional Wildlife Biologist

Region G

Butler Island, located in Ashland, is a small WMA of approximately 295 acres of Aroostook River floodplain and riparian area. The area is split into 2 compartments; the larger of the 2 compartments includes an 86-acre island referred to locally as Butler Island. Half of this island consists of grassland or reverting field, of which 15 acres is actively cultivated and managed for grassland plant species and habitat. The original parcel of land was purchased in 1989 (Compartment 1), with an additional 49 acres added in 1993 (Compartment 2). The WMA is surrounded by private land, but foot access has been granted off the Goding Road via a primitive gravel road that crosses an active rail line. Only foot-traffic is allowed on the WMA due to sensitive wetland habitat. The WMA is also accessible by water on the Aroostook River.

Waterfowl and woodcock are the focus of management activities on this WMA. The area contains high quality wetland habitat for waterfowl with approximately half of the area flooding during early spring snowmelt. While some pools will dry in late summer, several will retain water throughout the year and provide valuable feeding grounds for young and migrating waterfowl and wading birds. The island is also an active woodcock area, with its combination of old field, patches of alders, and hydric soils meeting the needs of this unique upland game bird.

Hunting, trapping, and wildlife viewing are allowed on the management area. Besides waterfowl and woodcock, keep your eyes open for moose, deer, beaver, muskrat, marsh birds, and songbirds that utilize the management area. If you want to access the island by foot, be sure to bring waders or be prepared to get your feet wet! The crossing between the island and mainland can vary in depth dramatically, depending on the time of year, but, at low water, it is well worth it!

-- Amanda DeMusz

Assistant Regional Wildlife Biologist

Lands Management Program

The Lands Program collaborates with Regional Wildlife Biologists, staff from the Research and Assessment Section, the U.S. Fish and Wildlife Service, and others to develop, enhance, and maintain various types of wildlife habitat for both game and non-game species on the Wildlife Management Areas throughout the state. One project the Lands Program is currently working on is the development of grouse and woodcock habitat at the Jamie's Pond WMA in the towns of Manchester, Farmingdale, and Hallowell.

Jamie's Pond Wildlife Management Area is an 800-acre upland parcel surrounding a 100-acre cold water fishery, which the Department began acquiring in 1991 with the aid of Land for Maine's Future Fund and through various gifts. Nearly three quarters of the WMA's forest is dominated by mixed hardwood species, some of which contain a significant aspen component. These aspen-dominated areas represent an opportunity to manage for a whole host of wildlife species that use young forests, particularly grouse and woodcock. "Early successional habitat" is the term commonly used to describe young forests. As fields in southern Maine have reverted to forest and grown-up over the course of the last 100 years, early successional habitat has been in steady decline, and the Jamie's Pond WMA represents an opportunity to develop a management approach to renew it.

An early successional structure is short-lived in nature and is characterized by species that are intolerant of shade and grow rapidly. Aspen is an early successional tree species and is particularly desirable because suckers emerge from the roots following a disturbance (in this instance, timber harvesting), and they grow as dense thickets providing cover for grouse and woodcock. Timber harvesting will occur in the form of patch-cuts over a portion of the aspen-dominated hardwood type. Grouse and woodcock both have similar cover requirements for portions of their life cycles and will benefit from these patches, as they begin to regenerate. Non-game bird species that will also benefit from habitat in patches include: the thrushes (Swainson's, hermit, wood and veerys), indigo bunting, towhee, northern harrier, and short-eared owl.

-- Leigh "Eric" Hoar

Lands Management Biologist

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

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Additional Regional Offices (Biologists)

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