2022-2023

RESEARCH + MANAGEMENT REPORT

Game Species Conservation & Management

Maine Department of Inland Fisheries and Wildlife protects and manages Maine's fish and wildlife and their habitats, promotes Maine's outdoor heritage, and safely connects people with nature through responsible recreation, sport, and science.

Cover photo by Brian Fitzgerald

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Game Species Conservation & Management

Game Mammal Conservation & Management

Game Bird Conservation & Management

Maine Department of Inland Fisheries & Wildlife

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PROJECT FUNDING

These studies are financed in part through Federal Aid in Wildlife Restoration Funds under Projects 88D and 87R and through State Wildlife Grants.

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GAME MAMMAL CONSERVATION & MANAGEMENT

The Mammal Group develops and oversees Maine's mammal monitoring and management programs, assists with permit reviews, and provides technical assistance to policy makers and the public. We address public and departmental informational needs by designing and implementing research programs, assisting with strategic planning, contributing to the Department's environmental education efforts, and responding to public information requests. We also make regulatory recommendations on hunting and trapping of mammals to the Wildlife Division Director. We conduct all regulatory recommendations, planning, and research in close cooperation with regional wildlife biologists in the Wildlife Management section.

Meet the Game Mammal Group

Craig McLaughlin, Ph.D.
Wildlife Research and Assessment Section Supervisor/Acting Mammal Group Leader
Retired December 2022

Craig supervises the Section and supports the Mammal Group's conservation and management programs. As one of the Department's primary liaisons with research programs at the University of Maine and other regional universities, he facilitates partnerships that strengthen the Department's research programs. These programs provide science to inform management that conserves both common and uncommon species statewide.

Nathan Bieber
Wildlife Biologist
White-tailed Deer

Nathan oversees deer management system implementation, working closely with a team of regional biologists, game wardens, and Department leadership to make recommendations for allocating antlerless deer permits and analyze hunter harvest and biological data. He organizes MDIFW's deer disease monitoring efforts, including Chronic Wasting Disease, serves as the departmental spokesperson on white-tailed deer issues, and he is nearing completion of a deer winter survival study. Nathan drafts proposals and provides feedback on rulemaking and legislative issues related to deer. Nathan is updating the deer management system to address the priorities described in the Department's new Big Game Management Plan.

Lee Kantar
Wildlife Biologist
Moose

Lee oversees Maine's Moose Management program. Lee's work involves conducting aerial moose surveys, collecting and analyzing biological information from moose, making hunting permit recommendations, and serving as the departmental spokesperson on moose. Lee led research on Adult Cow and Calf Survival (2014-2020) with cooperators and counterparts in NH/VT. He is continuing research on moose and winter ticks thru the implementation of an Adaptive Hunt Unit in northwestern Maine as well as continued collaboration with northeastern wildlife agencies and universities to assess moose populations in Maine as well as the northeast. This work will continue to inform the moose management system to address priorities described in the Department's Big Game Management Plan.

Jennifer Vashon
Wildlife Biologist
Black Bear and Canada Lynx

Jennifer oversees the management of black bears and Canada lynx – a federally-threatened species. Jen designs and implements surveys and monitoring plans for bears and lynx and analyzes biological data for these species. She is the departmental spokesperson for lynx and bear, makes annual recommendations for harvesting black bears, and provides technical support on bear and lynx issues to stakeholders in Maine and other states. Jen also ensures that the Department meets its obligations under the federal Incidental Take Permit for Canada lynx.

Shevenell Webb
Wildlife Biologist
Furbearers

Shevenell oversees the management of furbearers, work that involves monitoring populations, developing a new Furbearer Management Plan, conducting research, recommending trapping regulations, and serving as the departmental spokesperson for furbearers. Shevenell is participating in several research projects, including a study to determine the most effective way to monitor Maine's marten and fisher populations.

Mammal Group Contract Workers and Volunteers

DEER PROJECT

Holly Bates
Sarah Beck
Adrianna Bessenaire
Paul Campbell
Bailey Clock
Lisa Feener
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Wendell Harvey
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Gerry Lavigne
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Anneliese Matijas
Eldon McLean
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MOOSE PROJECT

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BEAR PROJECT

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Jake Feener
Colleen Kostovick
Matt O'Neal (project field leader)

FURBEARERS

Sara Beck
Adri Bessenaire
Maggie Hayes
Ben Kintner
Auden Lacorazza
Jacob Seehusen

WHITE-TAILED DEER

Nathan Bieber

Like a deer that finds a quiet place to graze,
seek seclusion to digest all you have gathered.

Namkhai Norbu

2022 Harvest Information

SEASON DATES AND STRUCTURE

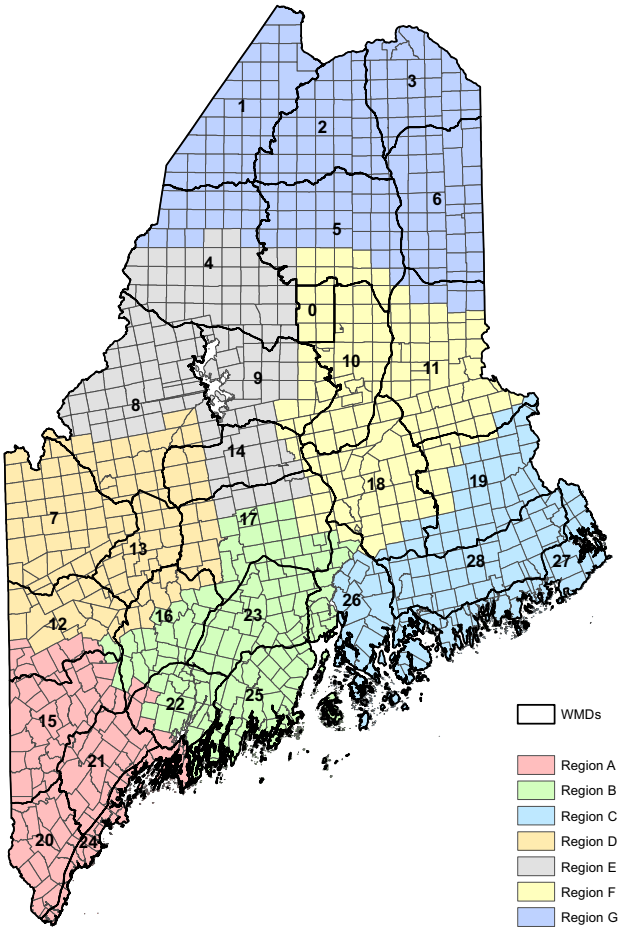
MDIFW manages deer primarily by issuing antlerless deer permits and establishing and regulating fall hunting seasons (including the expanded archery season, the regular archery and crossbow season, Youth Day, Residents' Day, the regular firearms season, and two muzzleloader seasons). In 2022, those seasons amounted to 79 deer hunting days.

PERMIT SYSTEM CHANGES

MDIFW developed the any-deer permit (ADP) system in 1986 to regulate the harvest of antlerless deer in each wildlife management district **(Figure 1)**, but over time, it has become increasingly difficult to achieve desired levels of doe harvest through ADPs alone. In 2021, MDIFW began a review of the antlerless deer harvest regulation system looking to identify ways to improve its ability to meet doe harvest objectives.

After internal review and stakeholder consultation, MDIFW packaged a series of recommended changes into L.D. 116 and a rulemaking proposal. The bill and rulemaking proposal were passed, and we were able to implement all the changes for the 2022 deer hunting seasons.

FIGURE 1. MDIFW REGIONAL AND WILDLIFE MANAGEMENT DISTRICT (WMD) BOUNDARIES.



Changes to the permit system included:

1) MDIFW transitioned from any-deer (either-sex) permits to antlerless deer permits. A hunter with an antlerless deer permit may take an antlered deer anywhere in the state in addition to an antlerless deer in a designated area.

2) A fee was attached to antlerless deer permits. Fee revenue goes to the Maine Deer Management Fund, which supports acquisition and management of deer habitat, with a current focus on wintering habitat.

3) Lottery permit applicants are limited to selecting two WMDs or deer management subunits.

4) Permits cannot be transferred or swapped.

5) Permits remaining after the lottery are sold on a first-come, first-served basis through the MDIFW website.

6) Super pack antlerless deer permits are available in WMDs with at least 2,000 available anterless permits.

7) In designated WMDs, harvest of anterless deer without a permit is allowed on Youth Day.

8) In designated WMDs, harvest of anterless deer without a permit is allowed during the regular archery and crossbow seasons.

9) MDIFW now has the authority to designate WMDs as open to either-sex hunting without a permit. In the future, we may exercise this authority when anterless permit issuance alone does not bring a WMD close enough to its doe harvest objective.

PERMIT ALLOCATION

MDIFW develops deer permit recommendations for each WMD on an annual basis, relying on a wide variety of data sources such as harvest data, biological data collected from harvested deer, winter severity data, and observation data from community scientists. A hunter with an antlerless deer permit may take an antlered deer anywhere in the state in addition to an antlerless deer in a designated area.

In 2022, MDIFW allocated 96,340 antlerless deer permits across 25 WMDs and two deer management subunits to meet a statewide doe harvest objective of 13,807.

Because many permit holders choose not to harvest a doe or not to hunt, MDIFW applies an expansion factor to the doe harvest objective in each WMD to ensure we issue enough permits to meet doe harvest goals. In other words, we issue far more permits than the number of does we expect will be harvested. An expansion factor of 10 indicates that we estimate we will need to issue 10 permits for every adult doe harvested. Because we anticipated significantly higher harvest for antlerless permits compared with the previous any-deer permits, we lowered expansion factors in 2022 (ranging by WMD from 1.0 to 11.6). This lowered permit numbers overall.

MDIFW distributes antlerless permits by lottery, and in 2022, we had 81,627 lottery applicants. Permits that were not claimed and paid for within 30 days of the lottery drawing and districts with more permits than applicants were made available for direct purchase through the MDIFW website. There were 58,306 permits distributed through the lottery that were claimed and paid for, and there were 29,345 permits purchased after the lottery through the website. Another 8,689 permits were not distributed.

MDIFW changed the antlerless deer permit system in 2022 to improve our ability to meet doe harvest objectives during the regular hunting seasons by providing hunters with the opportunity to take both an antlered and an antlerless deer by permit.

Maine's deer hunters registered 43,787 deer during the 2022 hunting seasons (Tables 1, 2). This was 4,840 more deer than 2021 — a 12.4% increase. Roughly 82% of that harvest occurred during the regular firearms season (including Residents' Day). This was Maine's highest total deer harvest on record.

HARVEST STATISTICS

The statewide antlered (adult) buck harvest totaled 23,802, a 9.7% increase from 2021 **(Table 1).** The five WMDs producing the most bucks per square mile in 2022 were (in descending order) districts 22, 24, 21, 29, and 23. Overall, hunters registered 19,985 antlerless deer, 3,167 of which were male fawns, 2,935 of which were female fawns, and 13,883 of which were adult (yearling and older) does. The adult doe harvest of 13,883 was within 0.6% of the Department's objective of 13,807.

2022

TABLE 1. MAINE DEER HARVEST IN 2022 BY WILDLIFE MANAGEMENT DISTRICT (WMD).

	ADULT		FAWN		TOTAL		HARVEST PER 100 ADULT BUCKS		HARVEST PER 100 SQ MILES HABITAT		
WMD	BUCK	DOE	BUCK	DOE	ANTLERLESS DEER	ALL DEER	ADULT DOES	ANTLERLESS	ADULT BUCKS	ALL	ADULT DOES
1	121	2	0	1	3	124	2	2	9	9	0
2	94	8	1	0	9	103	9	10	8	9	1
3	162	17	8	2	27	189	10	17	18	21	2
4	125	0	0	0	0	125	0	0	6	6	0
5	92	3	1	0	4	96	3	4	6	6	0
6	366	81	17	13	111	477	22	30	26	33	6
7	552	92	22	15	129	681	17	23	40	49	7
8	511	61	16	14	91	602	12	18	26	31	3
9	111	7	3	1	11	122	6	10	12	14	1
10	101	12	2	2	16	117	12	16	11	12	1
11	408	46	13	9	68	476	11	17	25	29	3
12	701	153	39	30	222	923	22	32	76	101	17
13	617	134	30	28	192	809	22	31	110	144	24
14	328	71	16	11	98	426	22	30	45	58	10
15	1,721	1,208	273	243	1,724	3,445	70	100	184	369	129
16	1,788	1,157	317	271	1,745	3,533	65	98	232	458	150
17	2,679	1,917	429	410	2,756	5,435	72	103	200	406	143
18	423	97	27	23	147	570	23	35	34	46	8
19	231	29	7	4	40	271	13	17	20	23	2
20	1,409	746	169	150	1,065	2,474	53	76	243	426	129
21	1,578	1,340	354	299	1,993	3,571	85	126	328	742	278
22	1,689	1,345	360	322	2,027	3,716	80	120	390	858	310
23	2,147	1,918	419	402	2,739	4,886	89	128	275	626	246
24	773	657	140	145	942	1,715	85	122	353	782	300
25	1,749	1,456	256	284	1,996	3,745	83	114	249	534	207
26	1,747	682	126	125	933	2,680	39	53	194	298	76
27	780	168	35	36	239	1,019	22	31	106	139	23
28	367	24	3	0	27	394	7	7	34	36	2
29	432	452	84	95	631	1,063	105	146	297	732	311
UNKNOWN	0	0	0	0	0	0	0	0	0	0	0
STATEWIDE	23,802	13,883	3,167	2,935	19,985	43,787	58	84	83	152	48

Corrections applied for errors in sex-age. Estimated error rates are applied independently for each table, so estimates will vary.

2022

TABLE 2. MAINE DEER HARVEST IN 2022 BY HUNTING SEASON.

SEASON	ADULT BUCK	ADULT DOE	FAWN BUCK	FAWN DOE	TOTAL DEER	TOTAL ANTLERLESS DEER	PERCENT BY SEASON AND WEEK TOTAL	ADULT BUCK	ANTLERLESS
ARCHERY	1,519	2,012	322	413	4,266	2,747	10	6	13
Expanded	752	944	171	215	2,082	1,330	5	3	6
Oct	767	1,068	151	198	2,184	1,417	5	3	7
YOUTH DAY	501	698	190	181	1,570	1,069	4	2	5
REGULAR FIREARMS	20,918	10,480	2,555	2,242	36,195	15,277	82	89	77
Opening Sat	2,294	1,637	374	361	4,666	2,372	11	10	12
Oct 31 - Nov 5	3,969	2,458	587	531	7,545	3,576	17	17	18
Nov 7 - 12	4,390	1,869	501	425	7,185	2,795	16	18	14
Nov 14 - 19	5,375	2,168	542	455	8,540	3,165	19	23	16
Nov 21 - 26	4,890	2,348	551	470	8,259	3,369	19	21	17
MUZZLELOADER	872	640	124	120	1,756	884	4	3	5
Nov 28 - Dec 3	472	247	50	46	815	343	2	2	2
Dec 5 - 10	400	393	74	74	941	541	2	1	3
UNKNOWN	0	0	0	0	0	0	0	0	0
TOTAL	23,810	13,830	3,191	2,956	43,787	19,977	100	100	100

Corrections applied for errors in sex-age. Estimated error rates are applied independently for each table, so estimates will vary.

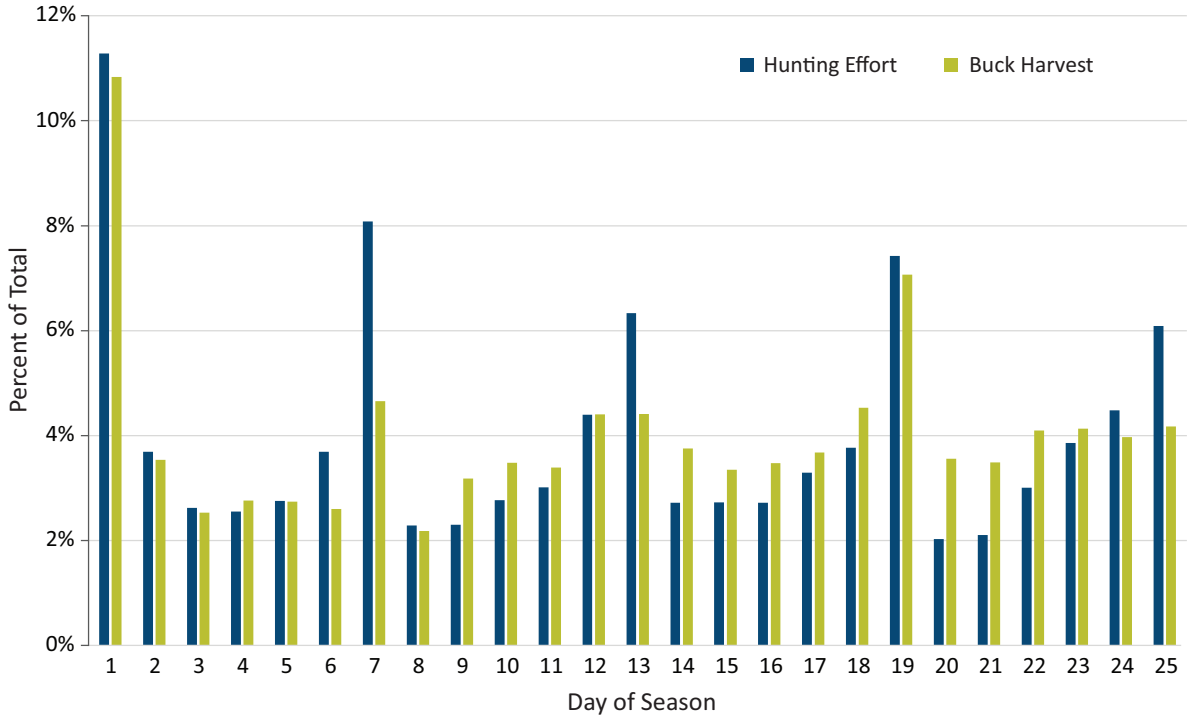
HUNTER PARTICIPATION

Each year, MDIFW sends an online deer hunter effort survey to a randomly selected group of Maine deer hunters to determine how much time they are spending hunting during the regular firearms deer season. In 2022, Maine deer hunters spent an average of 6.6 days and 4.8 hours per day hunting deer during this season. This means that the average hunter spent ~32 hours in the field pursuing deer during the firearms season, which was lower than the 35 hours they spent in 2021. This dip in effort may be at least partially attributable to hunters utilizing antlerless deer permits early in the season and then being less motivated to continue buck hunting throughout the remainder of the season, but this is uncertain given the very high buck harvest. Distribution of effort followed a typical pattern, **(Figure 2)** with high hunting effort resulting in high buck harvest. One outlier observation was that relative to the amount of effort invested, the buck harvest was very low on the second Saturday of the season. This may have been related to weather conditions with temperatures statewide in the 60's and 70's. We use effort data to define one parameter in a sex-age-kill (SAK) model to estimate deer density and abundance. These data add valuable context to discussions about deer populations and permit recommendations.

MDIFW will explore community science options for collecting deer breeding behavior observations.

♂ 2022

FIGURE 2. MAINE DEER HUNTER EFFORT AND BUCK HARVEST DURING THE 2022 REGULAR FIREARMS DEER HUNTING SEASON. *Hunting effort was highest on Residents' Day with additional peaks in effort on Saturdays and through the holiday week.*



This year's survey included the following additional questions:

"Did you observe any bucks mounting (breeding) does during the regular firearms season? If so, when?"

We added this question in 2021 and continued it in 2022 to see if the deer hunter effort survey could provide a small amount of additional data about conception dates. Twenty-five of the 630 hunters who answered the question had witnessed breeding behavior, with most of it occurring in the third and fourth weeks of the regular firearms season. We will explore implementing a community science survey to improve our reach and collect more breeding observations data.

"Did you attempt to get an antlerless deer permit this year either through the lottery or by purchasing a permit through the website?"

Roughly 16.6% of the 664 firearms season deer hunters who answered the question indicated that they did not try to get a permit at all in 2022. Whether successful or not at getting a permit, an additional ~43.5% indicated that they tried to get a permit through the lottery, over 9% said that they tried to purchase a permit through the website, and ~30.9% indicated that they tried to get a permit through the lottery and tried to purchase a permit through the website.

"What deer hunting seasons did you participate in this year?"

This question was included to determine what other deer hunting seasons firearms hunters participated in. Among the 623 who answered the question, 8.7% also hunted during the expanded archery season, 22.2% in the regular archery and crossbow season, 5.6% on Youth Day, 65.0% during the Residents' Day season, 93.4% during the regular firearms season, 18.1% during the first muzzleloader season, and 13.6% during the second muzzleloader season. The 6.6% who said they did not hunt during the regular firearms season included those hunters that purchased a license but did not end up hunting.

"What best describes how you most often process your deer when you are successful?"

This question was included to determine how hunters are processing their deer. Among the 654 who responded, 47.1% indicated that they butcher and package their deer on their own or with the help of friends or family. Those taking their deer to a business to be butchered accounted for 48.9% of respondents. Finally, 0.6% indicated that they donate their deer to a program such as Hunters for the Hungry, and 3.4% indicated "Other."

Biological Data

AGE AND SEX STRUCTURE

Age and sex structure data collected from harvested deer provide insight into mortality rates and adult sex ratios, and they are among the most important data we collect each year. To gather age structure data, trained staff examine deer harvested during the regular firearms season to differentiate between fawns, yearlings, and "adults" (2+ years old). We compare the sex and age determined by our staff examining deer to the sex and age assigned at registration to estimate error rates associated with sexing and aging deer at registration and correct harvest totals to account for these errors. In 2022, 2.2% of deer registered as adult bucks were found to be another sex or age class than what was assigned at registration, along with 17.8% of deer registered as adult does, 22.0% of deer registered as buck fawns, and 24.8% of deer registered as doe fawns. The most common errors (# of errors detected) were doe fawns registered as adult does and buck fawns registered as adult does.

Monitoring yearling frequencies gives us a way to estimate adult sex ratios **(number of adult does per adult buck; Figure 3)**. The yearling frequencies that we use in management decision making are 7-year running averages **(Figure 4)**. This ensures that values track with population changes over time while avoiding high single-year variability from stochastic events such as very severe or very mild winters.

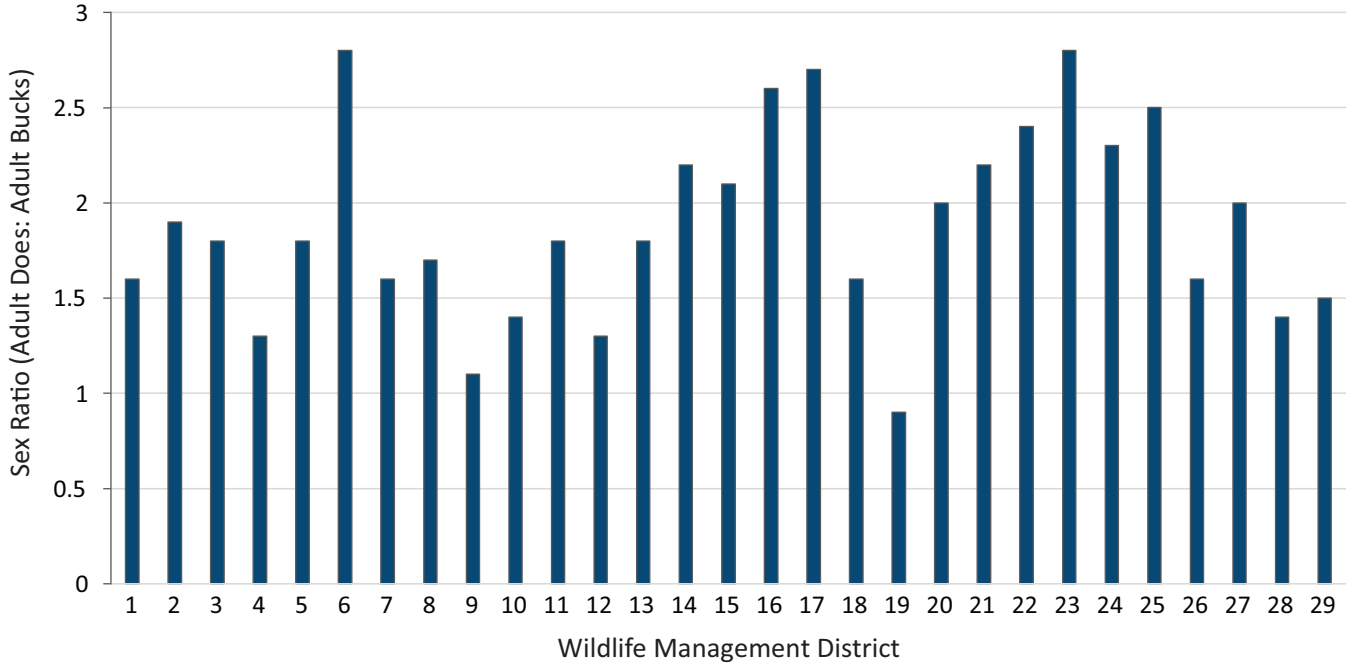
MDIFW also collects a random sample of incisor teeth each year at the regional scale **(Figure 1)**. These teeth are sent to a laboratory for cementum annuli analysis, which provides insight into advanced age structure. This data may be viewed at the end of the annual deer age report on our website at mefishwildlife.com/harvestinfo.

DEER WEIGHTS AND ANTLER CHARACTERISTICS

During annual biological data collection efforts, MDIFW collects dressed weight and antler characteristic data. We consider yearling antler beam diameters (YABD) as an index, which tells us the deer population level relative to carrying capacity. Higher YABD measurements suggest a higher plane of nutrition and a population below the land's carrying capacity, while lower YABD measurements suggest a lower plane of nutrition and a population closer to or exceeding the land's carrying capacity. YABD values between 15.5 – 16.8 millimeters (mm) are considered indicative of a population at or near carrying capacity. The statewide average YABD was 17.5 mm in 2022 suggesting that populations are generally below the carrying capacity of the land. The average adult Maine buck sported 6.8 points in 2022 with little variation north-to-south. The average yearling buck had 3.3 points.

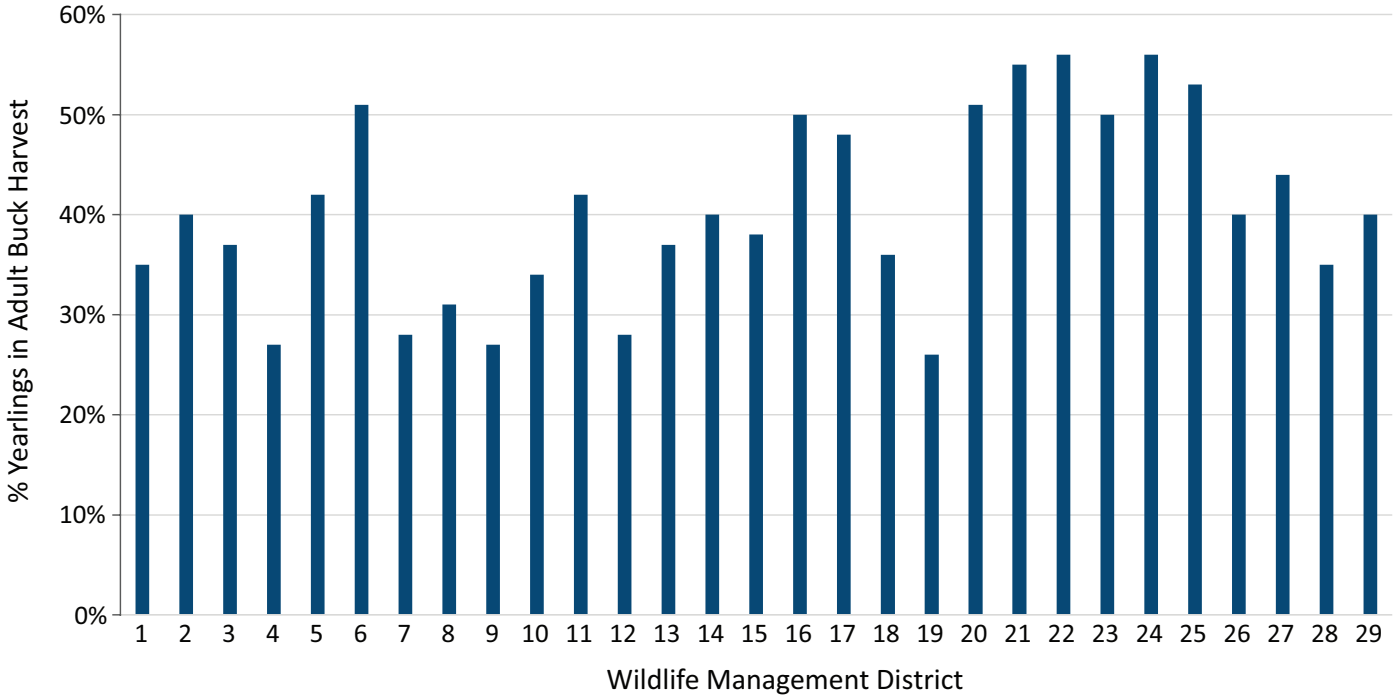
2022

FIGURE 3. ESTIMATED ADULT SEX RATIOS (ADULT DOES PER ADULT BUCK) IN MAINE, 2022.
Sex ratios may be manipulated to achieve management goals, for example, we aim to decrease sex ratios in WMDs where our management goal is to reduce deer numbers.



♂ 2022

FIGURE 4. YEARLING MALE FREQUENCIES USED IN MANAGEMENT DECISION MAKING IN MAINE, 2022. *Yearling frequencies may be used to estimate mortality rates, for example, in a WMD with a yearling male frequency of 40%, we estimate that 40% of all bucks are lost in a year in that WMD.*



The average dressed weight for a Maine adult buck (2+ year old) in 2022 was 155 pounds. Average weights varied by WMD north-to-south, with bucks in the northern WMDs averaging around 175 pounds and bucks in southern Maine closer to 150 pounds, though this is influenced both by latitude and age. Yearling bucks averaged 110 pounds statewide. The average dressed weight of an adult doe was 110 pounds statewide, and the average for a yearling doe was 93 pounds. Buck fawns dressed at 61 pounds on average and doe fawns 56 pounds. Sample sizes were inadequate to examine north-south variability in yearling buck and antlerless deer weights.

RECRUITMENT

In 2020, MDIFW initiated a community science project called "Maine Deer Spy" to collect deer observation data from Mainers with a particular interest in doe-fawn group observations, and these data are used to better understand recruitment patterns in Maine.

In 2022, 1,179 observations were collected from 345 different observers between August 1 and September 30. After quality control measures, which included removing data outside of the observation range, removing outliers and incorrectly entered values, and thinning data by observers, the dataset consisted of 985 deer group observations. Observations of single does and their fawns are particularly valuable as they provide the highest-confidence of the number of fawns with each doe. There were 326 such observations in 2022, and the average number of fawns per doe with fawns was 1.65 compared with 1.59 in 2021 and 1.49 in 2020. Among all observed does, 55.3% had fawns with them in 2022 compared with 53.8% in 2021 and 47.8% in 2020.

After three years of data collection through Maine Deer Spy, we've been extremely pleased with the amount of interest and participation, and we plan to continue this effort into the future.

These data have been used to help develop permit recommendations in WMDs with adequate sample sizes.

A note of correction, the participation and sample numbers presented in the 2021 Research and Management Report were those from the first two years of the project combined, not 2021 alone. Learn how to participate in Maine's community science projects at **mefishwildlife.com/science**.

Winter Severity Monitoring

WINTER SEVERITY INDEX

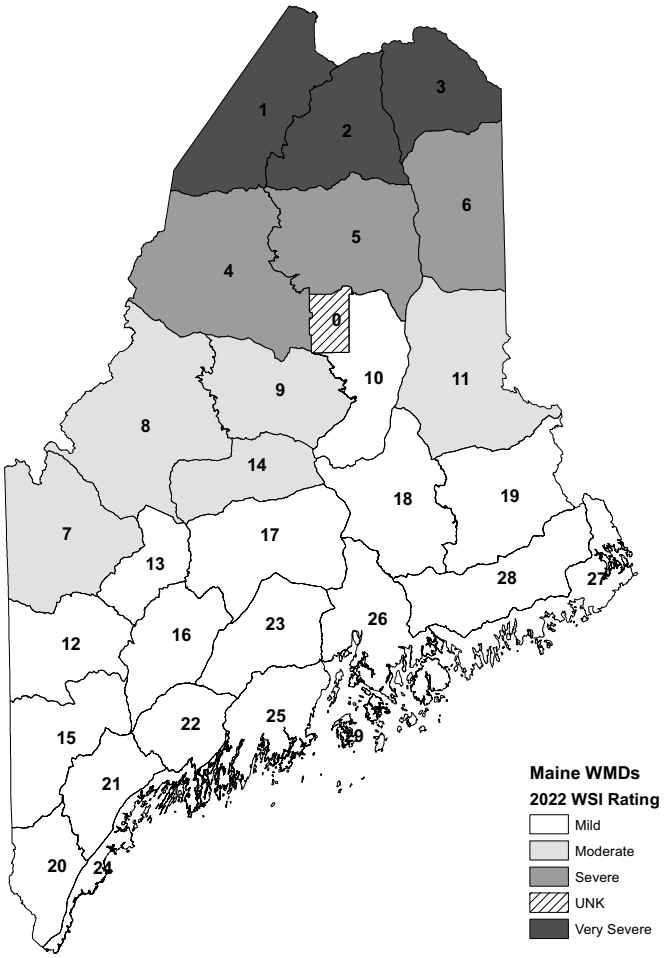
Deer overwinter survival is impacted by winter conditions, thus MDIFW monitors winter conditions at 26 stations statewide, collecting data on snow depths, deer sinking depths, and temperature. We use these data to calculate a winter severity index (WSI) value, which we use to estimate deer winter mortality rates. These estimates play an important role in developing permit recommendations, particularly in northern Maine. The winter of 2021-2022 was rated as "very severe" in 3 WMDs and "severe" in 3 additional WMDs, suggesting high levels of winter mortality relative to the statewide average. The winter rated as "moderate" in 5 WMDs, suggesting winter morality near the average, and "mild" in 18 WMDs suggesting winter morality below the average **(Figure 5)**. Conditions were mostly favorable statewide until mid to late January; successive large snowstorms in late January and early February led to restrictive conditions through the remainder of the winter.

DEER COLLARING PROJECT

Since 2015, MDIFW has been capturing and GPS-collaring white-tailed deer in four study sites: WMD 1 near Allagash, WMD 5 near the Scraggly Lake Maine Public Reserved Land, and throughout WMD 6 and 17. We created this study to improve our understanding of how winter severity impacts deer winter mortality rates. The results will aid MDIFW in decision making and permit allocation processes each year. Additional data on cause-specific mortality are collected as well.

Through 2021, we had collared 268 unique deer: 61 in WMD 1, 39 in WMD 5, 99 in WMD 6, and 69 in WMD 17. The winter of 2020-21 was the seventh and final capture year. The batteries on our collars typically last for 2-2.5 years, and we expect data collection to be completed or near enough to completion for final data analysis by September 2023.

FIGURE 5. WINTER SEVERITY INDEX (WSI) RATINGS BY WILDLIFE MANAGEMENT DISTRICT (WMD) IN MAINE, 2022. *We use these data to calculate a winter severity index (WSI) value, and we use the WSI to estimate deer winter mortality rates.*



Health and Diseases

CHRONIC WASTING DISEASE

Chronic wasting disease (CWD) is an always-fatal brain disease that impacts cervids such as white-tailed deer, mule deer, caribou, moose, and elk. CWD has been found in wild deer populations in 29 U.S. states and three Canadian provinces, but it has not yet been found in Maine. CWD can persist in the environment outside of a host for many years, and plants can uptake the disease agent and subsequently become a potential disease vector. Recent studies also suggest that ticks may ingest and excrete infectious prions after feeding from infected deer. The nearest state or province where CWD is found in wild cervids is Pennsylvania. There is currently no evidence that CWD can or has been transferred to humans, but similar diseases in humans do exist, and the disease has been transmitted to primates in a laboratory setting.

MDIFW has monitored white-tailed deer for CWD since 1999, during which time we have screened over 13,300 wild deer. In 2022, we collected 451 samples from white-tailed deer for lab testing, and all samples tested negative. As a precaution, MDIFW does not translocate deer from other states into Maine, and we prohibit the transportation of unprocessed deer carcasses and/or parts into Maine from all states and provinces other than New Hampshire. MDIFW has drafted a response plan for CWD, which outlines steps and protocols to follow if CWD is detected in an adjacent jurisdiction or in Maine.

There are many ways that you can help prevent the introduction of CWD into Maine or limit its spread if found:

Prevent the spread: If you feed deer, keep your feeding sites small and spread out on the landscape, and rotate sites periodically. Consider using synthetic deer lures instead of natural deer urine lures. Know and follow the state laws and rules around carcass processing and movement.

Report the signs: Contact your regional wildlife biologist or warden if an animal shows clinical signs of illness, such as loss of fear of humans, excessive drooling or urinating, loss of coordination, and/or excessive weight loss.

Protect yourself: When processing a harvested deer, take precautionary steps such as using latex gloves and sterilizing your equipment afterward. Also, avoid consuming the brain and spinal tissues.

EPIZOOTIC HEMORRHAGIC DISEASE

Epizootic hemorrhagic disease (EHD) and Bluetongue Virus (BT) are diseases caused by a biting midge, *Culicoides*. The midges are killed by frost and cold temperatures, and outbreaks typically occur in late summer or early fall. These viruses are very fast-acting; deer typically develop symptoms within a week of exposure and die within the following 48 hours. Observed symptoms include weakness, lack of fear or response to humans, and fever. This fever may drive deer to seek water, and EHD is often identified after dead deer are found near water. Because the disease acts so quickly, biologists do not perform routine surveillance for it.

EHD is not considered to have population level implications since the disease does not spread between deer and is highly seasonal. However, EHD-related die-offs may temporarily depress local deer populations. Some deer may survive infection, and in areas where the disease is established, some may develop resistance. EHD and BT are not known to impact humans, but they may impact some livestock such as cattle or sheep.

While EHD has not yet been detected in Maine, it was first detected in Vermont in 2021 and New Hampshire in 2022, and it may appear in Maine soon. If warming trends continue and the Maine climate becomes more hospitable to the *Culicoides* midge responsible for spreading EHD, cases could become common. To help us identify EHD outbreaks, please report any suspect cases (dead deer near water or groups of dead deer with no obvious cause of death — especially in the late summer/early fall) to your nearest MDIFW regional office.

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

PFAS are human-made chemicals that are resistant to heat, water, and oil. For decades, PFAS have been used in industrial applications and consumer products such as carpeting, waterproof clothing, upholstery, food wrappings, personal care products, fire-fighting foams, and metal plating. Long-term human exposure to PFAS chemicals may negatively impact cholesterol levels, liver enzyme chemistry, and immune response, and may lead to higher incidences of certain cancers.

In November 2021, MDIFW and the Maine Center for Disease Control and Prevention (MECDC) issued a "Do Not Eat" advisory for deer taken in the greater Fairfield, Maine area. A "Do Not Eat" advisory is a recommendation to not eat game harvested within a specified area in response to a possible health concern. We issued the advisory due to high levels of a PFAS chemical known as PFOS (perfluorooctane sulfonic acid) found in five of eight deer collected in Fairfield near fields known to have high PFOS soil and surface water levels. PFOS levels in meat were similar in a fawn, yearling, and adult animal- approximately 40 ng/g- and high enough to warrant a recommendation to eat less than two to three meals per year.

The advisory remained in place for the 2022 deer hunting seasons, but in response to additional sampling in the Fairfield area conducted by MDIFW and partners, the size of the advisory area was decreased in 2023.

DEER HEALTH NOTES

MDIFW collects reports of deer exhibiting signs of illness or injury as well as other unusual characteristics. If you see deer with conditions such as noteworthy hair loss, abnormal growths, behavior, or coloration, or injuries, please report these sightings and the town of observation to your nearest MDIFW regional office. Try to take and provide photos. While most cases require no management response, these reports are valuable for documenting trends and creating case histories.

MOOSE

Lee Kantar

Moose are the icon of the North Maine Woods. Moose are highly valued for viewing and their ecological role within the boreal forest ecosystem. Moose are also significant culturally as well as economically important (moose viewing and hunting). The large tracts of commercial forestlands in Maine provide a steady diet of food and abundant habitat; and due to this dynamic, moose hunting remains a viable and important part of Maine's hunting heritage.

2022 Moose Harvest

SEASON DATES AND STRUCTURE

The 2022 season framework allowed moose hunters that were awarded a permit through our moose lottery to hunt for six days in either September, or October. Permittees in November could hunt either sex coinciding with the November firearms season on deer.

Moose Permits and Applicants

TOTAL MOOSE PERMITS

The annual allocation of moose hunting permits is based on recommendations from the Big Game Management Plan (BGMP) to meet population goals. Permit levels changed in only WMD 8 between 2021 to 2022, resulting in an increase of 50 permits issued statewide (3,530 total). In WMD 4a, an additional 550 antlerless permits were allocated for the Adaptive Hunt, bringing the grand total to 4,080 permits in 2022. However, 30 Adaptive Hunt Permittees did not hunt, thus a total of 4,050 permittees participated in Maine's 2022 moose hunt. Permit changes since 2017 reflect the implementation of the BGMP, which increases cow permits in the core range to promote a healthier moose population, opens additional WMDs during the September season and increases bull hunting opportunity in the northwest portion of the core range.

MDIFW allocates moose hunting permits to qualified applicants through a random computerized lottery each year and may issue additional permits to prior-year permittees who deferred a year due to illness, military service, or other similar situations.

ANTLERLESS-ONLY PERMITS (AOPS)

Overall health of the moose population can be infered from the productivity of cows. That is, a healthier moose population has heavier cows that reproduce at an earlier age, reproduce more frequently, and have a higher probability of calving twins. Increases in winter ticks over the last two decades has exerted significant impacts on overwinter condition of moose and in particular, depressed reproduction in cows. Moose populations that exist at lower densities tend to have higher productivity rates (reproduce at an earlier age, reproduce more frequently, and have a higher probability of calving twins). Over the last 30 years, moose productivity in Maine has declined. In 2022, to help reduce moose densities and improve moose population health 1,410 Antlerless Only Permits (AOPs) were allotted to seven WMDs (1-6 and 8, including 4a).

ANY-MOOSE PERMITS (AMPS)

Any-moose Permits (AMPs; Bull, cow or calf) are allocated in areas of southern Maine to provide opportunity where moose densities are lower and allow for a small harvest. To honor Southern Maine landowners' recommendations, this season coincides with the November firearms season for deer. In 2022, 40 AMP were allocated to WMDs 15 and 16.

BULL ONLY PERMITS (BOP)

Bull permits (2,630) were issued across the moose range to provide hunting opportunity.

Season Dates
2022

WMDs 1-6, 10, 11, 18, 19, 27, 28

Sep 26-Oct 1

WMDs 1-14, 17-19, 27, 28

Oct 10-Oct 15

WMDs 1-6, 8

Oct 24-29

WMD 4A

Oct 17-Oct 22

Oct 24-Oct 29

Oct 31-Nov 5

WMDs 15-16

Oct 29-Nov 26

Statewide Statistics for 2022

2,334 moose were registered in 2022 **(Table 1)** including both the traditional and adaptive hunt seasons.

2022

TABLE 1. 2022 MAINE MOOSE SEASON REGISTERED KILL BY WMD, SEASON, PERMIT TYPE, AND SUCCESS RATE.

WMD	SEASON	PERMIT TYPE	# OF PERMITS	2021 REGISTRATIONS KILL	2021 REGISTRATIONS SUCCESS RATE
1	SEP	BOP	225	158	70%
	OCT	BOP	225	125	56%
	2nd OCT	AOP	175	121	69%
	*WMD Subtotals		625	404	65%
2	SEP	BOP	175	110	63%
	OCT	BOP	175	101	58%
	2nd OCT	AOP	175	125	71%
	*WMD Subtotals		525	336	64%
3	SEP	BOP	100	73	73%
	OCT	BOP	100	64	64%
	2nd OCT	AOP	125	78	62%
	*WMD Subtotals		325	215	66%
4	SEP	BOP	200	129	65%
	OCT	BOP	200	94	47%
	2nd OCT	AOP	100	30	30%
	*WMD Subtotals		500	253	51%
4a	OCT	AOP	188	76	40%
	OCT	AOP	142	26	18%
	NOV	AOP	190	33	17%
	*WMD Subtotals		520	135	26%
5	SEP	BOP	125	96	77%
	OCT	BOP	125	84	67%
	2nd OCT	AOP	125	63	50%
	*WMD Subtotals		375	243	65%
6	SEP	BOP	100	72	72%
	OCT	BOP	100	61	61%
	2nd OCT	AOP	60	30	50%
	*WMD Subtotals		260	163	63%
7	OCT	BOP	125	95	76%
	*WMD Subtotals		125	95	76%
8	OCT	BOP	200	134	67%
	2nd OCT	AOP	100	62	62%
	*WMD Subtotals		300	196	65%
9	OCT	BOP	125	75	60%
	*WMD Subtotals		125	75	60%
10	SEP	BOP	30	26	87%
	OCT	BOP	30	20	67%
	*WMD Subtotals		60	46	77%
11	SEP	BOP	25	22	88%
	OCT	BOP	25	20	80%
	*WMD Subtotals		50	42	84%
12	OCT	BOP	25	15	60%
	*WMD Subtotals		25	15	60%
13	OCT	BOP	15	3	20%
	*WMD Subtotals		15	3	20%
14	OCT	BOP	30	22	73%
	WMD Subtotals		30	22	73%
15	NOV	AMP-B		0	NA
	NOV	AMP-C		1	NA
	WMD Subtotals		25	1	4%
16	NOV	AMP-B		1	NA
	NOV	AMP-C		0	NA
	WMD Subtotals		15	1	7%
17	OCT	BOP	10	0	0%
	WMD Subtotals		10	0	0%
18	SEP	BOP	20	16	80%
	OCT	BOP	20	8	40%
	*WMD Subtotals		40	24	60%
19	SEP	BOP	30	25	83%
	OCT	BOP	30	19	63%
	*WMD Subtotals		60	44	73%
27/28	SEP	BOP	20	12	60%
	OCT	BOP	20	9	45%
	WMD Subtotals		40	21	53%
OVERALL WMD TOTALS			3,530	2,199	62%
PLUS ADAPTIVE			4,050	2,334	58%

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*

2022 Bull Harvest

Each year, MDIFW biologists collect biological data (age, sex, weight, antler spread, antler points, antler confirmation, reproductive samples) from harvested moose when hunters present their moose for registration. Biological data is used to help provide information on male and female age distributions, age specific reproductive data, success rates by management unit, average weights of males and females, average antler spreads of bulls as well as an annual description of moose hunting stats (e.g., heaviest bull, largest antler spread).

TOTAL HARVEST, AGE DISTRIBUTION

Among the 1,688 antlered bulls killed during the September and October 2022 season (totaling 30 less than the 2021 harvest of 1,718), biologists extracted a canine tooth from the animal and later aged 1,423 (84%) of them by counting the cementum annuli on the tooth. Cementum is added to a tooth each year, providing a mechanism for determining the age of an animal, like counting the rings on a tree stump to determine the age of the tree. The oldest bull harvested during the 2022 moose season was 15½ years old and the majority (54%) were less than 4½ years old.

Ages were distributed as follows:

- 1½ years old (yearlings sporting their first set of antlers): 10% (141)
- 2½ years old: 24% (341)
- 3½ years old: 20% (282)
- Mature bulls (aged at 4½ to 15½ years): 46% (659)

AVERAGE WEIGHT

On average, breeding bulls lose approximately 15% of their body mass during the rut (September to October). In 2022, this translated to a 5% decrease in average dressed weights from the September to October seasons (704 pounds in Sept. vs. 667 pounds in Oct.).

HEAVIEST WEIGHT

The heaviest bull weighed in at 1,011 pounds field dressed (no digestive tract, heart, lungs, or liver). He was 6½ years old and was killed in WMD 3 during the September season.

WIDEST ANTLER SPREAD

Two 60” bulls were harvested in WMD 11.

ANTLER STATS

Of the antlered bulls, 15% sported cervicorn antlers (antlers without a defined palm), 30% were yearlings, and 13% were mature bulls (>4 years old). The oldest was 15½ years old.

Antlerless Harvest

TOTAL HARVEST

The 2022 statewide harvest of adult (yearling and older) cows was 583 (down from 809 in 2021). In addition, 61 calves (36 males and 25 females) were harvested for a total harvest of 644 antlerless moose, including those taken as part of the AMPs issued within the southern zones and the Adaptive Hunt.

MOOSE REPRODUCTIVE DATA

During the second October season, MDIFW collects reproductive data critical to assessing and monitoring moose population health and growth. In 2022, hunters in WMDs 1-6 and 8 removed and submitted 146 sets of moose ovaries to be examined by biological staff.

Typically, a cow moose will not become pregnant until 2½ years old. The number of offspring she will produce depends upon her body weight and condition which is strongly influenced by diseases and parasites such as the winter tick. Of the cow moose examined in 2022, 89% of those older than 2½ years were pregnant.

MDIFW biologists can forecast what a cow’s reproductive rate would have been if the cow wasn’t harvested (number of calves being born to a cow) by looking at corpora lutea, which are identifiable structures within the ovaries that indicate ovulation and potential pregnancy rates. Overall, there were 1.02 corpora lutea per cow for cows older than 3½ years (maturity) harvested in 2022.

This is an increase from 2021, yet still represents depressed reproductive rates. We continue to evaluate the role of winter ticks and their impact on moose fitness, including their role in depressed reproductive rates.

Hunter Participation, Residency, & Success Rates

In 2022, 3,692 residents, 308 nonresidents, and 80 lodge owners won permits to hunt moose in our annual moose lottery. Out-of-state hunters came from 35 states (as far away as Alaska), 1 Canadian province and the territory of Guam. The majority of out-of-state hunters were from Pennsylvania (12%).

Conditions for September and October were highly variable. Unseasonably warm conditions typically lead to lower success rates. September had seasonable weather, but October was very warm and subsequently success rates were lower.

The resident success rate was 55%; and when combined with an outstanding 82% nonresident success rate, the total success rate was 62%; lodge owner tags resulted in 68% success rate for their clients. The higher nonresident success rate, which has been around 80% over the last 10 years, may be attributed to the higher proportion of out-of-state hunters using registered Maine guides for their hunt.

In 2023, there will be three separate "traditional" moose hunting periods in Maine.

- The September season will run from Sept. 25 – Sept. 30 in WMDs 1-6, 10, 11, 18, 19, and 27/28.
- The October season will run from Oct. 9-14 in WMDs 1-15, 17-19, and 27/28.
- WMDs 1-6 and 8 will have a cow moose hunt from Oct. 23 through Oct. 28.

New for 2023, moose hunters that are issued a permit to hunt in WMD 7 or 13, WMD 12 or 15, WMD 14 or 17 and WMD 27 or 28 can hunt in either paired WMD.

There will also be three extra moose hunt weeks as part of the Adaptive Unit Hunt (see below) to increase harvest of cows which was below target last year. These weeks will run consecutively from Oct. 16-21, Oct. 23-28, and Oct. 30-Nov. 4. In addition, any Adaptive Hunter Permittee who did not harvest a moose in their respective season in 2023, may return to their designated subzone to hunt November 6-11, 2023.

Regional Wildlife Biologist Doug Kane recording antler size, moose weight, and collecting teeth at a registration station in Kokadjo, Maine.

Comprehensive Moose Management in Maine

Since 2011, the Department has been conducting aerial surveys to estimate moose abundance and sex and age composition (bull, cow, and calf) across Maine's core moose range (roughly a line from Grafton Notch to Calais). This aerial survey data, combined with reproduction (collection of ovaries to count corpora lutea and estimate pregnancy rate) and age data (collection of moose teeth) from harvested moose, is providing biologists with a more complete picture of Maine's moose population size and composition than ever before. Biologists and the Commissioner's Advisory Council (rulemaking body) use these data to align moose permit levels with publicly derived management goals including moose viewing and hunting (both weighed equally).

Moose Adult Cow and Calf Survival Study

The size of Maine's moose population is not static, and it fluctuates in response to many factors, especially calf birth and overwintering calf survival rates.

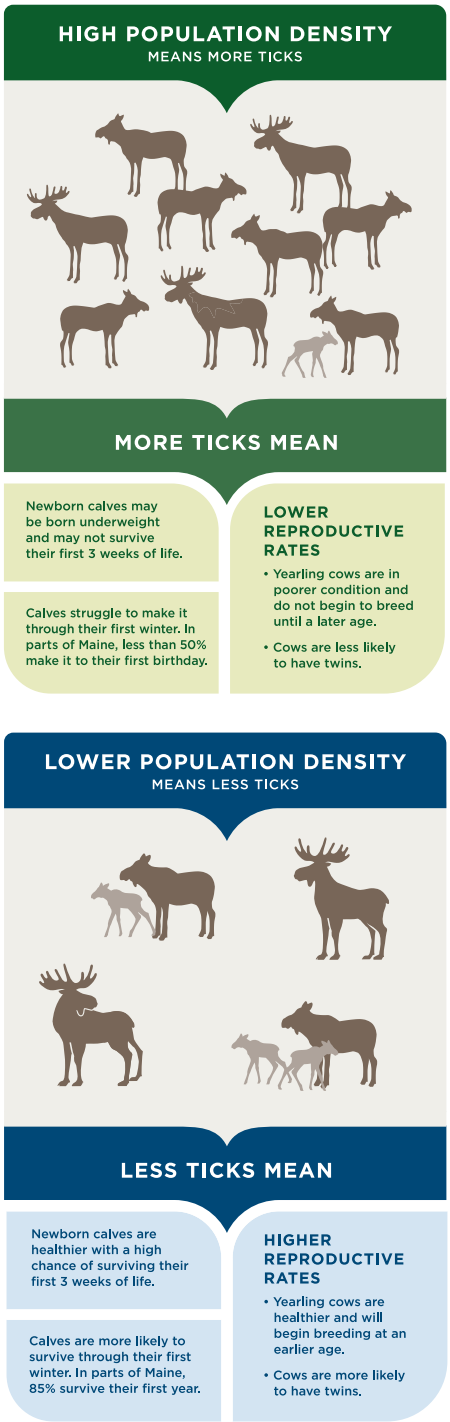
In 2020-21, after seven years of intensive work, we conducted our last aerial capture and GPS collaring of calves (~8 months old) in WMDs 2 and 8. This was the final year of our adult cow and calf capture work which examined calf and adult survival rates and causes of mortality.

The study began in the winter of 2014 in WMD 8; and in 2016, we added a second study area in northern Maine (WMD 2). Since 2014, we have captured over 675 moose and fitted them with GPS collars. We collect detailed health information on each captured moose, assessing blood parameters, parasite loads, body condition, and winter tick loads. Equipping moose with radio collars enables us to track moose locations and movements over time, and to be notified via text/email message if a moose dies, so we can respond quickly to determine cause of death. This information is providing our researchers with a comprehensive look at moose health, including the impact of parasites on survival and reproduction.

Adaptive Management Unit

After public consultation in 2020, the Department began implementing an Adaptive Unit Hunt in the western half of WMD 4. The goal is to decrease the local moose population and see if that lessens the impacts of winter tick on overwintering calf mortality while improving cows' reproductive success.

This past winter in WMD 4 where cow permits were added to reduce densities, we fit an additional 70 ~8-month-old calves with GPS collars to compare calf survival in WMD 4 to calf survival in WMDs 2 and 8. We will monitor this unit for the coming years to assess changes in cow reproductive rates and winter ticks impacts to calves during their first winter of life.



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

BLACK BEAR

Jennifer Vashon

The Maine black bear is an iconic symbol of Maine's forests and one of our wildlife success stories. Once relegated to no more than a nuisance, the black bear has risen in stature to one of our state's most valued animals – by wildlife watchers and hunters alike.

Today, Maine's expansive northern, eastern, and western forest supports one of the largest black bear populations in the lower 48 states **(Figure 1)**. MDIFW's bear management program strives to balance biological and social needs and use long-term monitoring of black bears and harvest and conflict data to inform our management decisions.

Monitoring

MDIFW's black bear monitoring program is one of the most extensive and longest-running programs of its type in the U.S. Over the last 47 years, Department biologists have captured and tracked more than 4,000 bears to determine their health and condition, estimate how many cubs are born each year, and determine annual cause-specific mortality rates.

Population Management

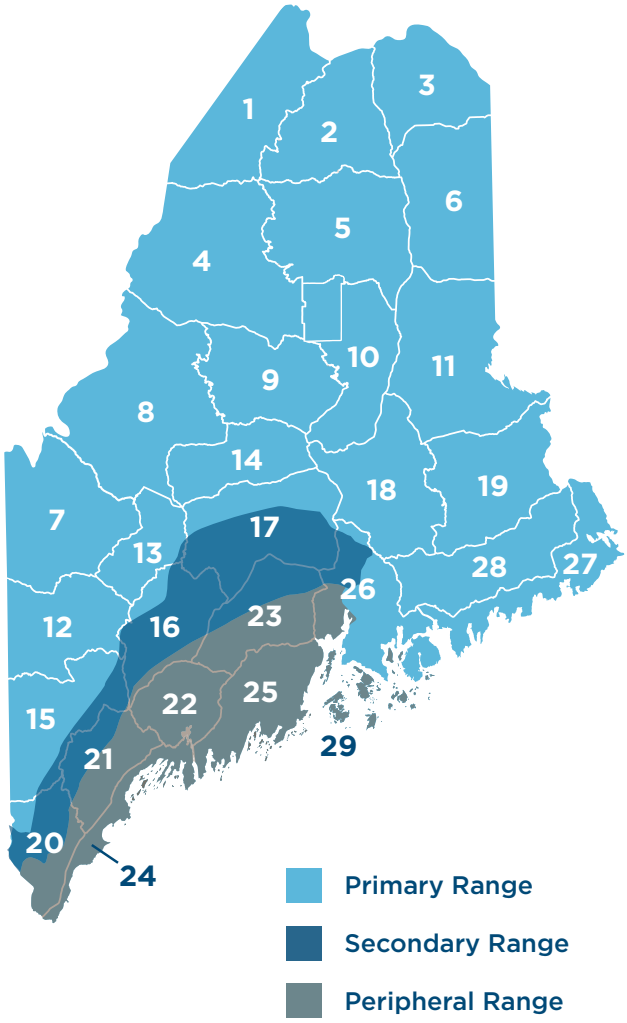
In 2017, the Department completed a 10-year black bear management plan that set a goal of maintaining a healthy, sustainable bear population overall, while minimizing population growth in areas of higher human density. To maintain the bear population at a healthy and socially acceptable level, the Department's primary tool is hunting.

Maine offers a variety of traditional bear hunting methods, but the odds of taking a bear are low. Most bears (~95%) are harvested with bait, trained bear dogs, or traps; but hunters also have the option of still-hunting or stalking, including the opportunity to take a bear while hunting deer. Success rates are 30% for hunters using bait or trained bear dogs, <20% for trappers, and <3% for those who still-hunt or stalk bears through Maine's dense forests.

Bear Management 2017-2027

MDIFW biologists set management goals through a strategic planning process which includes public input. In 2017, we finalized a new 10-year management plan for Maine's big game species (deer, moose, bear, and turkey). This plan carefully considers black bears' value to outdoor enthusiasts and the general public, as well as the likely public acceptance of an increasing bear population. It includes goals, objectives, and a series of management strategies designed to ensure continued enjoyment of black bears without too many conflicts in backyards and neighborhoods.

FIGURE 1. MAINE BLACK BEAR RANGE



Living with Black Bears

Maine's bear population is one of the largest in the country, thriving in the forests that cover more than 90% of our state's land area.

Despite a large bear population, the number of human-black bear conflicts in Maine is lower than other northeastern states, averaging about 500 complaints each year. This relatively low conflict level is partially attributed to bears being more common where human densities are lowest. But if Maine's bear population continues to grow and expand into areas with higher human densities, conflicts could rise.

These conflicts, when they happen, tend to be mild in nature (the most common complaints we receive involve bears feeding at bird feeders and on garbage); but, if you live in a community that is experiencing these issues, it can be concerning.

WHEN & WHY CONFLICTS HAPPEN

Most human-bear conflicts occur in the spring and early summer, after bears emerge from their winter dens and find it difficult to locate high-quality natural foods. As they search, they sometimes encounter food odors (bird seed, garbage, compost, and grills) that attract them to backyards and neighborhoods. Once berries begin to ripen in late summer, bears typically return to wooded areas to forage and conflicts with humans decline. However, when these natural foods are not abundant, bears are more likely to continue searching for food provided by people.

SOLUTIONS

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. While this can provide a temporary solution, 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, and they often return or create a new problem somewhere else. Moving bears also puts them at a greater mortality risk as they encounter more roads, other bears, and people.

Although it may seem simple to move the offending bear, the best solution is to remove or secure food, food odors, and other common bear attractants from your outdoor space every spring. If you don't, bears will likely continue visiting. Even when bears are trapped and transferred to new areas, you should remove or secure attractants to avoid future problems.

Here is a checklist that you can run through every spring:

YOU CAN PREVENT BEAR CONFLICTS by simply removing or securing bear attractants each spring.

	1 REMOVE & STORE INSIDE Between Apr 1 and Nov 1	2 SECURE & CLEAN
BIRD SEED 	• Take bird feeders down • Store seed and feeders indoors (you can still feed birds in the winter)	• Rake up bird seed from the ground
GARBAGE 	• Store garbage cans in a building or electric-fence enclosure • Take to curb on morning of pickup	• Keep outbuilding and garage doors closed at all times and repair broken window and doors • Keep dumpster lids and doors closed and latched • Use bear-resistant dumpsters or garbage cans
GRILLS 	• Store grill inside when not in use • If you are having bear conflicts, stop grilling until bear moves on	• Burn off food residue • Dispose of food wrappers and grease cups
PETS AND LIVESTOCK 	• Feed pets inside • Store livestock and pet food inside • Keep livestock in buildings at night • Install and maintain effective livestock fencing	If you feed your pets or livestock outside: • Clean dishes daily • Remove leftover food daily

We have revised our website and other outreach materials to provide additional information on what to do if you encounter a bear in your backyard, in your neighborhood, or during any outdoor activity in Maine. You can find that information, including printable/shareable PDFs, at: mefishwildlife.com/livingwithblackbears.

Black Bear Hunting and Trapping

SEASONS & PERMITS

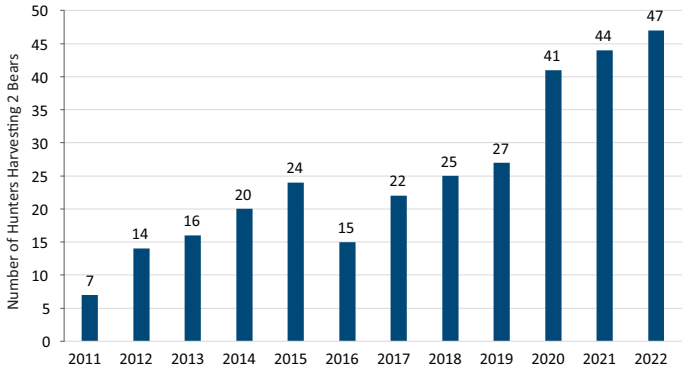
MDIFW's management of Maine's black bears includes setting the season length, bag limit, and legal hunting methods. In addition to a hunting license, hunters (except for resident deer hunters during the firearm season) must purchase a bear permit to hunt black bears, and each successful hunter must register their bear. The Department uses bear registration data to monitor harvest levels and adjust regulations as needed to meet bear harvest objectives.

The black bear hunting season runs from the last Monday in August through the last Saturday in November, and is restricted to certain hunting methods during certain weeks.

In 2022, hunting over bait was permitted from Aug. 29 through Sept. 24. The hound (trained bear dogs) season overlapped with the last two weeks of the bait season, spanning Sept. 12 to Oct. 28, and the trapping season opened on Sept. 1 and closed October 31. Hunters could hunt bears near natural food sources or by still-hunting throughout the entire three-month season.

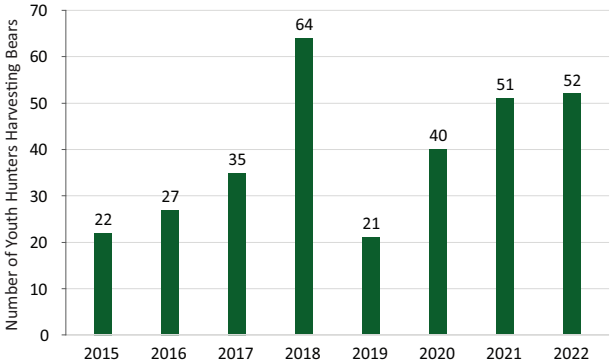
Since 2011, properly licensed individuals have been allowed to harvest two bears a year if one is taken by hunting and the other by trapping. While only a small proportion of hunters and trappers take advantage of this opportunity, the number of individuals harvesting two bears increased incrementally each year to 24 hunters by 2015 then stabilized. However, in 2020 the number of hunters harvesting two bears nearly doubled to 41 hunters. In 2022, in line with recent trend, 47 hunters harvested two bears – more than any previous year **(Figure 2)**.

FIGURE 2. STARTING IN 2011, PROPERLY LICENSED INDIVIDUALS CAN HARVEST 2 BEARS IF ONE IS TAKEN WHILE HUNTING AND THE OTHER WHILE TRAPPING. *In 2022, 47 hunters harvested 2 bears.*



Starting in 2015, the Saturday prior to the opening day of the season is designated for youth hunters. Although the 2022 youth day harvest did not exceed the 2018 record of 64 bears, the 2022 youth day harvest of 52 bears continued with the recent increasing trend **(Figure 3)**.

FIGURE 3. STARTING IN 2015, YOUTH HUNTERS CAN HUNT BLACK BEARS THE SATURDAY BEFORE OPENING DAY OF THE BEAR SEASON. *In 2022, 52 youth hunters harvested a black bear on youth day.*



ANNUAL HARVEST

Although many factors, including weather and hunter numbers, influence the black bear harvest, natural food levels traditionally play a large role. Natural foods generally alternate in abundance from one year to the next. In a good food year, bears show less interest in bait sites and forage for plentiful natural foods through late fall. In a poor food year, bears show greater interest in bait and enter their winter dens early to conserve their limited fat reserves.

As a result, harvest with the use of bait is typically higher in poor food years and lower in good food years, while harvest by deer hunters during the November firearm season is typically lower in poor food years and higher in good food years **(Figure 4 and Figure 5)**.

However, hunter numbers play a large role as well. In recent years, the impact of hunter numbers which have reached near record high levels has been reflected in consistent and higher harvest. Despite a relatively good natural food level, the 2021 harvest (3,779 bears) was similar to last year's near-record harvest of 3,883 bears. We attribute this to an increased interest in outdoor pursuits that began during the pandemic and has continued to date. In 2022, over 13,500 hunters pursued bears (up 1,300 from 2021) harvesting 3,761 bears, which was similar to 2021 and 2022's near-record harvest of 3,779 and 3,883 bears, respectively.

FIGURE 4. HARVEST ALTERNATES WITH NATURAL FOODS. *Typically, a good food year is followed by a poor food year.*

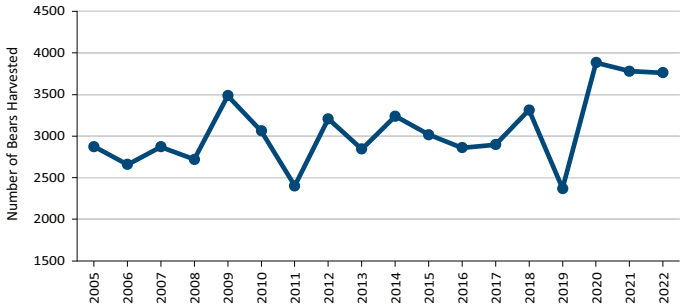
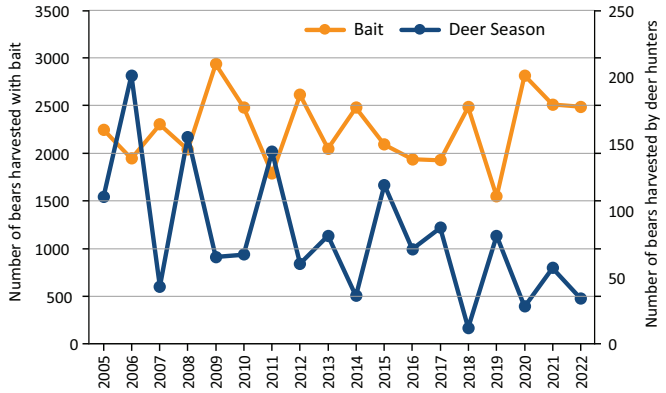


FIGURE 5. IN POOR FOOD YEARS, HARVEST BY BEAR HUNTERS USING BAIT IS HIGH AND HARVEST OF BEARS BY DEER HUNTERS IS LOW.



During the 2022 season, although 2,485 bears (66% of the total harvest) were taken by hunters using bait, the harvest by hunters using trained dogs reached a near record high of 903, accounting for 24% of the total; and harvest by trappers reached a record high of 295 – double the annual average. Meanwhile, harvest of bears by deer hunters in November remained low at just 34 **(Table 1 and Figure 6)**.

In Maine, most bears (>90%) are harvested over bait or with trained bear dogs. Prior to 2012, approximately 80% of bears were harvested over bait and 10% by hunters using dogs. In recent years, although bait has remained the prominent method of harvest, a higher proportion of bears have been harvested using trained bear dogs. Between 2013 and 2015, 16-17% of the harvest was with the aid of trained bears dogs and since 2016 has increased to between 20-25% of the total harvest annually. This increase is likely in response to greater interest following a recent bear hunting referendum that, if passed, would have made hunting bears with bait, trained bear dogs, or traps illegal in Maine. We saw a similar increased interest in harvesting a bear with a trap following both the 2004 and 2014 bear referendums **(Figure 7)**. It is important to note that the low number of trappers that harvested a black bear during the 2018 season was due to an emergency rule that limited the types of traps that could be set for bears during the 2018 season and not a change in interest.

FIGURE 6. MOST BEARS IN MAINE CONTINUE TO BE HARVESTED WITH BAIT AND HOUNDS (TRAINED BEAR DOGS). *Due to the lack of natural foods during the 2020 season, fewer bears were harvested later in the season by deer hunters.*

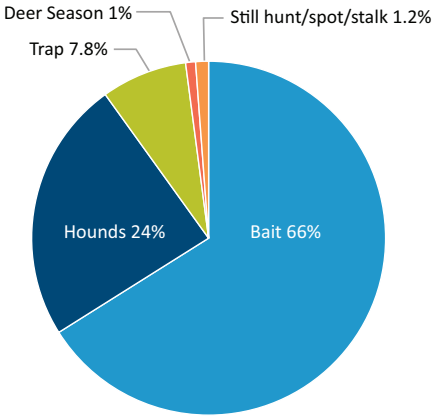
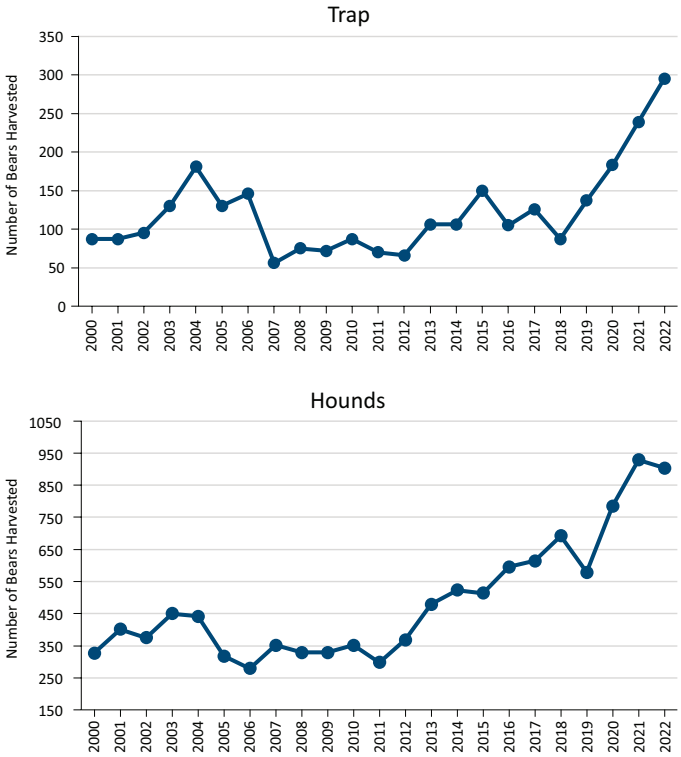


FIGURE 7. HARVEST BY HUNTING USING HOUNDS (TRAINED BEAR DOGS) HAS BEEN INCREASING IN RECENT YEARS, WHERE PERIODS OF HIGH HARVEST BY TRAPPERS OCCURRED FOLLOWING THE 2004 AND 2014 BEAR REFERENDUMS, THAT IF PASSED, WOULD HAVE MADE IT ILLEGAL TO HARVEST BEARS WITH BAIT, TRAINED BEAR DOGS, OR TRAPS.



2022

TABLE 1. NUMBER OF BEARS HARVESTED IN MAINE IN 2022 BY WILDLIFE MANAGEMENT DISTRICT (WMD).

	METHOD OF TAKE										
WMD	HUNTING WITH BAIT	WHILE DEER HUNTING	HUNTING WITH DOGS	SPOT AND STALK	TRAPPING	UNKNOWN[1]	TOTAL HARVEST	ARCHERY[2]	ASSISTED BY GUIDE	RESIDENT	NONRESIDENT
1	107	0	19	1	3		130	4	118	26	104
2	117	0	52	0	9		178	7	164	13	165
3	170	1	34	4	9		218	12	171	63	155
4	211	0	11	2	3		227	17	161	80	147
5	139	0	53	0	2		194	10	171	31	163
6	208	2	40	8	7		265	22	185	82	183
7	133	0	66	1	34		234	11	162	70	164
8	229	1	94	0	31		355	11	253	146	209
9	121	1	32	2	5		161	6	104	74	87
10	128	0	17	0	13		158	6	129	39	119
11	171	3	70	1	9		254	13	205	65	189
12	125	0	92	5	21		243	13	114	114	129
13	35	2	19	1	12		69	0	32	31	38
14	59	0	26	1	11		97	4	58	46	51
15	57	5	53	4	17		136	4	35	106	30
16	6	0	0	2	2		10	0	0	10	0
17	35	2	14	1	18		70	1	24	50	20
18	147	0	49	3	34		233	8	148	106	127
19	66	0	58	0	4		128	4	112	25	103
20	14	11	8	4	6		43	2	7	39	4
21	7	2	0	2	4		15	1	1	15	0
22	1	0	0	0	0		1	0	1	1	0
23	1	2	0	0	1		4	0	0	4	0
24	0	0	0	0	0		0	0	0	0	0
25	0	0	0	0	0		0	0	0	0	0
26	38	0	0	2	19		59	1	5	57	2
27	42	1	28	0	7		78	4	35	46	32
28	118	1	68	0	14		201	7	144	71	130
29	0	0	0	0	0		0	0	0	0	0
STATEWIDE	2485	34	903	44	295	0	3761	168	2539	1410	2351

[1]*Unknown Method = Hunter did not report the method they used to harvest their bear.*

[2]*This does not include 102 bears harvested with a crossbow.*

Hunters that use bait or trained bear dogs have the most success, with a 30% average success rate since 2008. Success is also higher among nonresidents **(Figure 8)**, who are more likely than residents to hire licensed professional Maine hunting guides (40% of nonresidents use a guide vs. 25% of residents).

FIGURE 8. BEAR HUNTING SUCCESS RATES BASED ON PERMIT SALES BY RESIDENCE AND METHOD OF HARVEST.

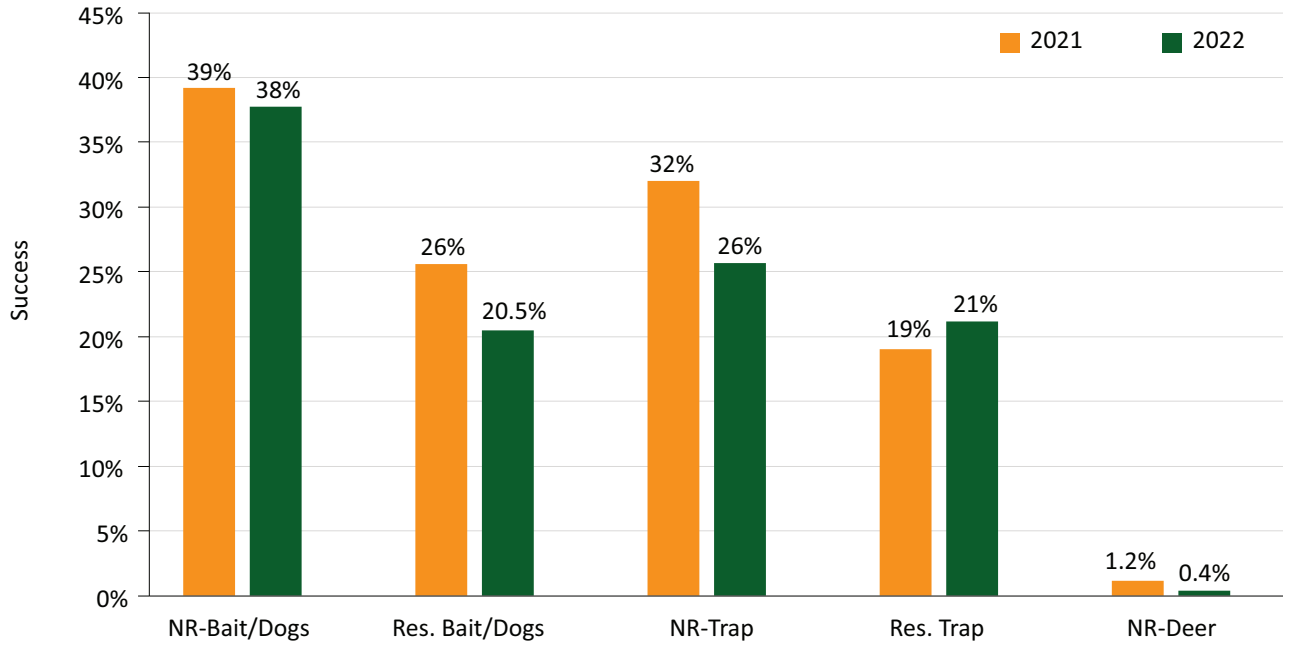
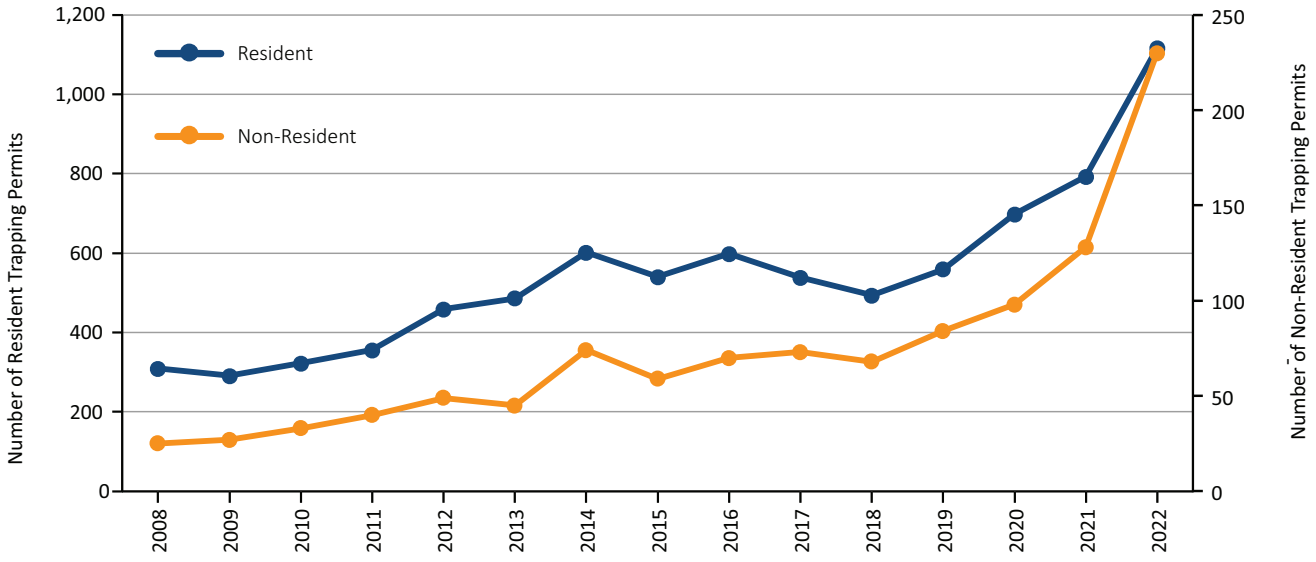


FIGURE 9. THE NUMBER OF RESIDENTS AND NONRESIDENTS PURCHASING A PERMIT TO TRAP BLACK BEARS IN MAINE HAS BEEN INCREASING



BEAR TRAPPING

Trappers can harvest a bear in September or October using a cable foot restraint or a cage-style trap. Since 2008, trappers have been required to purchase a separate permit to trap a bear, and permit sales indicate rising interest. Notably, about 90% of bear trapping permits are purchased by Maine residents.

For three years in a row, trapping permit sales reached a record high, likely in response to the pandemic and increased participation in outdoor activities **(Figure 9)**. Trappers purchased 796 permits in 2020, 919 in 2021, and 1,326 in 2022. The prior record was set in 2014 at 676. Trapping interest spiked that year in response to a ballot initiative that, if it had passed, would have eliminated traps, bait, and trained bear dogs as legal harvest methods.

Over the last 3 years, the harvest of 183, 239, and 295 bears by 796, 919, and 1,326 trappers eclipsed the previous five years, where an average of 538 trappers harvested anywhere between 87 and 150 bears.

RESIDENT VS. NONRESIDENT HARVEST NUMBERS

Nonresidents harvested most of the bears during the 2022 season (63%), taking 74% of the bears with trained bear dogs and 65% of the bears taken over bait. While the percentage of the harvest by nonresident hunters using spot and stalk methods remains low, it accounted for 16% of the 2022 nonresident harvest.

Among residents, hunting over bait remains popular, with 62% of successful residents taking bears by this means. Although fewer bears are taken during the deer season, in traps, or by spot and stalk methods, Maine residents continue to account for the majority of this harvest (82%).

THE INFLUENCE OF MAINE GUIDES

Every year, most bears harvested in Maine are taken by hunters employing a registered professional Maine hunting guide. In 2022, guides helped hunters (85% of whom were non-residents) harvest more than 2,500 bears (68% of the harvest). Hunters employing guides accounted for 88% of bears harvested with trained bear dogs, 67% of those taken over bait, and 23% of the bears taken in traps. Although guides also appear to have boosted spot and stalk success, as the proportion of bears taken by spot and stalk methods with a Maine Guide increased in the last five years, from 3% in 2016 to 18% in 2017, 21% in 2018, 12% in 2019 and 2020 and 24% in 2021, the use of guides by successful still hunters was down to 9% in 2022.

Only 27% of Maine residents who harvested a bear in 2022 used a guide compared to 92% of non-residents.

GEOGRAPHIC DISTRIBUTION OF THE HARVEST

In 2022, bears were harvested in 13 of 16 county and 26 of 29 WMD. Although most bears were harvested from Aroostook County (1,011, accounting for 27% of total harvest), the density of harvest expressed as the number of bears killed per 100 square miles of habitat (forested land) was greatest in WMD 28 at 28 bears/100mi2, followed by WMDs 3, 6, and 12 (portions of Aroostook, Oxford, Washington and Hancock counties) at between 25 and 27 bears/100 mi2. Fewer bears were taken in southern and central portions of the state (Androscoggin, Cumberland, Kennebec, Waldo, and York counties), and no bears were taken in Knox, Lincoln and Sagadahoc counties or WMDs 24, 25 and 29 **(Table 1)**. The statewide average of 13bears/100 mi2 was similar to the statewide average of 13 bears/100 mi2 in 2020 (a poor food year) and above the statewide average of nine bears/100mi2 in 2019 (a good food year).

HUNTER PARTICIPATION

Since 1990, hunters interested in harvesting a black bear have had to purchase a bear hunting permit in addition to their hunting license. That first year, nearly 12,000 permits were sold. It then stabilized to approximately 10,500 permits through 1999 before rising to more than 15,000 permits by 2002. In 2003, permit fees were raised from $5 to $25 for residents and from $25 to $67 for nonresidents. Subsequently, bear hunting participation steeply dropped for residents and nonresidents alike. After a slight bump during the bear hunting referendum of 2004, numbers continued a steady decline before stabilizing at just under 11,000 in 2009 **(Figure 10)**. More recently, in response to the pandemic, numbers have increased. More than 12,000 bear permits were sold in 2020 (the highest number in 17 years) and sales increased again in 2021 to nearly 12,500. In 2022, more than 13, 500 bear permits were sold. The continued increase in bear permit sales in 2022 is attributed to permit fee reductions for residents (i.e., $25 to $10) and changes in licensing requirements (i.e., hunters could harvest a bear in a trap with either a hunting or a trapping license).

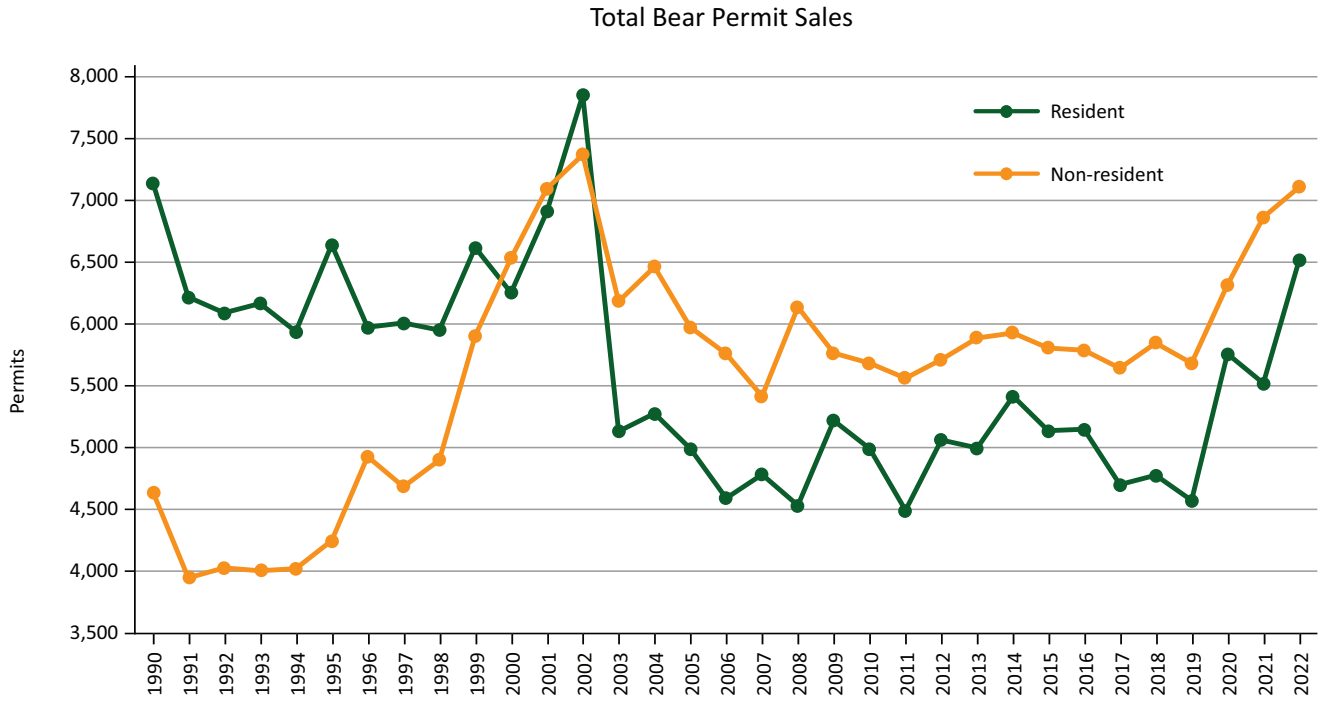
RESIDENT VS NONRESIDENT PARTICIPATION

Historically, most bear permits (55-60%) were purchased by residents. However, following the closure of the Ontario spring bear hunt in 1999, nonresidents became more interested in hunting Maine black bears; and in 2000, nonresident participation eclipsed that of residents. Since then, nonresidents have accounted for an average of 55% of bear hunting permits.

With the permit fee increase in 2003, resident participation fell more sharply. While not as many nonresidents dropped off, this decline is particularly significant since nonresidents' higher success rates have a greater impact on the final harvest level.

The bump in permit sales over the last 3 years **(Figure 10)** has contributed to near-record harvests of 3,883, 3,779, and 3,761 bears, respectively. In 2021, the increase in nonresident participation likely explains the higher-than-expected 2021 harvest. Most notable this year was the bump in resident permit fees that is likely attributed to the reduction in resident bear permit fees in 2022.

FIGURE 10. THE DEPARTMENT DOES NOT LIMIT THE NUMBER OF BEAR HUNTING OR TRAPPING PERMITS. *In recent years, resident and nonresident bear permit sales have stabilized to approximately 10,000 with a similar number of residents and nonresidents purchasing permits. Prior to 2003, more residents purchased bear permits, likely due to the low cost of the permit at the time.*



NEW PERMITS FUNDING BLACK BEAR RESEARCH AND MANAGEMENT

Since 2008, trappers have been required to purchase a bear permit to harvest a bear, and nonresidents have also been required to purchase a permit to take a bear during deer firearms season. Funds from these permit sales are dedicated to bear research and management, and we are currently using them to:

- Determine the age of harvested black bears from teeth turned in by hunters
- Develop an integrated population model for bears, and
- Evaluate the role of anthropogenic foods (including bait) on Maine's bear population.

This research will allow us to improve our monitoring of trends in Maine's bear population, including its age structure and refine population estimates to better inform our management of bears.

Although the number of nonresident bear permit sales for deer hunting season has remained stable at 700 to 1,000 per year (829 in 2022), sales of resident and nonresident bear trapping permits have been increasing. The sale of these permits has contributed between $40,000 and $100,000 annually to bear research and management.

This work is supported by the federal Pittman-Robertson program and state revenues from sales of hunting and trapping licenses.

FURBEARERS

Shevenell Webb

Trapping and Furbearer Management

Maine's abundant forests and aquatic habitat support some of the most diverse wildlife assemblages in the Northeast, including 16 species of furbearing animals. The terrestrial species include bobcat, coyote, red and gray fox, fisher, marten, raccoon, opossum, striped skunk, short and long-tailed weasel, and red squirrel and the semi-aquatic species include beaver, river otter, mink, and muskrat.

Thanks to modern wildlife management principles, many of these species are more abundant now than they were 100 years ago, allowing for viewing and harvest opportunities. Game wardens strictly enforce hunting and trapping regulations and wildlife biologists closely monitor the harvest and conduct studies to track the status of populations. MDIFW continually reviews and develops science-based regulations, education programs, and capture methods to ensure the harvest is sustainable and that practices are humane.

Furbearer management aims to maintain healthy, sustainable populations while also minimizing conflicts. Regulated trapping provides many benefits, including population management, protection and restoration of rare species, reduction of human-wildlife conflicts, and improved knowledge of furbearer species. Maine trappers have contributed to numerous scientific studies including the role that carnivores play as a potential vector for tick-borne diseases, increasing knowledge of lynx distribution, movement patterns, and habitat needs, prevalence and impacts of canine distemper and rodenticides in fisher, and other disease surveillance.

Trapping Best Management Practices

Many advancements have been made to improve the safety, effectiveness, and humaneness of trapping. A long-term study evaluated trap performance and advanced the use of humane traps through development of best management practices for trapping in the United States. Over 600 different types of traps have been tested through the BMP study, which continues to this day.

- Learn more here: furbearermanagement.com.
- To learn more about regulated trapping in Maine, please visit mefishwildlife.com/trapping.

Harvest Update

Trapping is the primary method of harvesting furbearers, but some species also can be hunted, including red and gray fox, coyote, bobcat, raccoon, opossum, and skunk. Small game, including snowshoe hare, red and gray squirrel, woodchuck, and porcupine, can be hunted as well.

Regardless of harvest method, the pelts of all furbearers except weasels, raccoon, red squirrel, muskrat, skunk, and opossum must be registered and tagged. The registration process gives the Department information on who harvested the animal, with what method, in which town, during which month and year, and total species taken each season to help inform and direct management decisions.

We also collect biological data for some species during registration. This information is important for monitoring the species distribution and population demographics to ensure a sustainable harvest.

Fur harvests can be influenced by many factors that affect trapper effort (e.g., changes in trapping regulations, pelt values, weather conditions, gas prices) or wildlife populations (e.g., food availability, disease, habitat changes). Trapping requires a large investment of time and skill. Interest in trapping has remained steady, with more people taking trapper education courses in recent years. People are motivated to trap for many reasons, including spending time outdoors with friends and family, passing along skills to the next generation, helping out a local neighbor or farmer who has had conflicts with wildlife, learning more about wildlife and the challenge of catching animals, or the prospect of making personal fur garments and other products.

Low fur values and high gas prices have affected harvest trends for many species (e.g., mink, fox, coyote). However, we saw an increase in the total furs harvested during the 2022/23 season **(Table 1)**. Beaver and coyote continue to comprise the highest furbearers tagged in the state. Beaver prices more than doubled from the previous year (~$12 to $30) and more favorable open water conditions in spring likely contributed to an increase in the number of beavers harvested this season.

Bobcat sightings are up and the harvest continues to be strong. Hunting is typically the most popular method of pursuing bobcats, with 56% of the annual harvest taken by hunting during recent years (2020/21-2022/23). The most successful bobcat hunters use dogs, followed by bait, other, calling, and incidental to other hunting activities. Snow conditions can vary at the local level, but they play an important role in dog hunter success. Over the past 10 years, the number of successful bobcat hunters has generally been higher but more variable (average = 99, range = 31-178 hunters), while the number of successful trappers has been lower but more stable (average = 68, range = 42-84 trappers).

The fisher and particularly marten harvest often alternate between years with high and then low harvests due to the abundance of natural foods. This past season, the fisher harvest was higher than the previous 5 and 10 year averages, which also coincides with recent camera research that shows that fisher are abundant across the state. The marten harvest was similar to the previous 5 year average, but below the 10 year average. Although many trappers have adapted to recent regulatory changes to protect Canada lynx (e.g., exclusion devices statewide beginning in 2015), it has affected trapper effort and success. We have seen a 67% decline in the average number of successful marten trappers and 57% decline in successful fisher trappers when comparing two time periods (2008-2014 vs. 2015-2021) with and without lynx exclusion devices, respectively.

TABLE 1. SUMMARY OF THE FURBEARER HARVEST REGISTERED FROM THE 2022/23 TRAPPING AND HUNTING SEASON AND PREVIOUS 5 AND 10 YEAR SEASON AVERAGES IN MAINE.[1]

	2022/23	PREVIOUS 5 YR. AVG	PREVIOUS 10 YR. AVG
BEAVER	**6,968**	5,437	5,346
BOBCAT	**336**	321	254
COYOTE	**1,157**	1,730	1,514
FISHER	**656**	518	592
R. FOX	**377**	585	622
G. FOX	**181**	226	259
MARTEN	**625**	647	1,106
MINK	**226**	355	827
OTTER	**737**	586	521
TOTAL	**11,236**	10,405	11,040

[1]*Registrations exclude imports and roadkills.*

Trapper Effort

The number of trapping licenses has been fairly stable over the last 20 years. During 2022/23, there were 4,870 trapping licenses (this includes annual, special, and lifetime trapping licenses), representing a 13% increase from the previous five-year average. The increase was mostly driven by more Resident, Resident Apprentice, and Lifetime trapping licenses.

All trappers 16 years and older are required to submit a fall and spring harvest report, even if they did not trap. MDIFW uses this information to monitor trapper activity, species catch per unit effort, disease observations, trapping effort and the harvest of all furbearer species. These reports indicate that coyote and beaver are the most popular species to target based on total trapnights (1 trap set for 1 night = 1 trapnight). The average species catch per 100 trapnights reported on fall harvest reports (2018-2021) has been the highest for muskrat (9) and beaver (5), followed by raccoon and otter (2), and coyote, fox, mink, fisher, marten, and bobcat (1), respectively **(Table 2)**.

TABLE 2. SPECIES CATCH PER 100 TRAPNIGHTS (1 TRAP SET 1 NIGHT = 1 TRAPNIGHT) AS REPORTED ON FALL HARVEST REPORTS FROM THE 2018/19 – 2021/22 TRAPPING SEASONS.

SEASON	COYOTE	G. FOX	R. FOX	MINK	FISHER	MARTEN	BEAVER	MUSKRAT	RACCOON	OTTER	BOBCAT
2018/19	1.59	0.46	0.73	1.21	0.79	1.08	4.48	7.94	2.71	2.08	0.42
2019/20	1.14	0.58	0.61	1.06	0.75	0.78	4.18	7.42	0.88	1.34	0.65
2020/21	1.07	0.61	1.41	1.01	0.99	1.6	4.76	8.77	4.38	1.61	0.77
2021/22	1.03	0.37	0.92	1.31	0.68	0.82	6.35	10.14	1.18	2.02	0.6
AVERAGE	**1.21**	**0.51**	**0.92**	**1.15**	**0.8**	**1.07**	**4.94**	**8.57**	**2.29**	**1.76**	**0.61**

Biological Data

Since 2016, MDIFW biologists have collected biological samples from harvested bobcat, fisher, marten, and river otter **(Figures 1-4)**. By closely monitoring harvest demographics (age and sex), we are able to improve how we manage these species and ensure that trapping and hunting levels are sustainable.

We have learned a lot in the past six years of the study. Younger age classes are often more common in the harvest because of their inexperience and greater movements during dispersal which makes them more vulnerable to mortality. On average, 77% of the fisher and marten, 56% of the otter, and 51% of the bobcats sampled each season were juveniles (<1 years old) or yearlings (1 year old). The percentage of adult females (2+ years old) in the harvest has been low, representing 15% of the fisher and otter, and 5% of the martens sampled each season. The percentage of adult female bobcats (2+ years old) has been higher (averaging 24% of the bobcat harvest sample), but we are interpreting these data cautiously because it is based on a low sample size (~7-31% of the annual bobcat harvest had age and sex from genetic analysis). Determining the sex of bobcats, like other felids, can be difficult because the presence of testes in males are not as obvious as it is for other carnivores. A small piece of muscle, like the tongue, is used to determine sex from genetic analysis and compared to field identification by hunters and trappers. During the first five years of the study, hunters and trappers correctly identified 77% of females and 55% of male bobcats. During the 2020/21 season, two thirds of the male bobcats that were mistakenly classified as females were young males (2 years old and younger). Although we have seen improvements, the Department will continue to work with staff, hunters, and trappers to increase the number of viable samples so the data is representative of the harvest. Further training on field identification could also improve the accuracy of sex reported.

MDIFW completed the 2020-2030 Furbearer Management Plan, a comprehensive effort with extensive public input to address management needs for Maine's 16 species of furbearers.

Other Updates

FURBEARER PLANNING

This year, the Department finalized the most comprehensive furbearer planning effort ever conducted. Extensive public input was gathered through scientific surveys and meetings. Over 40 stakeholder representatives worked with the Department to provide specific input on species and related issues. Management goals and strategies were developed to address research and monitoring, policy and regulations, and communication and outreach needs for each of the 16 furbearer species in Maine. This work will improve furbearer management and guide work priorities through 2030.

Check out the new Furbearer Management Plan: mefishwildlife.com/furbearerplan

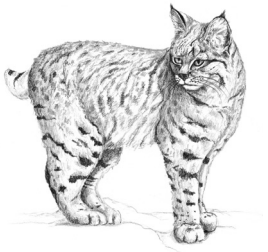
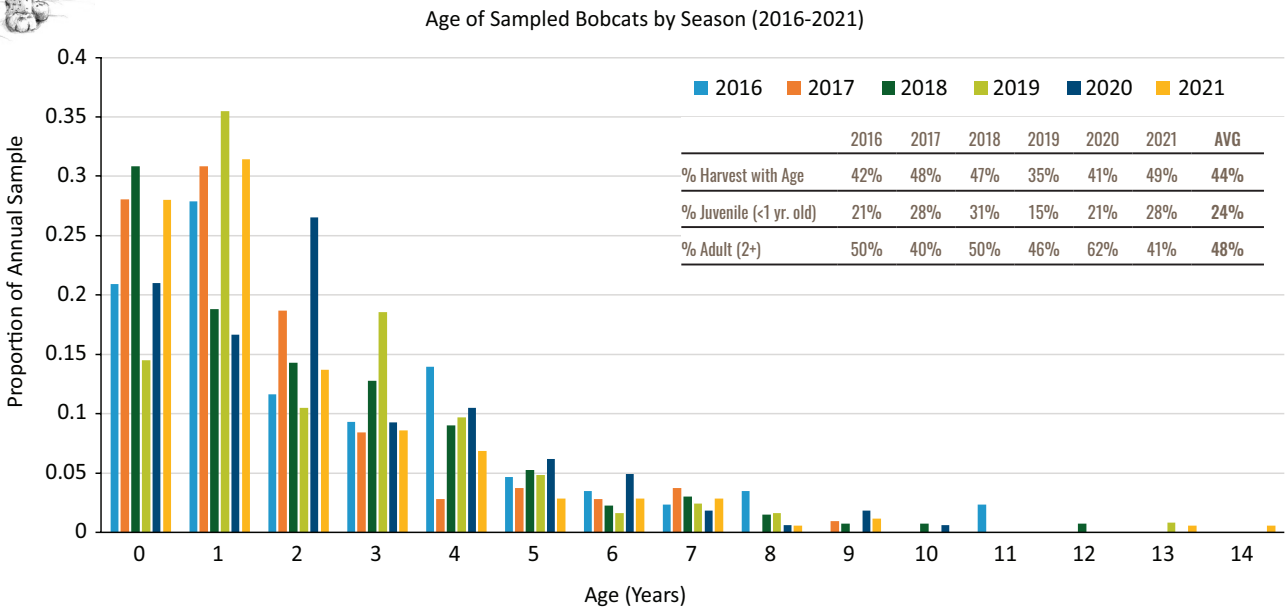
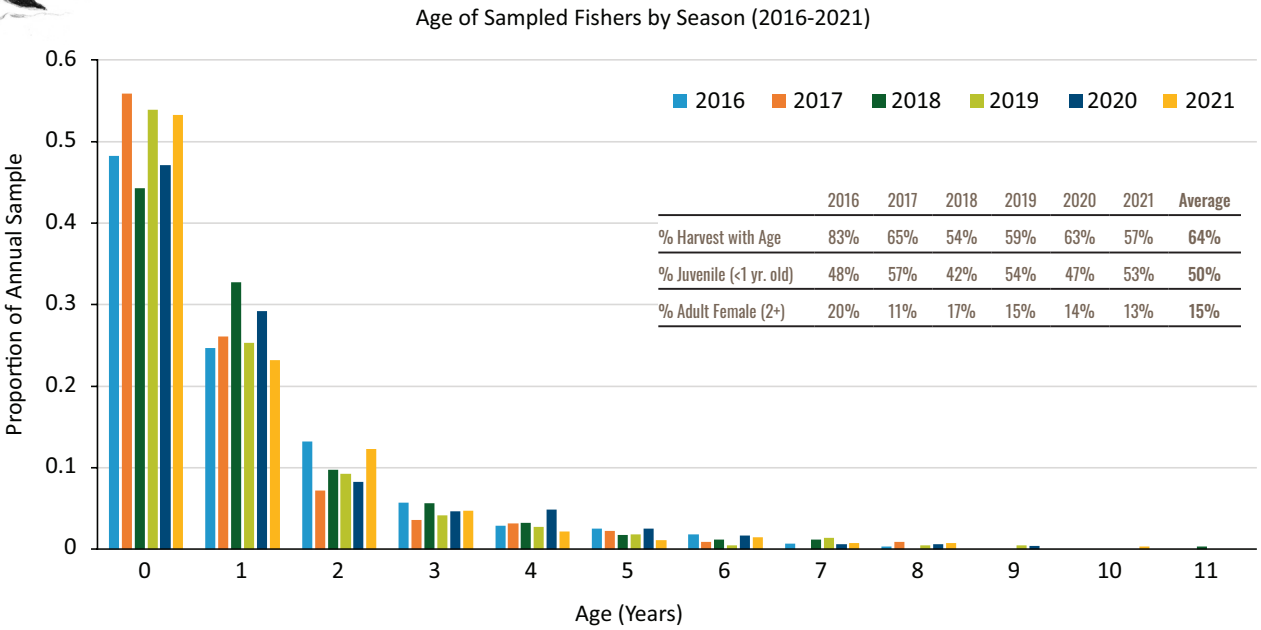


FIGURE 1. AGE AND SEX OF BOBCATS SAMPLED DURING THE 2016/17 – 2021/22 HUNTING AND TRAPPING SEASONS IN MAINE.



	2016	2017	2018	2019	2020	2021	AVG
% Harvest with Age	42%	48%	47%	35%	41%	49%	44%
% Juvenile (<1 yr. old)	21%	28%	31%	15%	21%	28%	24%
% Adult (2+)	50%	40%	50%	46%	62%	41%	48%

FIGURE 2. AGE AND SEX OF THE FISHERS SAMPLED DURING THE 2016/17 – 2021/22 TRAPPING SEASON IN MAINE.



	2016	2017	2018	2019	2020	2021	Average
% Harvest with Age	83%	65%	54%	59%	63%	57%	64%
% Juvenile (<1 yr. old)	48%	57%	42%	54%	47%	53%	50%
% Adult Female (2+)	20%	11%	17%	15%	14%	13%	15%

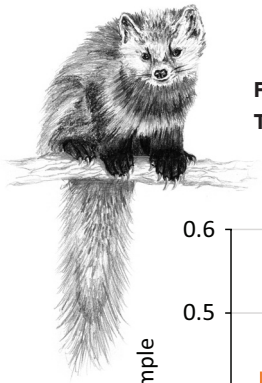
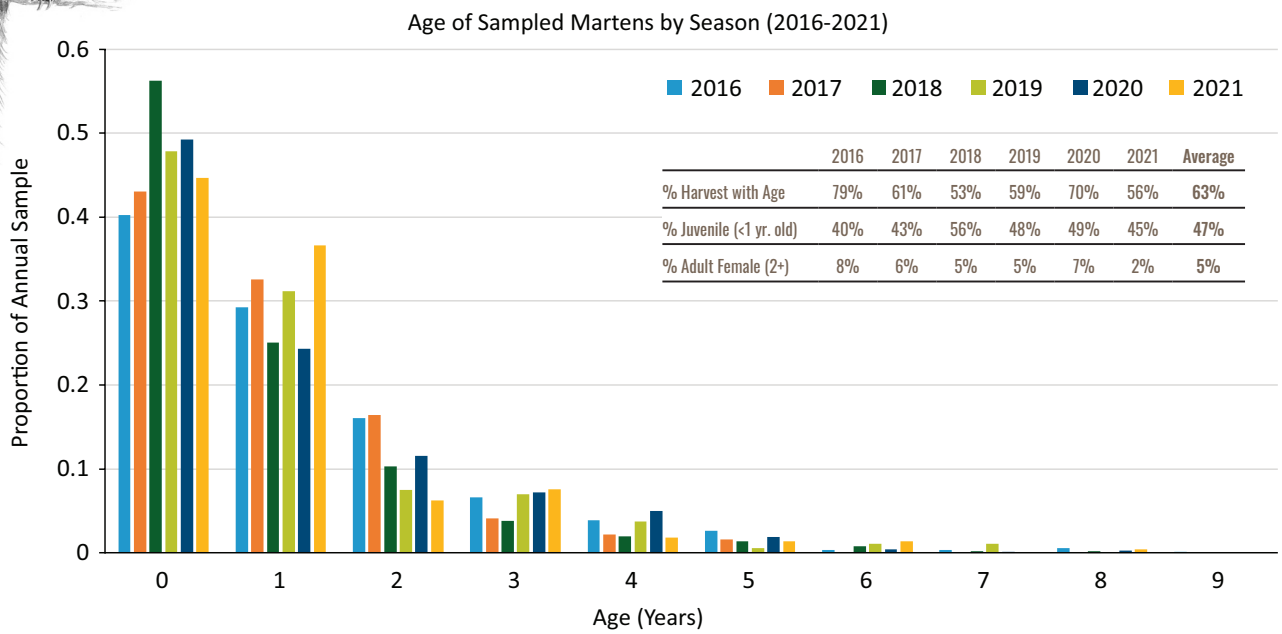
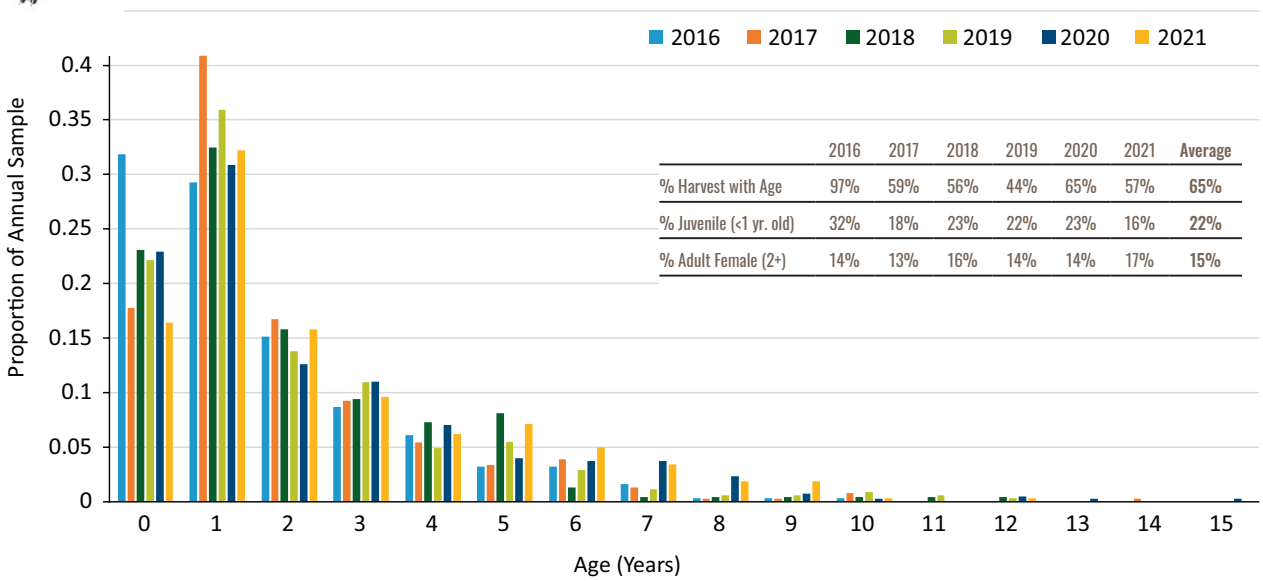


FIGURE 3. AGE AND SEX OF THE MARTENS SAMPLED DURING THE 2016/17 – 2021/22 TRAPPING SEASON IN MAINE.



	2016	2017	2018	2019	2020	2021	Average
% Harvest with Age	79%	61%	53%	59%	70%	56%	63%
% Juvenile (<1 yr. old)	40%	43%	56%	48%	49%	45%	47%
% Adult Female (2+)	8%	6%	5%	5%	7%	2%	5%

FIGURE 4. AGE AND SEX OF THE RIVER OTTERS SAMPLED DURING THE 2016/17 – 2021/22 TRAPPING SEASON IN MAINE.



	2016	2017	2018	2019	2020	2021	Average
% Harvest with Age	97%	59%	56%	44%	65%	57%	65%
% Juvenile (<1 yr. old)	32%	18%	23%	22%	23%	16%	22%
% Adult Female (2+)	14%	13%	16%	14%	14%	17%	15%

Wildlife Camera Study

This past winter, the Department launched a long-term camera study to monitor fisher and marten populations across the state. This study was informed by 4 years' worth of research conducted at the University of Maine by Dr. Alessio Mortelliti and PhD student Bryn Evans at nearly 200 sites.

During the winter of 2022/23, we deployed 273 cameras at 91 sites that included western, northern, and eastern Maine **(Figure 5)**. Results are still preliminary, but we collected over 70,000 images and documented over 30 wildlife species, with fisher and snowshoe hare being the most common species detected. The Department will continue camera surveys each winter as an index to long-term population trends of multiple wildlife species.

The Department would like to acknowledge that this work would not be possible without the support of many large landowners, state partners, local land trusts, and other cooperators across the state.

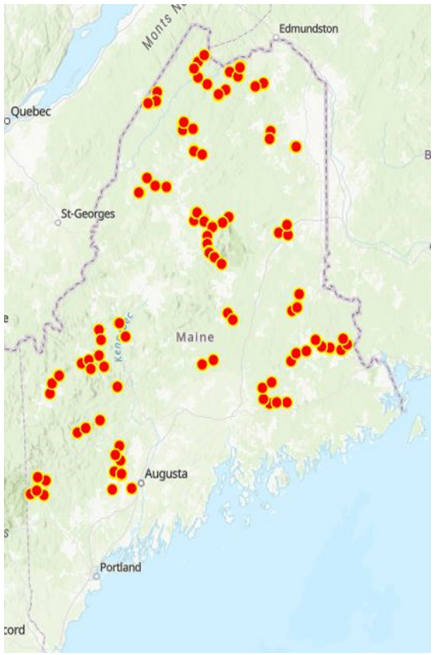


FIGURE 5. MAINE CAMERA STUDY LOCATIONS SAMPLED DURING THE WINTER OF 2022/23.

Rodenticide Study

Rodenticides are commonly used to control rodent populations, but it is not well understood how wildlife species, such as predators, may be impacted. Dr. Jacqui Frair and graduate student Georgianna Silveira (SUNY College) examined factors that may contribute to rodenticide exposure in fishers in the Northeast. Fisher livers were collected from Maine (106 fisher), Pennsylvania (67 fisher), New York (338 fisher), Vermont (71 fisher), and New Hampshire (15 fisher). The researchers identified patterns of exposure and landscape features associated with the rodenticide compounds.

Across all samples, residues from 8 of the 11 rodenticide compounds tested were found in fisher, with at least one compound detected in 78% of samples. Fishers were more likely to have more than 1 rodenticide compound in their system (55% of samples positive for 2-6 compounds) than either a single type (24%) or none (22%). The three most common types were diphacinone (available for public use) and two compounds restricted to professional applicators (brodifacoum and bromadiolone). The lowest exposure and number of rodenticide compounds detected were found from central to northern ME, and the highest overall exposure was found within a region that spanned southern VT and NH to southeastern NY. Exposure was positively associated with the wildland-urban intermix, defined where at least 1 building occurs within a 100-m radius otherwise dominated by wild vegetative cover (forest, shrubland, grassland, or wetland). Little to no variation in exposure was explained by agricultural land use or protected areas.

Although rodenticide levels were the lowest in Maine fisher, more study is necessary to better understand exposure pathways (e.g., feeding directly on baits or secondary ingestion on rodents that have eaten baits) and its effects on wildlife. Given the widespread availability of rodenticides to consumers, increased outreach is needed on integrated pest/rodent management and alternatives to poisons (e.g., snap traps).

Mapping Wildlife Connectivity Using Genetic Information

Dr. James Murdoch, Dr. Stephanie McKay, and PhD student Caitlin Drasher (University of Vermont) have been mapping wildlife connectivity for multiple species in the Northeast. Their approach involves collecting tissues samples from harvested animals across the region, genetically analyzing them, and then using the results to map how connected the landscape is for each species based on the amount of genetic exchange. Over the past two years, they completed an extensive effort to collect genetic samples from 11 species (mostly furbearers) across Vermont, New Hampshire, and Maine with 1,149 total samples collected across the three-state region.

MDIFW collected over 70,000 images, including this photo of a marten, during camera surveys conducted throughout the winter of 2022/23.

The next steps involve analyzing the genetic data to develop landscape resistance models for various species, to identify landscape features that could impede movement and reduce genetic diversity. These models, combined with species distribution information, will help map areas important to maintaining or increasing wildlife connectivity and gene flow across the region. All of the samples are currently being processed at a genetics lab, which involves extracting DNA and sequencing particular genetic markers, which are like a 'fingerprint' that is specific to each animal. All maps and data will also be available to the public on the Forest Ecosystem Monitoring Cooperative online database at the end of the project.

Zoonotic Canid Parasites

Dr. Pauline Kamath and PhD student Tegwin Taylor (University of Maine) have been leading research to better understand the risk of parasites to wild and domestic canid heath, as well as human health.

Their research objectives are to (1) quantify the prevalence and distribution of gastrointestinal parasites in Maine wild canids (coyotes, red fox, gray fox), (2) examine the overlap in parasite species found in domestic dogs with those found in wild canids, and (3) evaluate the potential risk to dog owners and canid trappers. Maine trappers and hunters and other partners have submitted 77 GI tracts from wild canids for this project, of which ~20 have been processed to identify prevalence of Echinococcus (tape worms). Echinococcus spp. has been visually identified in one red fox sample from Somerset County. As part of this work, outreach clinics were held in Ellsworth, Houlton and Skowhegan (Spring 2023) and feces were collected from 68 domestic dogs for analysis. The team will continue to collect and process wild canid samples and will start molecular analysis of dog and wild canid samples in the fall/winter of 2023-2024. These data will provide valuable information to veterinarians, as well as public health and wildlife management agencies for the management and mitigation of potential zoonotic disease spillover risks in the state of Maine.

Skunk Adenovirus Study

Skunk adenovirus (SkAdv1) is an emerging respiratory disease that was first discovered in North America in a striped skunk in Ontario in 2014. Since then, the virus has had an expansive host range, infecting several species in the Northeast, including North American porcupines, gray fox, and raccoon. The virus has also been discovered in captive hedgehog colonies and a captive pygmy marmoset in other parts of the world. In recent years, we have seen an uptick in sick porcupines with respiratory symptoms being submitted to wildlife rehabilitation centers. There appears to be split outcomes, with some infected animals recovering and others dying. According to Dr. David Needle (UNH Veterinary Diagnostic Lab), who first discovered the virus in the United States, it appears that porcupines are the animal infected and developing the disease that is most commonly seen by people. It is unknown how it impacts wildlife populations, but it may be species and strain-dependent. Based on preliminary evidence from UNH and collaborators at Cornell and in Canada, the virus appears fairly transmissible to other species and warrants further study as it is currently emerging in the northern portion of the eastern temperate forests of North America, seemingly focused on Maine and New York and the surrounding Canadian provinces.

The Department has been collaborating with Dr. Needle, Dr. Sarah Childs-Sanford (Cornell University), wildlife rehabilitation centers, and other partners to collect samples from multiple species in Maine. To date, we have collected over 600 samples from 16 wildlife species. Results are preliminary, but two animals have tested positive in southern Maine; a porcupine from Alfred and a raccoon from the next town over in Kennebunk. Swab samples were also tested for SARS-CoV-2, the virus that causes coronavirus, and all samples have been negative so far.

GAME BIRD
CONSERVATION & MANAGEMENT

Kelsey Sullivan

Meet the Game Bird Group

Brad Allen, Wildlife Biologist and Bird Group Leader
Retired August 2022

Brad oversees bird group activities and budgets and continues to investigate the lives and times of the common eider, focusing currently on a collaborative duckling survival study. Brad also coordinates Department interests in seabird research and management activities.

Kelsey Sullivan
Wildlife Biologist
Wild Turkey and Game Birds

Kelsey coordinates MDIFW's 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 and waterfowl.

WILD TURKEY

Maine continues to have quality wild turkey spring hunting with a season that runs five weeks starting the first Monday closest to May 1st each year. The 2023 spring season ran from May 1st to June 3rd with a youth day hunt, for youth hunters under 16, on April 29th. The bag limit is two bearded wild turkeys for the spring season. Most turkey hunters (65%) registered one turkey with 35% registering two turkeys. The total 2023 spring registration of 7,050 turkeys was 7% higher than the most recent 5-year average (6,570) and is the second highest recorded since the start of spring turkey hunting in Maine in 1986. Non-resident turkey registrations have increased steadily from 11% in 2019 to 19% in 2023, suggesting that non-residents are participating more in the Maine spring wild turkey hunt.

Youth day for the 2023 spring wild turkey season fell on Saturday, April 29th with 457 youth hunters registering 573 turkeys. Most youth hunters (75%) harvested one turkey and 116 of the 457 youth day hunters (25%) harvested 2 turkeys. The 2023 total youth day harvest was 14% above the 5-year average of 502 turkeys.

Table 1 shows the spring wild turkey harvest each year from 2019 to 2023 by Wildlife Management District (WMD), along with the average harvest over those five years and the percent difference for each year. **Figure 1**, also below, shows the long term trend of the spring wild-turkey harvest at the state-wide scale from 2005 to 2023 when the season has been open to all turkey hunters. Prior to 2005, turkey hunters entered a lottery to receive a limited number of hunting permits. Harvest for that period is not directly comparable to when the spring season is available to all turkey hunters.

Self-Registration Option for Wild Turkey Hunters

A new option for reporting wild turkey harvest was initiated for the spring 2023 wild turkey hunting season. Hunters were given the option to self-report their harvest through a web-based application that can be used on a cell phone, tablet, laptop, or other device that is able to connect to the internet registration system. In-person registration at hunter registration stations continues to be an option. Preliminary data shows that the majority (67%) of wild turkey hunters registered their turkey with the self-registration system. Reports from hunters indicate that the majority using the self-registration system found it user-friendly and were appreciative of having this new registration option. The Department will be evaluating the results of the spring wild turkey season and the new self-registration system, with a final report completed fall 2023.

Wild Turkey Fall Harvest

The 2023 fall wild turkey season will be open from Monday September 18 until November 7 with a youth day, open to hunters under 16, on September 16th. Bag limits vary by Wildlife Management District (WMD) and are based on each WMD's estimated wild turkey density (WMDs with higher estimated turkey densities have higher bag limits). The overall season bag limit per hunter is five wild turkeys.

Prior to 2021, the Department required all turkeys harvested in the fall to be taken to an in-person registration station. In 2021, the requirement to register fall wild turkey harvest was removed and remained in place for the 2022 fall wild turkey season. Now, in the fall of 2023, hunters will be required to register their turkeys either in person or through the new self-registration system. Although we can't report the 2021 or 2022 fall turkey harvest, when hunters weren't required to register turkeys, the fall 2020 wild turkey registration was the highest in the state since the fall season began in 2002, with a total harvest of 3,645 turkeys — 45% more than the 5-year average (2016 to 2020) of 2,515 turkeys. Higher fall turkey registrations are partially attributed to the reproductive success of wild turkeys in the summer, which is strongly related to temperature and rainfall during the nesting and brood rearing period (when young are being raised). Periods of extended rainfall and cold can decrease poult (young turkey) survival. Weather patterns in 2020 were favorable and resulted in a very good year for wild turkey reproduction and poult survival and thus increased opportunity for fall turkey hunters.

FIGURE 1.

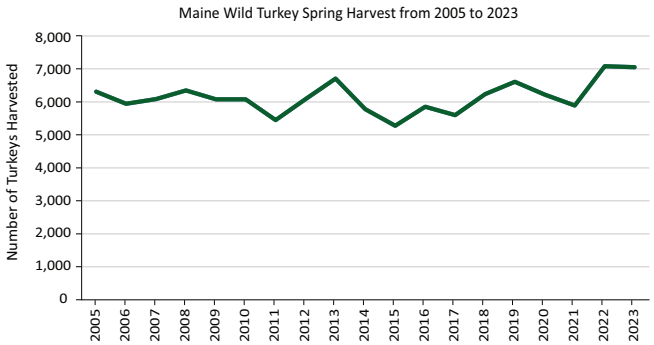


TABLE 1. WILD TURKEY SPRING HARVEST BY WILDLIFE MANAGEMENT DISTRICT (WMD) FROM 2019 TO 2023 AND THE FIVE YEAR AVERAGE

WMD	2019	2020	2021	2022	2023	5 YR AVERAGE
1	0	3	0	0	3	1
2	5	4	3	4	7	5
3	6	9	20	22	34	18
4	1	6	5	0	2	3
5	6	2	14	9	18	10
6	49	37	90	120	130	85
7	52	24	37	57	57	45
8	14	10	19	35	19	19
9	4	0	9	13	8	7
10	4	0	18	22	20	13
11	75	40	71	125	144	91
12	176	118	164	201	209	174
13	122	35	87	172	134	110
14	55	20	53	66	53	49
15	592	567	605	720	735	644
16	523	457	464	551	601	519
17	603	461	562	681	743	610
18	104	149	92	97	93	107
19	20	54	22	37	31	33
20	705	521	701	719	747	679
21	666	481	651	720	707	645
22	607	526	439	525	537	527
23	765	679	607	749	716	703
24	172	180	185	195	185	183
25	687	558	498	631	540	583
26	456	458	302	406	372	399
27	68	51	97	118	104	88
28	67	58	58	66	83	66
29	8	13	18	20	18	15
TOTAL HARVEST	6612	6216	5891	7081	7050	6570
% DIFF FROM 5 YR AVG	1%	-5%	-10%	8%	7%	6570

**Estimated from a post season harvest survey. In 2020, due to COVID, spring harvest registration was waived.*

MIGRATORY GAME BIRDS

Waterfowl Season and Harvest

The 2022 Maine waterfowl season continued with three zones: North, South, and Coastal. The federal framework offered states in the Atlantic Flyway a 60-day general duck season with a six-duck daily bag limit, a 60-day Canada goose season with a two-goose daily bag limit in our North and South Zones, and a 70-day Canada goose season with a three-goose daily bag limit in our Coastal Zone.

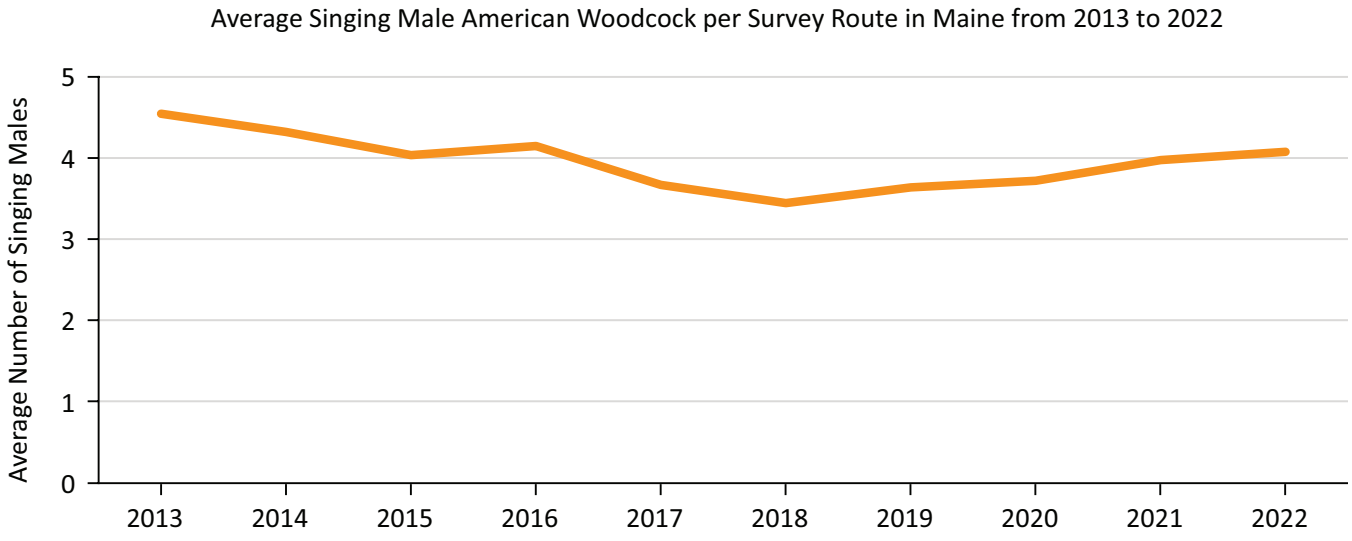
In addition, an early Canada goose season was open from September 1st to September 24th. This season is for the more abundant portion of the Canada goose population breeding in Maine, referred to as resident Canada geese. The regular goose season is timed for when the less abundant geese migrating from the northern breeding grounds in Canada co-mingle with the resident geese. The early season daily bag limit was 10 in the South and Coastal Zones and six in the North Zone.

Starting with the 2022 waterfowl season, an important change was made to sea duck hunting regulations with the elimination of the special sea duck season in Maine and across the Atlantic Flyway. With the elimination of the special season, sea duck harvest is now limited to the general 60-day duck season and is considered part of the overall six-duck per day daily bag limit. Within that six-duck per day daily bag limit, up to four sea ducks can be harvested but no more than three of any one species (long-tailed ducks, scoters, and common eiders) and only one female (hen) common eider can be harvested per day.

Waterfowl harvest estimates are derived from data collected through the Harvest Information Program (HIP) led by the US Fish and Wildlife Service (USFWS). The HIP program is an annual hunter survey to monitor waterfowl harvest. All hunters intending to hunt waterfowl must register for HIP each year when they purchase their hunting license. Duck and goose harvest estimates for the 2018 through 2022 hunting seasons are in **Table 2.**

TABLE 2. WATERFOWL HARVEST IN MAINE BY SPECIES FROM 2018 TO 2022 AND FIVE YEAR AVERAGE

SPECIES	2018	2019	2020	2021	2022	5 YEAR AVERAGE
BLACK DUCK	5,600	2,700	3,500	4,470	3,620	3,978
MALLARD	11,800	6,300	10,400	7,634	8,520	8,931
MALLARD X BLACK DUCK HYBRID	100	100	300	100	278	176
GREEN-WINGED TEAL	1,100	1,900	2,100	1,858	2,060	1,804
BLUE-WINGED TEAL	0	200	600	251	334	277
NORTHERN SHOVELER	0	100	0	0	0	20
NORTHERN PINTAIL	400	100	200	151	56	181
WIGEON	200	200	100	151	46	139
WOOD DUCK	3,700	4,600	9,800	5,023	4,455	5,516
GREATER SCAUP	100	0	0	0	0	20
LESSER SCAUP	0	0	100	151	0	50
RING-NECKED DUCK	800	900	1,200	452	167	704
BUFFLEHEAD	2,700	700	2,400	2,612	223	1,727
COMMON GOLDENEYE	700	400	900	804	278	616
HOODED MERGANSER	600	400	900	452	668	604
OTHER MERGANSERS	700	200	900	502	111	483
TOTAL REGULAR DUCK HARVEST	28,500	18,800	33,400	24,611	20,816	25,225
CANADA GOOSE	11,400	7,200	14,300	10,133	8,198	10,246
COMMON EIDER	7,300	1,700	2,200	212	259	2,334
LONG-TAILED DUCK	2,600	1,300	2,400	2,387	2,852	2,308
SCOTER SPECIES	800	1,100	2,400	1,061	1,093	1,291
TOTAL SEA DUCK HARVEST	10,700	4,100	7,000	3,660	4,204	5,933



American Woodcock

State and federal biologists with the support of volunteers in Maine contributed to the USFWS-coordinated American Woodcock Singing Ground Survey (SGS), which is carried out each spring across the woodcock breeding range in eastern Canada and central and eastern US. MDIFW and USFWS staff, together with several volunteers, completed 56 routes in Maine in the spring of 2022. The average number of males heard per route was 4.08, up slightly from the previous year's average of 3.97, and above the 10-year average of 3.96. These numbers indicate that the breeding portion of woodcock is stable in Maine, (see table below) despite having declined in many other parts of the woodcock range. The declines in other states are attributed, in a large part, to loss of young forest habitat important to woodcock.

As with waterfowl, the USFWS Harvest Information Program (HIP) provides estimates of woodcock hunter numbers and harvest annually, see **Table 3.**

TABLE 3. AMERICAN WOODCOCK HARVEST IN MAINE BY SPECIES FROM 2018 TO 2022 AND FIVE YEAR AVERAGE

2018	2019	2020	2021	2022	FIVE-YEAR AVERAGE
9,700	6,200	9,600	19,600	20,400	13,100

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