Massachusetts Wildlife

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Eastern Coyote,
BioMap, Deer Hunting,
Fisheries Management

Rare bird documented in the Burrage Pond WMA on New Year's Day

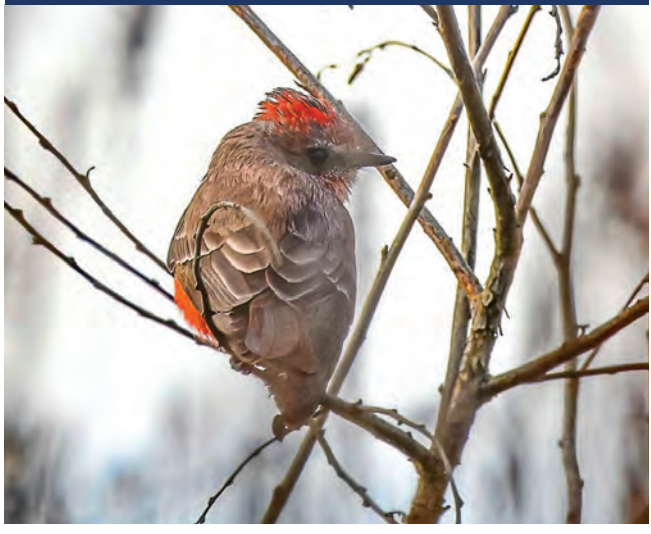


Photo © Bill Marquardt

Bill Marquardt was visiting Burrage Pond Wildlife Management Area (WMA) on New Year's Day when something unexpected caught his eye. Bill observed and documented a young male vermilion flycatcher (*Pyrocephalus rubinus*) with a mottled red plumage. This striking red and gray flycatcher is a bird of open shrubby habitats of the southwestern United States and is seldom observed in the Northeast. In fact, there are only four other documented records of this species in Massachusetts with the last one being on Cape Cod in October 2022. While this bird bears some resembles to an adult female northern cardinal, the color and shape of their beaks are noticeably different.

Located in Halifax and Hanson, Burrage Pond WMA is a beautiful property where visitors can observe a variety of wildlife, including common mammals; numerous turtles and snakes; and many species of moths, butterflies, and native pollinators. Over 200 species of birds have been documented here, including ducks, geese, raptors, egrets, herons, bitterns, rails, shorebirds, and a variety of songbirds. Once a large cranberry-growing operation, this nearly 2,000-acre WMA contains extensive wetlands, ponds, and forested swamps. This area was once known as the Great Cedar Swamp and portions were logged for cedar and mined for bog iron in the 17th and 18th centuries. Since acquiring the land in 2002, MassWildlife has been restoring the cranberry bogs to natural emergent wetlands for improved wildlife habitat. This property has something for everyone, whether you fish or paddle in one of the many reservoirs, walk along the old cranberry bog dikes, hunt waterfowl in the wetlands, or explore the expansive red maple and Atlantic white cedar swamps. For maps of WMAs statewide, visit **mass.gov/wildlife-lands**.

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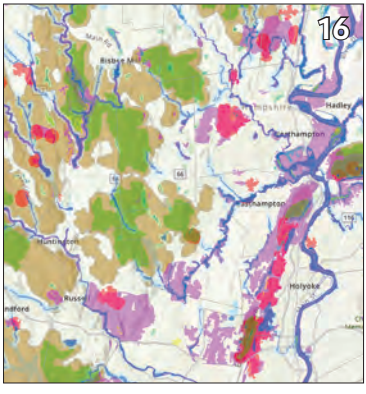
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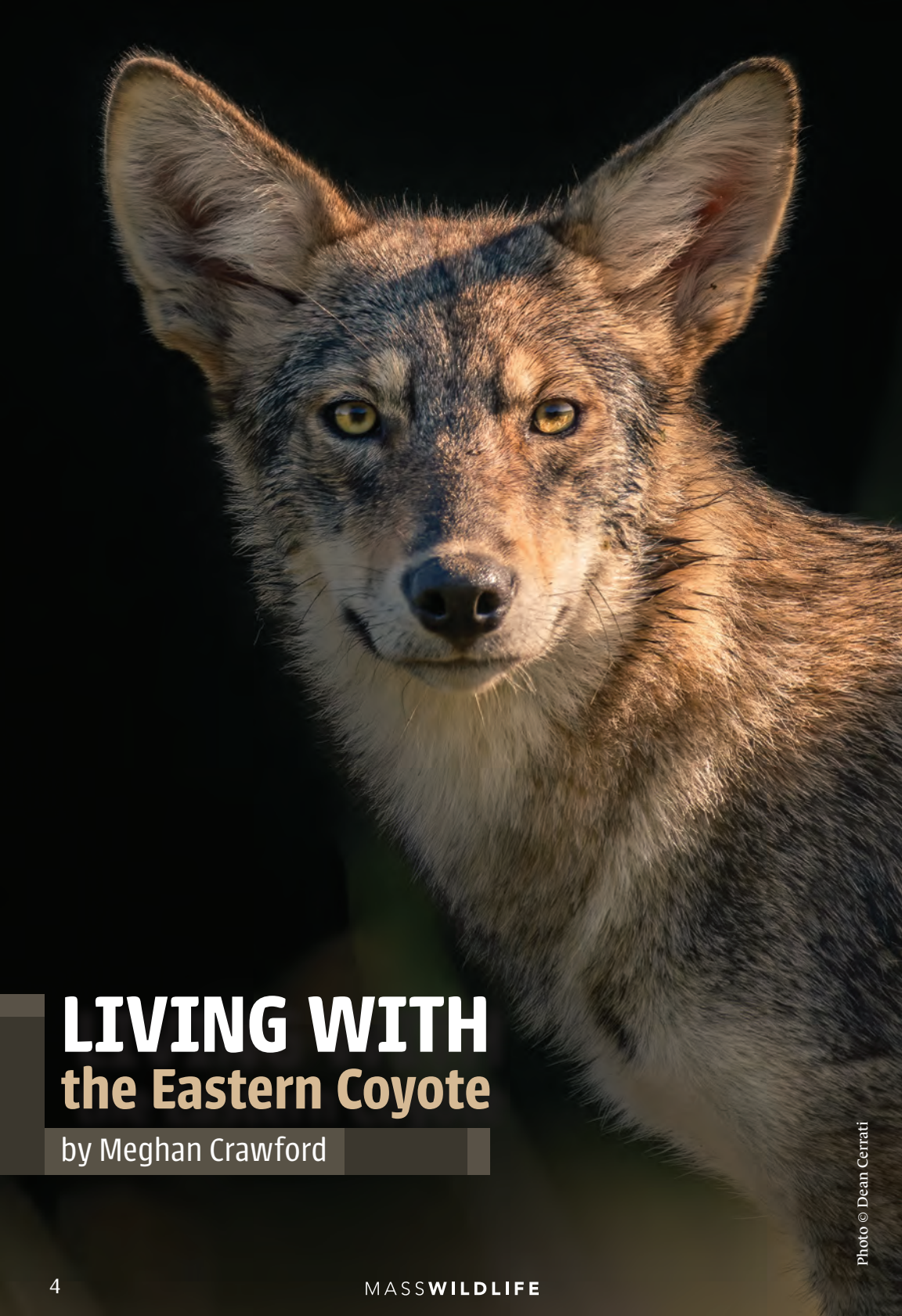
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On the Cover: An eastern coyote (*Canis latrans*) patrols a field at dawn. Moments like these appeal to wildlife enthusiasts of all stripes, but the line between beauty and nuisance behavior can quickly be blurred by the actions people take when they encounter these highly adaptable canids. Photo © Dean Cerrati

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LIVING WITH
the Eastern Coyote

by Meghan Crawford

Photo © Dean Cerrati

(Phone rings)

"Good morning, this is Meghan Crawford, MassWildlife's Community Engagement Biologist. How can I help you?"

"Hi Meghan. I'm extremely concerned about the aggressive coyotes in my neighborhood. It's getting out of hand, and something needs to be done."

"Can you tell me a little more about what's been happening?"

"Well, for starters, I let my dog outside this morning and there were two coyotes standing in my yard only 20 feet away, then they started walking toward me. I yelled at them, and they barely moved. I've never seen coyotes act like this before. They're not afraid of people. They don't care. I see them all the time and they're huge, like the size of a German Shepherd. They walk the street in the middle of the day. It's getting dangerous. We have children and pets here and someone is going to get hurt. I'm afraid to let my kids play outside and it's not fair. The coyotes don't belong here. They need to be relocated or removed before something really bad happens."

In my role with MassWildlife, I receive different versions of this call weekly from residents across Massachusetts. It's usually someone who's learned first-hand that eastern coyotes (*Canis latrans*) can live near people, and they've started to fear for the safety of their family, pets, and property. Fortunately, most of the public's coyote concerns are rooted in misunderstanding and can be resolved with an empathetic ear and education. That said, there can be true human-coyote conflict where bold and aggressive behaviors have started to develop. Responding to these calls is one of the most difficult yet most important aspects of my job. While every coyote conversation has unique circumstances, many can be boiled down to a single question: How am I supposed to live with coyotes?

Did Massachusetts always have coyotes?

Historically, there were no coyotes in the eastern United States—there were gray wolves (*Canis lupus*). Prior to European colonization, gray wolves were common across mainland Massachusetts. However, wolves were an early source of conflict for colonizers because wolves competed with them for wild game and threatened their livestock. To address this conflict, the Massachusetts Bay Colony established a paid bounty on wolves in 1630. After over a century of unregulated and encouraged killing of wolves, they were extirpated from Massachusetts in the mid-1800s. Up to this point, the western coyote range in the United States had been limited to the Great Plains and Rocky Mountains. Yet, with the absence of wolves and the conversion of forests to agricultural land by early settlers, the highly adaptable western coyote began moving eastward in the 1900s. The first record of wild coyotes in Massachusetts was in 1957 in Otis (Berkshire County). By 2000, the expansion of the coyote into Massachusetts was complete, with the new "eastern coyote" being documented in every city and town in mainland Massachusetts. But what, exactly, is an eastern coyote?



Photo MassWildlife Archive/Bill Byrne

When western coyotes expanded eastward in the 1900s, ideal mates were sometimes scarce, which led to interbreeding with remnant wolves and domestic dogs along the way. As a result, the animal colonizing the Northeast had a mixed genetic background. Today, eastern coyote DNA contains 60%–84% western coyote DNA, 8%–25% wolf DNA, and 8%–11% domestic dog DNA. Given this genetic makeup, some have attempted to describe this animal as a "coywolf." While the term "coywolf" piques public interest, it does not accurately describe the animal as it implies they are equal part wolf and coyote. This is not supported by current research which shows their genetic makeup is predominantly comprised of western coyote DNA. "Eastern coyote" is the scientifically accepted and best way to describe this mixed-genetic canid.



The progression of coyote range expansion throughout North America and Mexico, 1880–1990. By 2000, the expansion of coyote into mainland Massachusetts was complete.

Graphic courtesy of Urban Coyote Research Project

It's no secret that eastern coyotes are larger than western coyotes, which weigh 20–30 pounds. However, eastern coyotes are much smaller than the wolves that historically inhabited the region, which averaged around 70–100 pounds. Although MassWildlife receives public claims of Massachusetts coyotes weighing 75–100 pounds, eastern coyotes actually weigh between 30–45 pounds. It is extremely rare for a coyote to weigh over 50 pounds. So, why do people report seeing German Shepherd-sized coyotes? For one, it can be difficult to estimate an animal's size, especially if someone is seeing a coyote for the first time, at a distance, and while experiencing a rush of adrenaline. Additionally, due to their wolf DNA, eastern coyotes have long legs and thick winter fur that make them appear larger than they truly are.

Food and Shelter

When it comes to food and shelter, eastern coyotes are not picky. This flexibility makes them uniquely able to live in a variety of habitats and near people. Coyotes are opportunistic omnivores, meaning they eat almost anything they can find or catch. Natural food sources include rodents, other small mammals, birds, eggs, insects, fruit, carrion, and white-tailed deer fawns. But their diet doesn't end there. Coyotes will also take advantage of human-associated foods near homes and businesses, like bird seed, unsecured garbage and compost, fallen fruit, overripe vegetables in gardens, pet food placed outdoors, as well as unprotected outdoor pets, free-range chickens, and other livestock, all of which are abundant in every community in Massachusetts.

Colorful Coyote Coats

Every year, we receive enthusiastic messages and questions from the public about coyotes with unique coat variations. While most coyotes have the typical mixture of brown, black, white, and gray fur, coyote coat color can vary widely. It's exciting when the public captures photos of coyotes with dominantly black, blonde, and red coats. Although there are many reasons why an individual animal may have an unusual appearance, recent genomic research suggests that the eastern coyote coat color variation we see today is tied to their historical interbreeding with domestic dogs.


Photo © Dean Cerrati


Photo MassWildlife Archive/Bill Byrne


Photo ©Steve Weiser

Unfortunately, these human-associated foods essentially train coyotes to look for food in our yards and neighborhoods and increase human-coyote interactions. While people typically unintentionally provide coyotes access to human-associated foods, the reality is that there are Massachusetts residents who purposely feed coyotes. Although a "wildlife feeder" may have good intentions, the decision to feed coyotes is dangerous for both the animal and people as it causes coyotes to associate people with food. This is particularly dangerous, as most of the recent coyote bites of people in Massachusetts have been directly linked to intentional feeding.

Since coyotes have a diverse diet, they can live in almost any habitat. They can occupy natural spaces, like grasslands, agricultural land, forest, and wetlands. They can also live in more developed areas, knitting together home ranges that include neighborhoods and natural and semi-natural areas like parks, cemeteries, golf courses, and abandoned lots. People are often surprised to hear that coyotes not only use urban environments like the City of Boston, but that they're capable of permanently living and raising pups in the city. Urban-suburban coyotes are not unique to Massachusetts. Many cities, including Chicago and Los Angeles, also have resident coyote populations. Urban-suburban coyotes thrive in developed spaces because of plentiful human-associated foods.

Coyotes are elusive but curious animals that can be seen individually, in pairs, or in small groups. Unlike wolves, coyotes

typically travel and hunt alone, but, on occasion, they will hunt in pairs. They're highly territorial and will aggressively defend their territory against other coyotes. This is particularly true during the mating season, which takes place in late-January through March. Coyotes are very social and will communicate with one another using dominant body language like direct staring, exposing teeth, and raising the hair along their back. Coyotes also communicate by scent-marking and vocalizations. We frequently get reports from the public that they hear coyotes howling in their neighborhood. Contrary to popular belief, these vocalizations are not meant to announce a kill, but to communicate with members of their family group or to defend their territory from intruders. Other vocalizations include barks, yips, growls, whines, and huffs. Counting coyotes by listening to their howls can be difficult. Two coyotes howling with their pups can sound like many more because of an auditory illusion known as the "beau geste" effect where sound is distorted as it moves through the environment.

Population Ecology

There are two main components of coyote social organization: family groups and transients. A family group has a stable home range and will actively defend their established territory. Each family



Photo © Allison Willcutt

Coyote Predation on White-tailed Deer

Like black bears and bobcats, coyotes prey on white-tailed deer; primarily on fawns. However, this predation is not a population-limiting factor for white-tailed deer in the northeastern United States. This is most evident with the establishment of coyote populations across the region over the last century coinciding with rising deer populations that are now at record densities. Fawn survival rates are often similar between nearby areas with and without the presence of coyotes. There are many sources of fawn mortality, including abandonment, neonatal complications, disease, hypothermia, and vehicle collisions. Many of the fawns ultimately taken by coyotes would have likely died from another cause, which is why coyote predation has little impact on overall fawn survival. Coyotes will occasionally prey on adult white-tailed deer, but those are primarily deer that are injured, diseased, facing winter mortality, or otherwise compromised. Although deer bone fragments and fur can be found in coyote scat, this is typically a result of coyotes scavenging deer carrion rather than direct predation—such as the road-killed deer pictured here.



Photos © Allison Willcutt

Opportunistic Omnivores

Coyotes will eat almost anything they can find or catch, including rodents and fruit, as shown below. This flexibility makes them uniquely able to live in close proximity to people. For this reason, it is very important for residents to deny coyotes access to all human-associated foods and to never intentionally feed coyotes.



first consists of a mated male and female, otherwise referred to as the alpha pair. Then, there can be subordinate members, usually offspring from the previous litter, that serve as helpers to provide food and assist in raising the next pups. Finally, each spring, a litter of pups joins the group. In fall, most of the mature pups from that year's litter will disperse from the family and attempt to establish their own territories.

Coyote populations also have transients. It's estimated that transients make up about 30% of the overall coyote population. Transients are solitary coyotes that have dispersed from their family group and live on the fringes of other coyote territories. They're usually young or subordinate coyotes that struggle to outcompete more dominant individuals. Transients don't have an established home range, so they travel widely as they look to find a mate and establish a territory of their own.

This social organization plays a big role in the way coyote populations persist on the landscape even when mortality occurs. For example, if the alpha male in a family group were to die, another subordinate coyote, whether a transient or helper, is readily available to take its place. They will move in quickly, mate with the alpha female, produce pups, and keep the overall coyote population relatively stable over time.

There's another key factor to how coyotes persist on the landscape, especially in more developed areas: human-associated foods. Coyote reproductive success is resource-dependent. This means that if ample resources are available, like food and space, coyotes will have larger litters, higher pup survival rates, more breeding individuals, and larger family groups. If there are less resources, coyotes will have smaller litters, lower pup survival, fewer breeding individuals, and smaller family groups. Simply put: More food means more coyotes; less food means fewer coyotes. As a result, limiting the availability of human-associated foods can actually reduce the number of coyotes living in any area over time.

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Annual Coyote Life Events

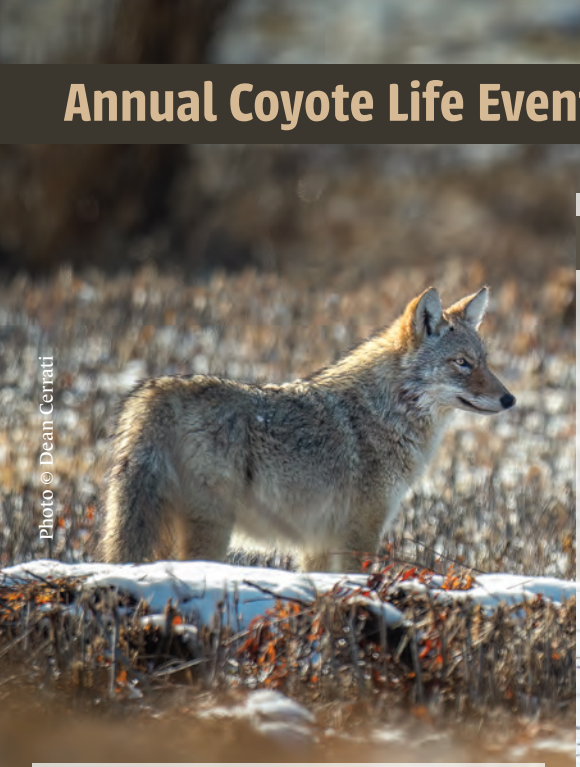


Photo © Dean Cerrati

Mating: late-January – March

Coyotes are very active during the winter season while courting mates and defending their territory. Coyotes will be more aggressive toward medium- and large-sized dogs during this time because coyotes view them as potential competition. Pet owners should be especially vigilant during the winter and directly supervise and leash their pets when outdoors.



Photo MassWildlife Archive/Bill Byrne

Denning: April – May

Denning, or pupping season, is when coyotes establish a den and give birth to typically 4–8 but up to a dozen pups. The family group is tied to that den site for about 8 weeks while the pups are young and not very mobile. Coyotes can be aggressive towards dogs and people with dogs that are in the vicinity of their den. If a person thinks they are close to a coyote den, they should keep their dog on a leash, pick up small pets, and calmly leave the area.

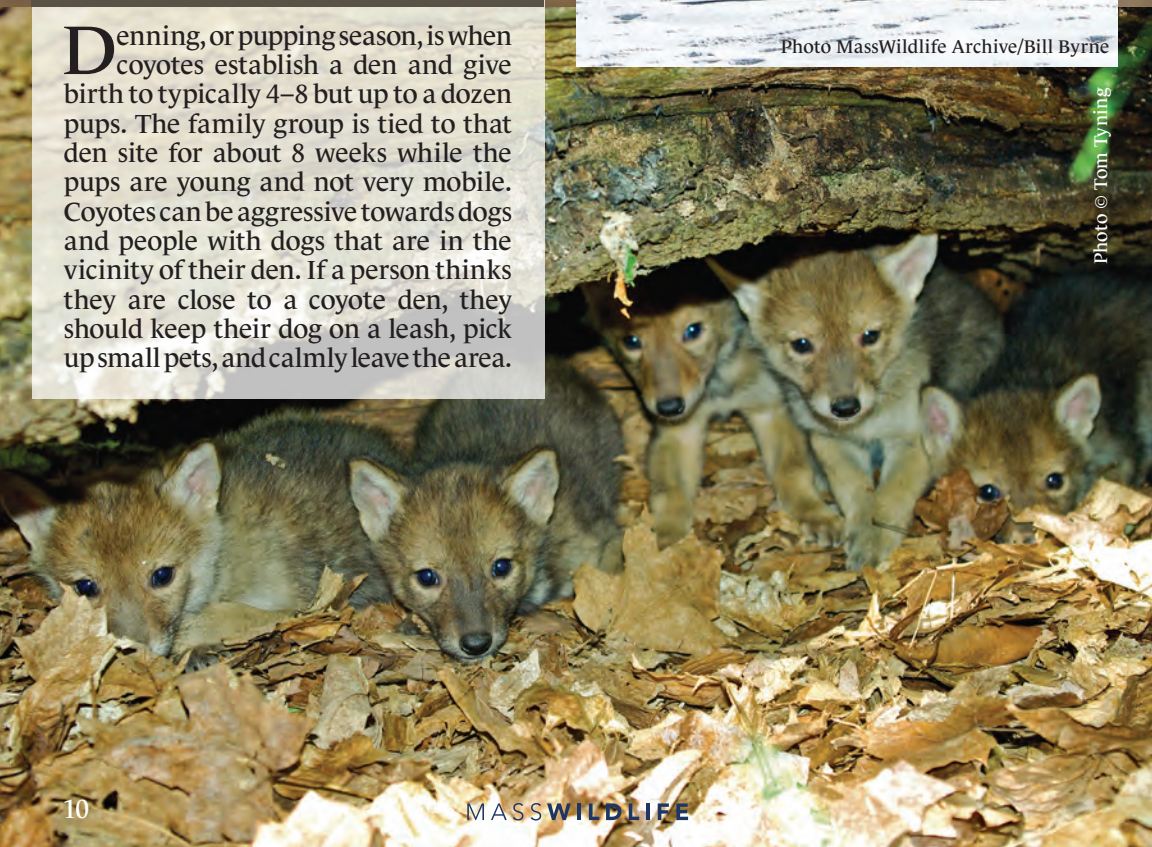


Photo © Tom Tyning



Pups on the Prowl: June – August

As summer approaches, the pups are more developed and ready to learn how to hunt and forage. Coyote activity changes during this time as different members of the family group show pups how to find food. Family groups can be heard howling and yipping as adults teach the pups how to communicate.





Photo © Allison Willcutt



Dispersal: September – November

Come fall, pups are nearly full grown and are ready to leave their family group and attempt to find a territory of their own. During this dispersal period, MassWildlife receives reports from the public of a coyote "population explosion," based on the increase in sightings. In reality, there are about the same number of coyotes on the landscape, but their higher level of activity makes them more visible.

Photos © Dean Cerrati

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This resource dependency is why we find coyotes living in higher densities in developed areas where human-associated foods are easily found. The Conservation Society's Narragansett Bay Coyote Study used GPS tracking collars to investigate the use of resources by coyotes on Conanicut and Aquidneck islands in Narragansett Bay, Rhode Island. Through this study, they identified 10 unique family groups on the combined 47 square miles of islands. This equates to about one family group per five square miles. These coyotes were able to live in such high densities in close proximity to people because there was an abundance of easily accessible, human-associated foods.

Population Management

Eastern coyotes are an important natural resource in Massachusetts. Although access to human-associated food and shelter can influence local coyote population size, their territoriality and resource-dependent reproduction make it so that coyote populations cannot increase indefinitely. Currently, the Massachusetts coyote population is relatively stable, with an estimated 9,500–11,500 coyotes statewide. Coyotes play an essential ecological role as medium-sized omnivores, eating small mammals and rodents that can be a nuisance to people. Coyotes are appreciated by a wide variety of nature enthusiasts, including hunters and trappers who harvest coyotes during regulated seasons set by MassWildlife and utilize their fur for personal use and sale. While the regulated hunting and trapping of coyotes will temporarily decrease a local coyote population and can be useful in situations with individual problem coyotes, it does not reduce the overall coyote population. As discussed earlier, even if individuals are removed from the population, transient coyotes are always ready to take their place. A reduction in the local population due to mortality temporarily makes more resources available for the remaining coyotes. This, in turn, means larger litter sizes and higher pup survival rates that will result in an almost immediate rebound in coyote numbers. It is estimated that over 70% of a coyote population would need to be removed year after year to result in incremental decreases in the population over time. For the past 15 years, approximately 5%–6% of Massachusetts' coyote population has been harvested annually through regulated hunting and trapping. Other states have attempted to reduce their overall coyote population through incentivized hunting and trapping efforts. Despite high annual harvest rates in those states, coyote populations have continually rebounded, providing evidence that such methods are ineffective at reducing coyote populations over time. Given coyote population ecology and resource-dependent reproduction, it's clear that the best way to manage Massachusetts' coyotes is to work together to minimize the availability of human-associated foods.

Conflict and Coexistence

As mentioned at the beginning of this article, MassWildlife frequently responds to calls from the public about coyotes. People are generally worried about the safety of their children, elderly parents, pets, livestock, property, and even the coyotes themselves. Luckily, most of these concerns are only perceived threats that can be remedied through education and a willingness to take simple steps to coexist with coyotes.

Some calls are with distraught pet owners, who report a missing pet or one that has been injured or killed by a coyote. Pet attacks are highly underreported to MassWildlife but they're a regular occurrence based on reports to municipal police and animal control officers. Although incredibly unfortunate, it is normal behavior for coyotes to attack outdoor cats and unsupervised dogs. Coyotes cannot differentiate between their natural prey and unprotected cats and small dogs, so they view them as a potential food source. Coyotes may also view medium- to large-sized dogs as competition for mates and territory, which can prompt attacks. In the



Photo by Troy Gipps/MassWildlife

Neighborhood Safety

The presence of human-associated foods can bring coyotes into areas they would normally avoid. In this case, a coyote was seen passing through a yard in Millbury multiple times. It was later discovered that there were domestic rabbits being housed outside in wire cages in the neighbor's yard, which were viewed as a potential food source by the coyote.

same way pet owners protect their dogs and cats from disease and vehicles, they must protect them from wildlife encounters. It is very common to hear reports that someone was watching their pet from the deck or the backdoor and a coyote came out of nowhere, grabbed their dog, and disappeared. While the person is generally present, they may be 20–30 feet away and, from a coyote's perspective, might as well not be there. It is extremely unlikely for a coyote to take a leashed and closely supervised pet and this only occurs when a coyote has become uncharacteristically bold due to feeding or lack of harassment. To avoid conflict, pets should be *directly* supervised and leashed whenever they're outdoors. It is the human presence immediately next to a leashed pet that prevents a coyote attack.

While exceedingly rare, MassWildlife does receive reports of human-coyote attacks, where a person is bitten or scratched by a coyote. Serious injuries and fatalities resulting from coyote attacks are exceptionally rare, and there have been no recorded human fatalities in Massachusetts from a coyote attack. Unless the animal is rabid, coyote bites to humans can almost always be directly linked to intentional feeding. When a person intentionally feeds a coyote, it teaches the animal to associate people with food and to search around homes for food, consequently making them less wary of people. This can cause the coyote to develop bold or aggressive behaviors. Over the last decade, there have been several Massachusetts communities that experienced an uptick in human-coyote conflict due to intentional feeding. Salem, Swampscott, Arlington, and several Cape Cod communities all have a recent history of intentional feeding that led to multiple coyote bites. While the intentional feeder may not be bitten, it's the next-door neighbor or child playing in the yard that becomes the victim. Intentionally feeding coyotes is bad for the animal as it can cause them to be lethally removed by officials to ensure the safety of the public. If you care about wildlife, you'll let animals find naturally available food. Never intentionally feed coyotes.

Avoid Harmful Habituation by Hazing

A motorist in Quincy sits quietly in his car while watching a habituated coyote. Given its willingness to approach a vehicle in this way, its highly likely that this coyote had previously been fed by someone from a vehicle. While this may seem like a unique opportunity to observe wildlife, the motorist is actually reinforcing a harmful level of habituation. Employing the hazing techniques described in this article can teach coyotes to avoid people.

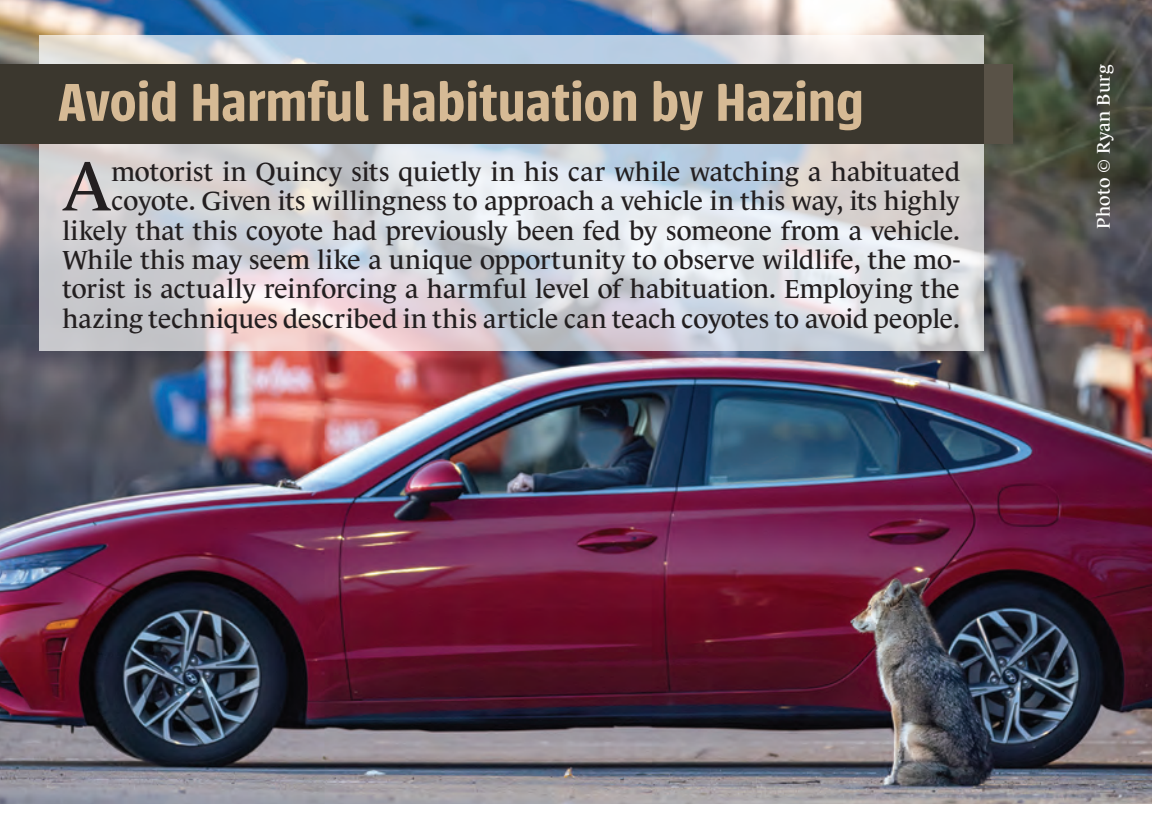


Photo © Ryan Burg

More commonly, coyote conflicts originate from the unintentional feeding of coyotes. Since coyotes have such a diverse diet, they're well adapted to take advantage of human-associated foods that are easily found around homes and businesses. As long as bird feeders, garbage, open compost, outdoor pet food, unprotected pets, and more, are available to coyotes, they will continue to thrive in neighborhoods. If communities work together to secure these resources and eliminate wildlife feeding, coyotes will be less tempted to spend their time near homes and businesses and the reduction of resources can reduce the coyote population in a community over time.

Feeding wildlife also has serious consequences for the health of wildlife populations. Wildlife feeding sites, whether intentional or unintentional, attract both sick and healthy animals. Direct physical contact among individual animals at feeding sites creates the opportunity for disease, like mange, to spread across a local population. Mange is a contagious skin disease caused by microscopic mites that affects mammals. The most common type of mange in Massachusetts is sarcoptic mange, which can be found in over 100 species of wild and domestic mammals, including foxes, coyotes, black bears, squirrels, and raccoons. Mange-infected animals have moderate to severe hair loss or thinning, scabbing, and flaky skin. While individuals with healthy immune systems may be able to recover from mange on their own, some will die from the infection. Although it's natural to have moderate levels of mange on the landscape, wildlife feeding can cause an increase in spread and mortality because of the higher likelihood of animals encountering one another at the feeding site. The public should never attempt to medicate or trap animals infected with mange. It is illegal, can further spread the disease, and has many negative and potentially lethal side effects for wild and domestic animals. The best way for people to support healthy wildlife populations is to secure all human-associated food sources.

The final way to minimize human-coyote conflict is to remind coyotes that they should be cautious around people. Too often, people see coyotes in parking lots, on sidewalks, and in their yard, and instead of taking action, they choose to quietly take a photo or video, turn around, run away, or run inside. This body language is perceived by coyotes as submissive, and it trains them to view themselves as dominant in their relationship with humans. This can lead to the habituation of coyotes, especially in urban-suburban settings where coyotes have grown up in the presence of people, making them exceedingly comfortable in developed spaces. Fortunately, it's easy to remind coyotes to be wary of people by effectively hazing them. Hazing is a safe technique used to deter an animal from an area or to change its behavior. The intent of hazing is to frighten, not injure, the animal. There are many ways to successfully haze coyotes, including making eye contact and moving confidently toward the coyote while clapping, creating loud noises by yelling or using a small air horn or whistle, waving a jacket overhead to appear bigger, spraying a hose or throwing small objects in the coyote's direction, and physically chasing and driving the coyote off. Hazing is perceived similarly to how one coyote chases another out of its territory, so the animal should be continually hazed until it has fully left the area. Hazing will not be effective if it's done from inside a building, from behind a screen door, or from a car. Hazing is most effective when it's done repeatedly, when a variety of techniques are used, and when many people participate.

Coyotes Now and in the Future

Although eastern coyotes weren't originally found in Massachusetts, their incredible ability to survive almost anywhere and under any conditions ensures they're here to stay. Some residents will celebrate this reality while others may still feel uncertain about living alongside these curious canids. The good news is that the power to coexist with coyotes is entirely in our hands. Human behavior influences wildlife behavior, and the daily choices we make really do matter. If individuals and their communities proactively reduce access to human-associated foods, protect pets, effectively haze, and stop all intentional feeding of coyotes and other wildlife, the potential for coyote conflict will be greatly reduced. While the eastern coyote may never be "man's best friend," we undoubtedly have the means to be civil neighbors.

About the Author

Meghan Crawford is MassWildlife's Community Engagement Biologist. In addition to her background in wildlife management, she has 10 years of experience increasing the public's understanding of the natural world as a science educator in museums, zoos, and environmental education centers.

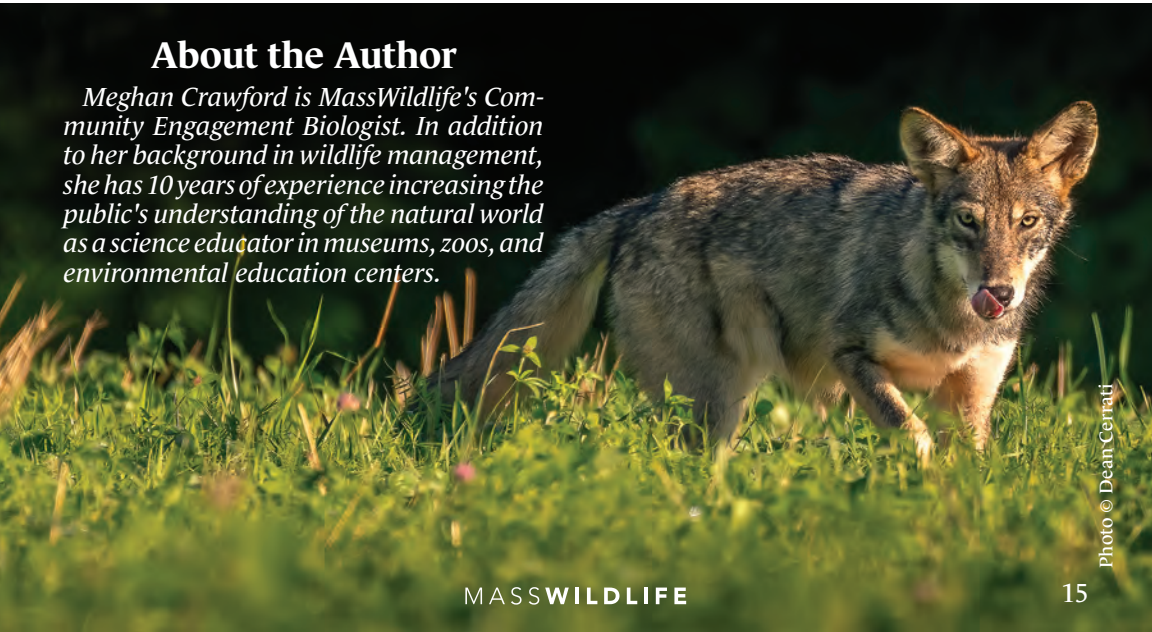


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Registration for the 2024 Massachusetts Junior Conservation Camp (MJCC) is now open. Youth aged 13–17 are eligible to attend this two-week overnight camp that offers a hands-on curriculum focused on outdoor skills, shooting sports, fishing techniques, boating, conservation, ethics, and much more, in a fun, safe environment. Tuition is $1,150, but most campers receive full scholarships from sporting clubs and conservation organizations. The MJCC will be held at the Moses Scout Reservation in Russell from August 5–17. To register, visit **juniorconservationcamp.org**. Photos by Troy Gipps/MassWildlife







