

More often, we refer to coyotes as being crepuscular, where they are most active during early morning and at or just after dusk. Coyotes' eyesight, hearing, and sense of smell are all very well-developed. They communicate principally through scent marking and various vocalizations, for which they have earned the distinction of being one of the most vocal mammals in North America. Coyote vocalizations include short barks, ending in a high-pitched howl, and various whines, yelps, and growls.

Coyotes are omnivorous (eat both plant and animal matter) and their diet reflects whatever is most available and/or abundant at the time. Their diet typically consists of seasonal berries and fruits, grasses, and insects; rabbits, groundhogs, voles, and mice, as well as game birds (ruffed grouse, wild turkey, bobwhite quail) and ground-nesting non-game birds are consumed when encountered. Coyotes are also scavengers; they frequently forage on gut piles left behind by hunters and on animal carcasses (e.g., deer shot, but not recovered; road-killed wildlife). Coyotes fill several important ecological roles, including as a predator of species commonly viewed as pests (e.g., mice, Norway and black rats, voles, moles, woodchucks) and the natural housekeeping function of removing carcasses, which affords certain aesthetic benefits and helps stem the spread of some diseases.

Only a small proportion of the diet is comprised of deer directly killed by coyotes; where such predation occurs, it usually involves newborn fawns or sick or injured adults. Contrary to common myth, coyotes pose little threat to healthy deer populations throughout most of Virginia; however, where deer numbers are already low due to poor habitat quality (e.g., western highlands, southwestern coal counties), predation on fawns by coyotes, black bears, and bobcats may be sufficient to negatively impact population status or recovery.

Coyotes will prey on domestic animals, such as sheep, goats, small calves, and fowl left unprotected and vulnerable in pastures, and on companion animals (cats, small dogs) that are allowed to roam free, particularly in spring when demand for food for their pups is highest. Here in Virginia, statewide coyote depredation on cattle (~200/year) and calves (~3,100/year) has remained relatively stable over the last decade. Depredation on sheep (250-450 deaths/year) and goats (100-175 deaths/year), though smaller in total number of mortalities compared to cattle and calves, is often more impactful to producers as the number of animals affected on an individual farm can be high (3-15 sheep/farm; 9-19 goats/farm) (NASS 2011).

Here in Virginia, the Department of Wildlife Resources (DWR) classifies the coyote as a "nuisance species." Under this statutory classification, there is a continuous open season on the take of coyotes (except on National Forest and DWR-managed lands); otherwise, coyotes receive little protection and may be taken at any time and without limit, provided legal methods for take, as defined by the DWR, are used.

Despite the low incidence of safety issues experienced since their arrival here in Virginia, coyotes do pose potential threats to human and domestic animal health and safety. Like other native canids, coyotes vector the rabies virus. They also may be a reservoir of canine distemper in areas where this disease is endemic. Where coyotes have become habituated, they lose their fear of humans and can become emboldened, threatening, or aggressive; such behaviors likely arise where coyotes have been fed, potentially leading to someone being bitten by or involved in an aggressive interaction with a coyote.

Do's and Don'ts of Dealing with Coyotes

For residential property owners:

- Precautionary measures should be taken before problems first occur; recognize that no single technique provides absolute protection. Coyotes are persistent and adaptable, so several management strategies may be necessary.
- Because coyotes fulfill important ecological roles, coexistence is encouraged; some landowners take pleasure in watching them on their property and appreciate the benefits received in terms of pest management. That said, do not allow coyotes to become comfortable residing close to homes as this can increase their habituation.
- Do not allow pets to roam freely outdoors. Avoid attracting coyotes by feeding pets inside or limiting the amount of food you place outside only to what can be consumed in a single feeding; leftover food will attract the animals coyotes prey on.
- Limit the amount of dense, brushy, or overgrown areas close to your residence as a means to reduce suitable cover for prey species and coyotes.

For agricultural producers:

- Use sound husbandry practices that reduce the potential for coyote depredations, including confining livestock or moving them close to farm activity centers during periods of greatest vulnerability (such as birthing); avoid using secluded pastures surrounded by forest, especially when turning out newborns; use lighted night paddocks near buildings or human activity.
- Remove and properly dispose of mortalities/carcasses from pastures immediately upon detection to prevent coyotes from developing an association between livestock facilities and carcasses as food sources.
- Consider using guard animals (dogs, llamas, donkeys) to monitor and protect livestock on remote pastures.
- Evaluate cost-effectiveness of using auditory and visual deterrents in providing temporary protection, especially when two or more methods are used in rotation to prevent habituation.
- Assess whether exclusion fencing to keep coyotes out of pastures might be cost-effective for the type of operation being conducted. High installation and maintenance costs or the presence of irregular topography often can make fencing impractical.
- Where husbandry and non-lethal approaches fail to resolve coyote problems, lethal control measures may be necessary. Trapping can be effective in removing particular offending animals. The Virginia Cooperative Coyote Damage Control Program (VCCDCP), administered through USDA-APHIS Wildlife Services, provides on-site technical assistance to participating producers and disseminates technical information on preventive strategies.



Figure 4. Image of the typical physical appearance of a coyote, this one observed in Fairfax, VA. Photo from: Virginia Department of Wildlife Resources.

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The Coyote (*Canis latrans*) in Virginia
 By: Jim Parkhurst, Virginia Tech

Originally native to western Canada, Mexico, and the central prairies and arid southwest of the U.S., the coyote (*Canis latrans*) has gradually expanded its range to include all U.S. states, except Hawaii, as well as much of Central America (Figure 1). This expansion coincided with, and likely was facilitated by, the human-enhanced demise of most other large predator species throughout this range. During the early 1900s, coyotes originating from the northern prairies moved north and east through southern Canada, where they encountered and interbred with gray wolves (*Canis lupus*), before heading into New England, the eastern Great Lakes region, and ultimately into the mid-Atlantic area (Figure 2). Similarly, coyotes originating from the southern plains moved east through the southeastern states, where they encountered and interbred with red wolves (*Canis rufus*). These two founding populations ultimately merged here in Virginia beginning in the 1950s. Coyotes were also brought to and released in Virginia (illegally) by hunt clubs and managers of commercial penned hunting operations. Today, coyotes have dispersed across all of Virginia and populate every county.

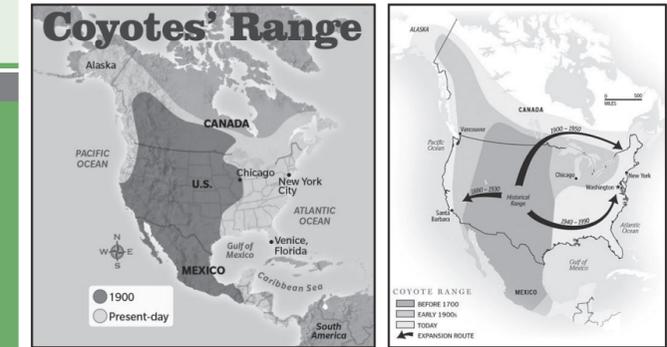


Figure 1 (left). Map of range expansion by coyote within North and Central America. Image from: <https://sn56.scholastic.com/content/dam/classroom-magazines/sn56/issues/2018-19/090318/coyotes-come-to-town/SN56090318-Coyotes-Popup-2.png>.

Figure 2 (right). Historical record of coyote dispersal during range expansion across the U.S. Image from: <https://urbancoyoteresearch.com/coyote-info/north-american-distribution>.

Although more commonly found in rural settings, seeing coyotes roaming the streets of suburban neighborhoods and even heavily urbanized cities (e.g., in Washington, D.C.'s Rock Creek Park) is not unusual today (Figure 3). A coyote's home range may extend over 8 to 16 square miles and will be largest in areas where food resources are less abundant or unreliable. Coyotes prefer to hunt in and travel through open woodlands, forest edges, meadows, and riparian draws or gullies. Small woodlots, pastures, fence rows, and other brushy or overgrown habitats in both rural and suburban areas provide excellent cover and foraging opportunities.

Coyotes have been hunted, trapped, and poisoned for more than 150 years in response to livestock depredations and to supply the fur trade with pelts. Yet, these programs have had little impact on overall coyote populations, due to the coyote's exceptional adaptability and resilience (as demonstrated by its successful range expansion). Although it is possible to temporarily reduce coyote numbers within small areas for short periods of time, such exploitation often stimulates increased reproductive output among remaining individuals. Further, non-territorial individuals (called floaters) will disperse from surrounding areas and quickly recolonize depopulated areas.



Figure 3. A coyote runs along an urban street. Photo from: <https://www.MercuryNews.com>.

In appearance, coyotes are larger than a fox, being approximately the size of an adult collie dog (Figure 4). Adult females normally weigh between 18 and 35 pounds, whereas males are usually larger, weighing between 25 and 45 pounds. They have a noticeably pointed muzzle and erect pointed ears. Pelt color can be highly variable; the typical individual appears light tan overall, mixed with gray, brown, and black tones that give them a salt and pepper look. Although not common statewide, some individuals are silky black. The tail is 12 to 15 inches long, tipped with black, and carried at a downward slant. In the wild, coyotes rarely live longer than 6 to 8 years.

Coyotes maintain territorial family units that consist of a mated pair of adults, the current year's pups, and several offspring from a previous litter. Juvenile males disperse or are driven off by the adults after their first year. Although often considered nocturnal animals, coyotes actually are quite active throughout daylight hours, particularly during spring and early summer when gathering food to feed growing pups.

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EVENTS CALENDAR			For the most complete listing of natural resource education events, visit the on-line events calendar at https://forestupdate.frec.vt.edu		
Contact	Date	Location	Event	Time	Fee
DCR	Jan., Feb., March	Virginia's State Parks	A variety of events and activities For a complete list, visit: www.dcr.virginia.gov/parks	Varies	Varies
MP	Year-round	Statewide	Virginia Master Naturalist Volunteer Basic Training*** Some Virginia Master Naturalist chapters will be holding spring training courses for new volunteers, if conditions allow. Visit http://www.virginiamasternaturalist.org/chapters-a-map-and-contacts.html for a map of chapters and information on training schedules and application procedures as they become available.	Varies	Varies
15Forest	Fridays	Online	Fifteen Minutes in the Forest Join Virginia Cooperative Extension's Forestry Team (and their special guests) each Friday for a video on a natural resources-related topic. View previous videos on our YouTube Channel.	12:15	Free
SREF	Year-round	Online	Forestry & Natural Resources Webinar Portal Stay up-to-date with the latest research and industry practices in forestry and natural resources by participating and viewing live and on-demand webinars through the Webinar Portal.	Varies	Free
JG	Jan. 11 - April 2	Online	On-line Woodland Options for Landowners This 12-week, on-line, self-paced class will teach you the basics of woodland management. Topics include: tree ID, woodland ecology, sustainability, soils, mapping, and silviculture. Registration includes a hands-on field trip*** and 3 books.	NA	\$45/family
WWF	Jan. 28-31	Virginia Beach Area & Online	Winter Wildlife Festival The 2021 festival will be celebrated a little differently to allow safe observation of nature's beauty while following health and safety guidelines. Featured activities will include virtual workshops, lectures, and in-person excursions.	Varies	Varies
JG	Feb. 2 Feb. 9 Feb. 16 Feb. 23	Online	Woodland Stewards Webinar Series Determining Your Goals Digital Toolbox for Woodland Owners: There's an App for That! Safety Tips for Working in Your Woods How to Start Doing Things on Your Property	1:00	TBD
JG/AD	Feb. 19-20	Online	Annual Woods & Wildlife Conference This Conference provides information, tools, and personal contacts to help private woodland owners keep their woods, and the wildlife that live in them, healthy and productive. A variety of topics are offered to appeal to owners of both small and large tracts, and both new and experienced owners.	Fri. 1:30 - 5 Sat. 8 - 12:45	\$25/household
JG	March 19-20	Appomattox	Central Virginia Beginning Woodland Owner Retreat*** This entry-level program covers the basics of keeping your woods and wildlife healthy and productive, while working towards meeting your ownership goals. A combination of classroom, field-trip, and hands-on activities are used to explore these concepts of sustainability.	March 19 7:30 - 6 March 20 7:30 - 1	No Lodging Individual: \$40* Couple: \$70* Lodging Individual: \$90** Couple: \$170**

*Meals included; **Meals and lodging included; ***Pending COVID-19 developments.

EVENT CONTACTS

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DCR	Virginia Department of Conservation & Recreation	804-786-6124	www.dcr.virginia.gov
MP	Michelle Prysby	434-872-4580	www.virginiamasternaturalist.org
JG	Jennifer Gagnon	540-231-6391	jgagnon@vt.edu
15Forest	Fifteen Minutes in the Forest	ZOOM live: https://virginiatech.zoom.us/j/97509089739 YouTube: https://www.youtube.com/c/VirginiaForestLandownerEducationProgram	
SREF	Southern Region Extension Forestry	http://www.forestrywebinars.net/	
WWF	Winter Wildlife Festival	757-385-2990	www.VBGov.com/winterwildlife
AD	Adam Downing	540-948-6881	adowning@vt.edu

You Ain't from Around Here! Invasive of the Quarter: Spotted Knapweed (*Centaurea stoebe* ssp. *micranthos*) By: Jennifer Gagnon, Virginia Tech

This summer I walked around the farm feeling quite pleased with myself. The bee balm I had been planting in my herb gardens had spread so very nicely all throughout my pollinator gardens and even into the hay fields. What a marvelous friend to pollinators I had become. My smugness was quickly subdued when I realized it wasn't bee balm at all. In fact, it wasn't even a native species. It was actually spotted knapweed, an invasive species. And then I truly understood the overwhelming despair so many landowners with invasive species experience. How would I even begin to control this mess?

Of course, I always like to look on the bright side. As you might imagine, since it looks like bee balm, spotted knapweed is an aesthetically pleasing plant. Pollinators such as butterflies, flies, bees, and beetles are attracted to it. And the grub-filled dried seed heads attract goldfinches. I can attest to this personally since we've spent many summer afternoons on the front porch watching the birds flit around in the pollinator garden next to the house.

Unfortunately, as I have personally experienced, spotted knapweed is also an aggressive invader that rapidly takes over pasture land and other sunny disturbed areas. Individual plants are reported to produce over 1,000 seeds per year. In addition to copious reproduction, the plants grow vigorously and the foliage and roots contain a toxin, catechin, that acts like an herbicide. This is called allelopathy and further increases spotted knapweed's competitive advantage over native species.

And although pollinators do use this species, it replaces native species that are typically higher-quality food sources. Ultimately, spotted knapweed crowds out native plants, threatens wildlife habitat, degrades pastures, and increases soil erosion. On some pasture land, spotted knapweed can occupy up to 95% of the available plant community. And while edible, it is less palatable than other pasture plants and is thus less likely to be eaten by herbivores.

Spotted knapweed is in the genus *Centaurea*, which, in ancient Greek, means "of the centaur." Apparently, centaurs are known for having healing powers, and many species in this genus do as well. Knapweeds as a group have been used to treat wounds, jaundice, eye disorders, venomous bites, indigestion, and many other ailments.

There are two other invasive knapweeds here in the U.S., diffuse and Russian. The three species can be identified by their bracts. Spotted knapweed bracts are, well, spotted, diffuse knapweed bracts have rigid sharp spines, and Russian knapweed has opaque bracts. While they are all invasive and should all be controlled, the exact method of control depends on the species. This article will focus on identification and control of spotted knapweed.

Spotted knapweed is native to central, eastern, and southeastern Europe. It was introduced into the U.S. in the late 1800s, probably as seeds in contaminated alfalfa and/or in ships' ballasts. In 1920, it was limited to the San Juan Islands in Washington state. By 1980, it had spread to 48 counties in the Pacific Northwest. Today, it is reported in 45 states (including Virginia) and is listed as a noxious or restricted weed in at least 15 of them. Spotted knapweed is estimated to affect 6.9 million acres in the U.S., including 89 national parks.

How to Identify Spotted Knapweed

Roots: Deep, stout taproot

Form: An herbaceous biennial or perennial plant. In the spring of the first year, it grows as a rosette. In the second year and beyond, plants have several (1-20) branched, upright stems, 3 to 5' tall. The woody shrub is dull green and covered with small rough hairs.

Stems: Slender, hairy, upright, stiff, and branched. Small plants usually have an unbranched stem and one flower head. Large plants have many branches and over 100 flower heads.

Leaves: Basal leaves at the base of the plant are up to 8" long, deeply lobed, and arranged in a rosette. As they move up the stem, leaves become smaller (1-3") and more linear. The leaves are alternately arranged, medium-green with a silvery cast, and a rough surface. The uppermost leaves are more bract-like.

Flowers: The pink to purple flowers bloom from May through October and occur at the ends of branches. They are small (0.2-0.4" long), oval, and thistle-like. Each flower head has stiff bracts (modified leaf structures just below the flower) marked with fine, vertical streaks and tipped with dark, comb-like fringes that give the flower head a spotted appearance.

Seeds: Seeds develop in erect, slender, green pods that turn pale brown when mature. The seeds are 0.1" long, oval, and shiny black or brown with pale, vertical lines. At the tip of each seed is a short, bristly pappus (a ring of fine feathery hairs) that enables wind dispersal. Seeds are also dispersed by seed-eating animals. Seeds can remain dormant for 5 or more years.

Knapweed cont. on page 4



*Although pollinators do use spotted knapweed, it displaces native vegetation that are typically higher-quality food sources.
Photo by: Jennifer Gagnon, Virginia Tech.*

Knapweed cont. from page 3

How to Control Spotted Knapweed

Manual: For small, localized infestations, digging up or pulling individual plants can be an effective means of control. This method is easiest after the plants have bolted and left the rosette stage, and when the soil is moist. Remove as much root as possible and monitor the area for new plants. Gloves and long sleeves are recommended for this activity, as spotted knapweed can be a skin irritant.

Mowing spotted knapweed can be effective if mowing is continued throughout the growing season until the first hard frost. Simply mowing the plants once will cause them to regrow and flower within weeks.

Chemical: Small, young infestations of knapweed are generally easy to control with herbicides. However, treated areas must be monitored for several years and retreated as necessary. Before using any herbicide, double-check the label for appropriate application methods and any site-specific restrictions.

Rosettes can be sprayed in the fall to prevent them from bolting and seeding the following year. Larger plants should be sprayed in spring or early summer before seeds have formed.

According to the 2020 Pest Management Guide: Home Grounds and Animals (VCE Publication ENTO-336P), 2,4-D is an effective active ingredient when used in conjunction with dicamba, MCPP, or dicamba + MCPP. Glyphosate is also effective, but is non-selective, meaning it may kill nearby desirable vegetation as well. Spray herbicide on the entire leaf and stem surface of actively growing plants; do not cut the stem until plants are dead, since this stops the plant from absorbing the chemical. A heavy seedling infestation can be efficiently controlled with an herbicide application in spring, followed by an application later in the summer or fall if needed.

As with any invasive control program, continued monitoring for new infestations is essential, as is reclaiming the site quickly with desirable vegetation.

As for my infestation, it is neither small nor young. The plants in the pollinator gardens will be hand-pulled in the spring. My plan is to work with the farmer to whom we lease our hay fields and see what he wants to do in those areas. He already does spot control of the multiflora rose, so hopefully he'll be willing to take on spotted knapweed as well.

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Final Upshot

The successful management of coyote problems demands that a variety of abatement measures must be evaluated and tailored to individual situations. The coyote is an exceptionally clever animal, and now a permanent resident throughout all of the commonwealth. People must recognize and appreciate that the coyote is here forever; eradication is not feasible nor attainable. Therefore, landowners must become better informed about its life history, the ecological roles it plays, and appropriate management strategies available to minimize the risk of damage.

Useful Information

National Agricultural Statistics Service: https://www.nass.usda.gov/Publications/Ag_Statistics/2011/index.php.

Virginia Wildlife Conflict Helpline 855-571-9003 (toll free).

Virginia Cooperative Coyote Damage Control Program
US Department of Agriculture, Animal Plant Health Inspection Service, Wildlife Services, 540- 381-7387
https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/SA_Program_Overview/SA_Contact/ws-state-info?st=VA:Virginia.

Virginia Department of Wildlife Resources, 804-367-1000, <https://dwr.virginia.gov/>.

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The arrows point to the spots on the bracts of the flower. These spots distinguish spotted knapweed from the similar diffuse and Russian knapweeds. This photo also shows the alternately-arranged lanceolate leaves on the upper stems. Photo by: Jennifer Gagnon, Virginia Tech.