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How to Find and Observe Wildlife

Guidebook

Casey McFarland

WONDRIUM

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Table of Contents

1

Signs and Sounds of the Wild

This book and the production it accompanies are about developing practical and applicable skills to help you learn about wildlife and ecological relationships. And it's about learning to see things that most others don't. Whether you're a hiker, hunter, photographer, nature guide, educator, biologist, or enthusiastic wildlife watcher, the content that follows will help you to understand and celebrate a part of the world that often hides.

Tracking's Dynamism

The art of tracking can be divided into two categories. One category is identifying tracks and other animal signs such as beds, scats, feathers, nests, and the like. The other category is trailing, which is the art of following the tracks for distance.

Tracking is a dynamic practice. Animal tracks and other signs of wildlife are constantly in flux, evolving with the weather and seasons. Animal behaviors change throughout the year, too. Any one track might have been made by dozens of different species, some of which are very similar to one another. The tracks are often incomplete or obscured. A track might represent an animal's front foot or hind foot, the two of which often look very different. It could belong to a male, a female, or their young.

Each species leaves different sign particular to how they live and express themselves. All of this results in a world brimming with thousands of pieces of evidence. The challenge of a tracker is to recognize and interpret that evidence.

Tracking will invite you into a realm that reveals vast stores of information and potential knowledge. It's an incredibly powerful way for humans to relate to animals and to the environment—whether that's a backyard, an adjacent forest or meadow, or a bucket-list trip to somewhere else on the planet. Stories about individual animals and the lives they live are waiting to be discovered everywhere.

Preparing to Track

If you're just beginning to learn about tracking, all you need are your eyes and your mind. However, there are some other helpful tools that will help you explore, record, study, and remember what you learn and experience. Those tools include:

- a high-quality field guide
- a sketch pad
- a camera
- a journal

Many subjects are relevant to animal tracking. Below is a general list of those covered in this book.

- Camouflage and movement: Wild animals are good at being sneaky. You can be good at it, too. Even a giant bull elk can turn into a ghost and vanish. You'll learn some strategies for casual camouflage, and simple movement techniques that will help you go unnoticed—and see more wildlife—whether in a desert, woodland, or city park.
- Track aging: Estimating when a track was made can a be tricky business. Time and weather affects the clarity, color, and texture of tracks.
- Bird nests: Nests are a quintessential reflection of who a bird is and how it fits into the world. Various nest types appear in this production. You'll learn to identify layers of nests, to understand how they're built, and to identify their makers.
- Bugs: In the eastern United States, studies have shown that between 125 million and 450 million insects might occupy a single acre of land. There's a great deal to learn from and about them, including the mechanics of beetle movement and the corresponding track patterns.

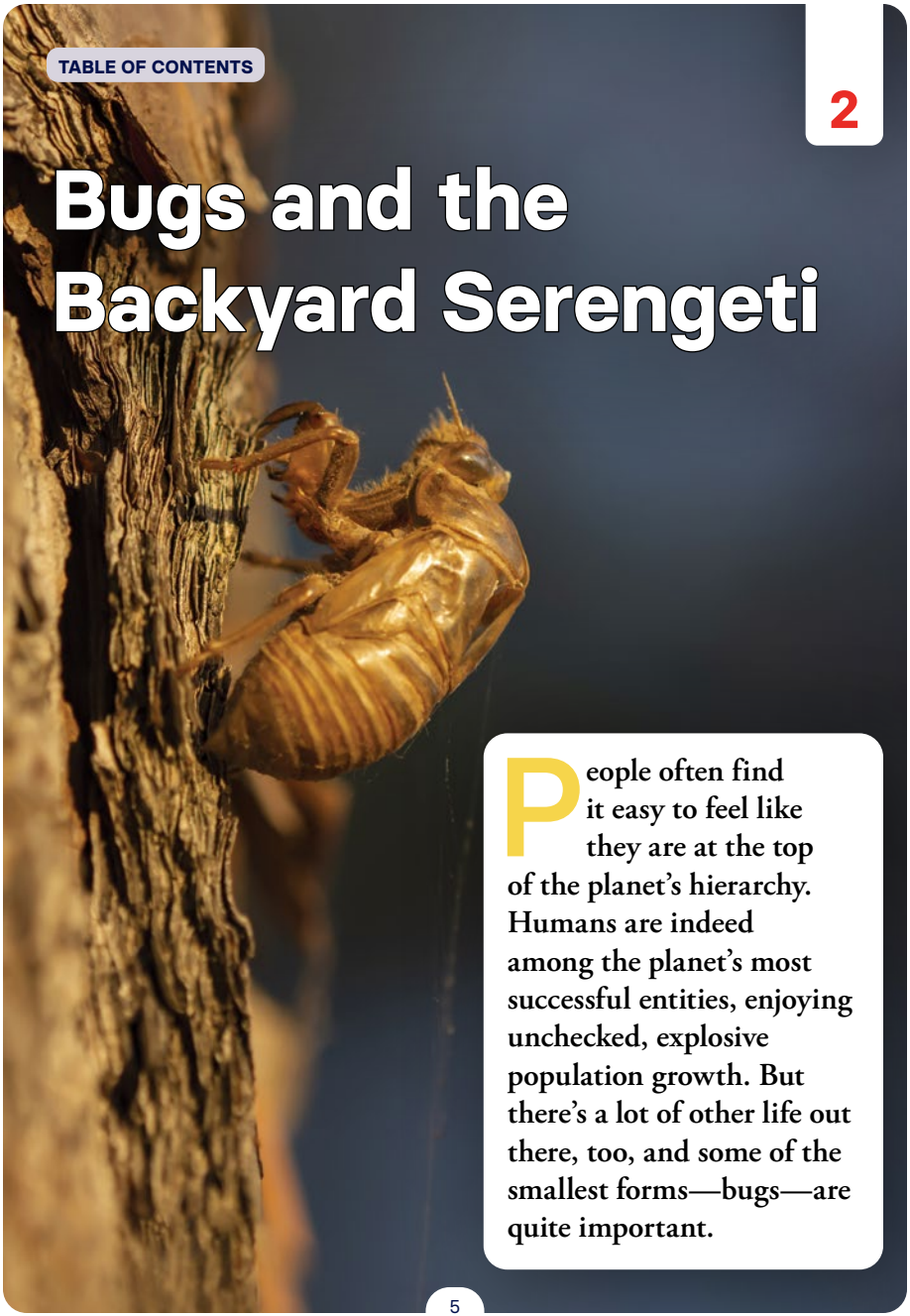
- Migration and animal trails: Trails orient people and animals to landscapes. Some trails are readily visible, and many are more subtle.

- Marking behaviors: All animals communicate in one form or another and leave signs of how they talk to their neighbors. You'll learn how communication is universal in nature and what to look for.
- Other topics within this book include:
  - animal bedding
  - bird feathers
  - foot morphology
  - gaits and animal locomotion
  - mapping
  - scatology
  - tracking in the snow and life in the cold

The book's conclusion offers an opportunity to assess your skills, which you can develop regardless of your background. No matter what stage of life you're at, you can become more proficient at interpreting, understanding, and interacting with the world around you. Tracking offers a revealing and awe-inspiring path—forward and back—to a lost world of wildness.

2

Bugs and the Backyard Serengeti



People often find it easy to feel like they are at the top of the planet's hierarchy. Humans are indeed among the planet's most successful entities, enjoying unchecked, explosive population growth. But there's a lot of other life out there, too, and some of the smallest forms—bugs—are quite important.

Insects' Importance

Humans are one of the world's more than 60,000 species of vertebrates, distinguished by the possession of a backbone, or spinal column. These include mammals, birds, fish, reptiles, and amphibians. But there are also invertebrate critters with exoskeletons, such as arthropods, insects, and crustaceans. More diversity comes from the mushy, boneless bodies of mollusks and jellyfish, plus other animals such as starfish and coral. A general estimate is that there are more than 1.25 million invertebrate species, most of them insects. There may be millions more than that.

When it comes to maintaining a robust, biodiverse, and healthy planet, insects are far more important than humans. However, many insects can seem like terrifying, alien creatures that many people wish weren't here at all. Humans spread millions of tons of pesticides, and they happily drench their farms, lawns, and homes with poisons to get rid of bugs. But while bugs can indeed cause some serious problems, they are definitely friends of life.

Why are insects so important? Life on Earth revolves around a complex food system, dominated by plants at the first trophic level. *Troph* is Latin for "food." Herbivores—plant eaters—make up the second trophic level. Many well-known herbivores like deer are within the second trophic level, but bugs dominate this part of the food system.

The majority of insects eat plants and transform cellulose into calorie-rich, easily digestible insect protein that other animals depend on for food. Nearly all terrestrial bird species in the United States depend entirely on insect consumption to raise their young. And many go to great lengths, literally traversing continents, so they can time their stays with bursts of insect life. Simply put, landscapes without insect protein cannot support higher forms of life. If insects went away, so would life.

Insects offer opportunities to learn about life on Earth, right in your local woods. In some places, 125 million to 450 million insects can occupy a single acre of land. You can think of herbivorous insects—those that feed on plants—as miniature versions of other grazing animals like moose. These bugs hustle about, competing for mates and searching for food, all while keeping a constant lookout. Their predators—like field spiders, praying mantises, and tiger beetles—also roam the grasses and flower beds.

Insect Tracks and Trails

The important types of insect evidence are tracks, signs of feeding, and egg cases. Most insects hardly weigh anything, so you'll see their tracks only in fine substrates, like sandy river bars, dune systems, dusty roads, or smooth mud. The number of insects scurrying about can be so abundant in some places that they obliterate the tracks and trails of larger animals.

The best way to learn about bug tracks is to study the tracks of beetles. This works so well because beetle tracks are very common, and they can teach you about the mechanics of insect design and movement in general. Beetles come in a huge variety of shapes and sizes, but due to their ubiquitous nature, they are quite useful for learning track-observation skills.

If you look straight down at a beetle, you'll see that it has six legs, three on each side of the body. At the base of each leg is a foot, or tarsus, which is a small appendage that makes horizontal contact with the ground much like a human foot does. Typically, the front foot points a bit forward, the middle usually points almost directly outward, and the longest foot on the hind leg points backward at an angle.

A beetle walks much the way a deer does. After a deer's front foot lifts off the ground and swings ahead, the hind foot steps forward and lands directly where the front foot was. A beetle's locomotion is the same, but the beetle has three pairs of legs. This combination of feet—each stepping into the same spot but angled in different directions—makes a unique checkmark pattern that points like an arrow in the direction of travel.

A beetle trail

Once you learn this, you will be able to recognize a classic beetle trail and where it's headed. And once you know what the tracks of a six-legged insect like a beetle look like, you can often recognize the trails of eight-legged arachnids like tarantulas and scorpions. They leave a grouping of four tracks instead of three.

You'll commonly see the tracks of two other arthropods that are easy to recognize, too: those made by caterpillars and millipedes. A caterpillar's front legs are small and hook-like, but its back half has several pairs of suction-cup-like protrusions, called prolegs. Those prolegs create a distinct trail of circular, paired marks.

By comparison, millipedes—which are not true insects—have many fine, sharp legs that reach almost vertically to the ground. A millipede produces a very different-looking trail than a caterpillar. Because a millipede has dozens of small, tightly spaced legs, it leaves a trail of two thin rows that resemble miniature train tracks. A big millipede leaves a wide trail—about the width of a pinky finger—and small millipedes leave smaller trails.

Tracking Cicadas

Cicadas are a familiar bug type around most of the United States, and they leave some great evidence. The periodic cicadas—those with incredibly long lives—are especially well known. Most folks are familiar with cicadas but not necessarily the evidence they leave as they live their lives.

During the cicadas' adult phase—when they're out and about, singing and mating—the female lays her eggs in thin twigs of shrubs and trees. With her ovipositor, a straw-like organ with a sharp cutting edge, she slices into the twig along its length and inserts the eggs into that opening. Therefore, the first signs to look for are little cuts, which are usually about one-quarter to half of an inch long. These can be so deep that the end of the twig will break. It's easy to find this sign at any time of year, either fresh or by looking for the scars that cicadas have left on branches in the past.

When the eggs hatch, tiny little nymphs—the immature cicadas—drop to earth and burrow underground. There, they feed on the juices of tree and plant roots. And when the time is right—whether a year later or more than a decade later—they reemerge. This process produces the cicada's shell, or exuviae—the second sign to look for.

An exuviae shows front legs that are perfectly adapted for digging. Up front is a curved, needle-sharp spike that works like a pickaxe. The forelimb is broad and flat, and it packs the walls of the little underground tunnel the cicada makes.

When cicadas finally emerge from below the ground to start the next phase of life, they often leave visible holes behind, which are the third sign of cicadas. In certain areas, like the high desert of New Mexico, these holes can last for months or even years, depending on the weather. They are about the size of a dime, depending on the cicada type. The opening can look a lot like a wolf spider hole. But if it's a cicada's, it's a clean entrance, lacking any evidence of spider silk.

Feeding Signs of Slugs and Snails

Signs of feeding are also useful for tracking, as exemplified by those left by terrestrial mollusks—slugs and snails. The mouths of slugs and snails are strange. They are rake-like appendages that rasp away at a food source. They are called radula, and leave telltale, unmistakable evidence of a slug or snail feeding. If you let a snail crawl across the palm of your hand and it starts to taste your skin, you will feel a ticklish scrape like a cat's tongue. That's the radula at work.

A sign of a radula

Many slugs and snails love lichen and algae, and they feed on it with sweeping arcs that leave beautiful, fanlike designs. You'll find these patterns on the bark of deciduous trees or on places like algae-covered gates or concrete walls.

Assignment: Learning about and Helping Insects

This chapter's takeaway assignment is for you to begin learning about the insect life around you. Search for insect sign wherever you go. Look for tracks, for egg cases, and for sign of insects feeding on twigs and leaves. And if you see an insect or some other arthropod, spend five minutes watching them. You might find an ant, beetle, spider, or something else, but regardless of what you're observing, think about whether they're a grazer, a hunter, or a scavenger and how they experience their environment. Whatever form of life they take, they'll provide a new perspective and reveal a sense of who they are.

As part of your learning about insects, also look into how you can help native insects. They are crucial to biodiversity and are foundational to other life forms. But insect numbers and diversity are declining, which is not good news. As a countermeasure, helping bugs is one of the easiest ways to contribute to a vibrant and healthy ecosystem. One way to do that is gardening with native plant species that are important for native insects.

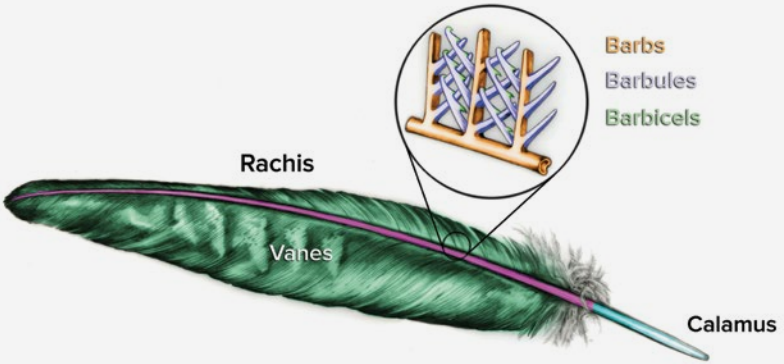
3

What Feathers Tell Us about Birds and Flight

Birds are a hugely important part of the planetary life system, having adapted to every environment possible, from deserts to polar domains. There are anywhere from 200 billion to 400 billion of them around the world at any given moment, which means there are a lot of feathers out there. That is good news for wildlife trackers, as feathers reveal much about their owners. This chapter focuses on flight feathers, and it offers a few tips that will provide a foundation to learn how to identify species and where on the body a feather originated.

Bird Anatomy

Each flight feather has a quill, or calamus; a shaft, or rachis; and the flexible, broad feather vanes, or webs, that extend from either side of the shaft. The vane is made up of hairlike bristles called barbs, stacked tightly side by side. Each barb has tiny branches called barbules, each of which also has small hooklets called barbicels. That feature allows the barbs to firmly bind together but remain flexible.



Picturing the bird's skeletal structure can help you visualize how feathers connect. Imagine your own arm and hand for comparison. A bird's humerus, radius, and ulna are pretty similar to those of a mammal, but most of the bones of the avian "hand" are fused into a sturdy, bladelike structure.

The flight feathers of the wing can be divided into two categories: primary and secondary feathers. The primary feathers attach to the bones of a bird's "hand," or manus, and act as a propeller of sorts. They are responsible for propulsion. The secondaries are attached to the bones of the "forearm," and they generate lift.

Primary and secondary feathers

Primary feathers have fairly straight quills and are typically more pointed and narrower than secondaries. Their feather vanes are also more asymmetrical. The leading vane is narrower than the trailing vane. Most bird groups have 10 primaries per wing. In contrast, secondary feathers are extremely variable in number. An average songbird has 9 secondary feathers on each wing, while an albatross has 32, enabling it to fly up to 10,000 miles at a stretch.

Secondary feathers tend to be much more curved across the length of the quill than primary feathers. They tend to have rounded or squared tips, and vanes of similar width. It's important to note, though, that the primary and secondary feathers in the central part of the wing can be similar in appearance and difficult to distinguish.

The weight of a bird is also associated with wing and feather design. The heavier the body, the more physical force there is on the wing, called wing loading.

Efforts to Fly

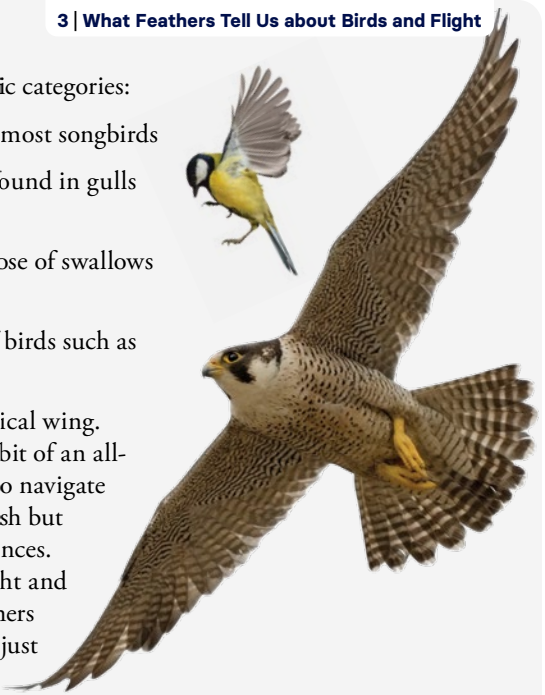
Heavier birds need to expend more energy to stay aloft. For instance, a Canada goose must flap its wings constantly, lest it begin plummeting. Distance plays a role in energy expenditure too: Many birds that migrate hundreds or thousands of miles burn mind-boggling numbers of calories.

Aspect Ratio

For all wing shapes, two important traits are their length and width. A wing's aspect ratio is the length of the wing divided by its width. Therefore, a long and narrow wing has a high aspect ratio. One with a low aspect ratio is broad and short. Think of the stubby, rounded wing of a wren in contrast with the incredibly long and sleek wing of an albatross.

Wing designs fall into four basic categories:

- the elliptical wing found in most songbirds
- the high-aspect-ratio wing found in gulls and other oceangoing birds
- the high-speed wing like those of swallows and falcons
- the slotted high-lift wing of birds such as hawks and eagles



The most common is the elliptical wing. Elliptical songbird wings are a bit of an all-purpose wing—short enough to navigate easily and quickly through brush but also suited for flying long distances. The primary feathers are straight and pointy, and the secondary feathers are fairly long and broad, with just slight curvature.

High-aspect-ratio wings, which aid the soaring that albatross are famous for, feature primary feathers that are long and shaped like steak knives. The secondary feathers are much shorter in comparison, usually half the length of the longest primaries, and are heavily curved.

Along with swallows and falcons, swifts, plovers, and ducks feature high-speed wings. These wings are slim, sleek, and elegantly tapered to narrow tips, with spectacular maneuverability. The birds that sport these wings hold record flight speeds. Some species can reach speeds of more than 200 miles an hour.

Slotted high-lift wings—or soaring wings—are common to the aforementioned hawks and eagles as well as vultures, geese, swans, pelicans, and other beefy-winged species. These are large, powerfully built, broad wings that are capable of a number of flight styles. They're good for propelling a heavy body forward, like a goose. But they're also used by other species, such as hawks, as a highly efficient soaring wing.

Identifying Feathers' Sources

When you find a feather and want to identify its source bird, the first goal is to determine the feather's type and the shape of wing it came from. For instance, imagine that you find a feather near a pond in the woods. It's from something larger than a songbird, and it's a short and heavily curved secondary. Therefore, you can judge that it came from a high-speed or high-aspect-ratio wing. You also know that there are only a few species that match that description in the region, leading to the idea that it could be a duck or a falcon. With that information, it becomes much easier to puzzle out which species the feather belongs to.

Cinnamon teal

Even though a duck, such as a cinnamon teal, and a falcon, like an American kestrel, are completely different from one another in almost every way possible, they share the same wing type. With knowledge like that, you'll be better prepared to accurately identify a feather because you can narrow down your possibilities by wing shape first, then by coloration and marking.

American kestrel

Many feathers do have other distinctive features that can also help you narrow down identification. For instance, many birds of prey—including hawks and owls—have prominent stripes or barring on their flight feathers. And many species that rely on camouflaged plumage—like nighthawks, poorwills, and game birds like grouse—also have striped or barred feathers.

The stealth of owls as they fly is due to the specialized barbs and barbules of their feathers. The leading edge of their primary feathers looks a lot like a comb, and that helps scatter and disrupt the flow of air across the upper and lower surfaces of their wings. And the feathers themselves have a furred appearance.

Spotted flight feathers are also unique and often belong to woodpeckers. Woodpecker tail feathers are also fascinating and easy to recognize. They're very pointy and spear-shaped, and they are amazingly stiff and springy because woodpeckers leverage their body weight with their tails when chipping holes into trees.

There are a couple of reliable ways to differentiate between some of the birds that share the slotted high-lift wing design. Because species such as Canada geese and eagles are both equipped with the same wing shape, their feathers can appear nearly identical. But if you compare two flight feathers from the wing that are the same size, you'll find one key distinction: The bare portion of a goose's quill is significantly longer than that of a hawk's quill. Knowing this feature makes it a lot easier to know when you've found a raptor or waterfowl feather.

Waterfowl, such as ducks and geese, and game birds, like grouse and quail, have another distinctive feature to look for. Flip the primary feather over to inspect the underside, and you'll see a waxy, glossy strip that runs the feather's length. This is called the tegmen, and the lacquered appearance is the result of specialized, flattened barbs that reinforce the strength of the feather.

Game bird feathers are distinct in other ways, too. They can fly well enough on their stubby, elliptical wings, but not for long. These are the birds like grouse that explode from the underbrush when you come upon them. And that explosive flight is made possible by the unique design of their wing and the feathers that it consists of. If you hold up one of their wing feathers, you'll see that it is aggressively bowed across the length. This bowed appearance is called camber, and it helps a very heavy bird to quickly fling itself out of harm's way.

Reasons for Finding Feathers

You'll usually find feathers for one of two reasons. One is that bird feathers wear out over time and will eventually drop out to make way for new plumage. But you'll also find the feathers of birds that have been killed and eaten. If you learn predators' techniques of feather removal, you can often determine whether the predator was mammal or avian.

Look for whether or not the flight feathers show any obvious damage. Cats, foxes, and other mammalian predators often shear the feathers of their bird prey, cutting them like scissors with their sharp back teeth. Even if shearing isn't evident, the feathers might show signs of matting and kinks, indicating that they've been in a wet mouth. Many of the kills you'll find, though, are the work of sleek bird-killing raptors, such as Cooper's and sharp-shinned hawks. They are really good at plucking feathers and leaving little to no visible damage on them at all.

Threats to Birds

Collecting or possessing feathers of non-game birds is illegal in the United States. The reason for that is that humans nearly wiped out countless bird species while seeking profits from the fashion industry. Congress passed the Migratory Bird Treaty Act in the early 20th century to prevent the killing, capturing, selling, trading, and transport of protected migratory birds to prevent widespread extinctions. Many birds have since bounced back.

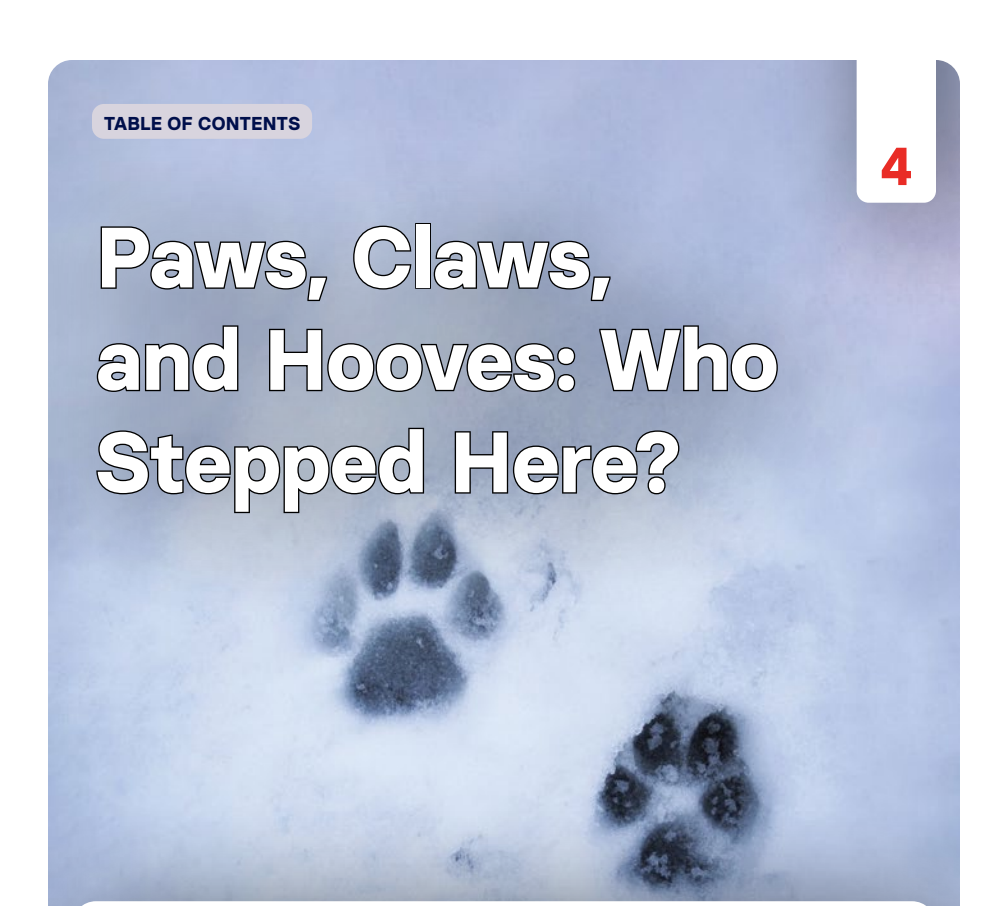
But today, there is a new dilemma, as the climate changes and we forever alter more and more landscapes for our own needs. Many of North America's bird species face alarming, rapid, and sharp declines in number. A significant number of them are in immediate danger. The study of bird feathers increases people's appreciation of these amazing creatures and is a potent symbol of why bird-conservation efforts are so important.

Assignment: Looking for Feathers

This chapter's assignment is for you to go out looking for a few feathers. Start looking for prominent trees in the landscape that might be good roosting spots for crows, ravens, vultures, and owls. Examine any feather you find for key identification features. Use its size, shape, markings, coloration, and wing type to determine which bird it likely came from.

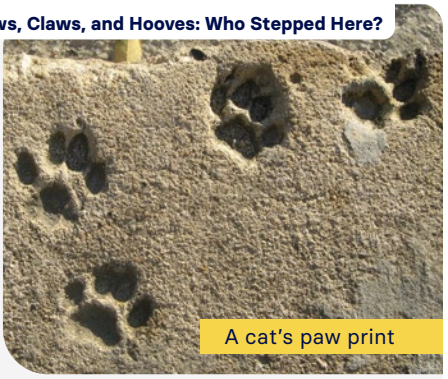
4

Paws, Claws, and Hooves: Who Stepped Here?



A skilled tracker can use small bits of information to puzzle together a larger story. For instance, as you learn to recognize the tracks of various species, you will also learn the characteristics of a given animal's foot morphology: the unique design and structure of their feet. Some features—like particularly robust palm pads, for instance—will be the only part of the track that registers on firm ground. Learning these signatures becomes the doorway to effective, fluent tracking. To introduce the subject of tracks, this chapter focuses on several animals, including cats, beavers, deer, and rabbits.

Cat Tracks


A cat's paw print

A helpful example to start with is a familiar animal: the cat. The structure of a cat's foot reflects the fact that felines (unlike canines) incorporate their front paws in the act of capturing and damaging prey. A cat's heel pads are large and meaty, with three distinct, prominent lobes at the back.

Cats have a particular way of moving. The front leg sweeps forward, and as it lands, the foot flicks forward and stamps down on that large pad. In cats' tracks, the heel pad tends to register clearly. But when the substrate is dry and loose—such as dry sand or deep dust—the cat's toes push the substrate back onto the imprint of the heel pad, obscuring all of the track except three lobes.

Eventually, you'll be able to tell the species of the cat by its size. For instance, a house cat's heel pad might be less than an inch wide. A mountain lion's might be nearly as wide as your thumb is long.

Feline Grasping

Cats use their thumbs when grasping prey. The four main claws serve as a rake, hooking into the prey's flesh, while the thumb and its claw establish a grip, just like when a person palms a basketball. In wild cats, the claw of the thumb is also significantly larger than the other four. This foot design is what allows a 70-pound female mountain lion to hold on to a 600-pound bull elk.

Beaver Tracks

The American beaver's hind feet also leave telltale marks. Beavers are a big rodent specialized for a life in water. Their front feet are small and hand-like, with four fingerlike toes and a stubby, vestigial thumb. Their hind feet are massive in comparison, with heavily built toes the length of our own fingers, and webbed for swimming. The two central toes of the beaver's hind foot are analogous to the middle and ring fingers of a human hand. Each one sports a big claw that's more robust than the others, and one is specially designed for grooming.

When the ground is firm, a beaver's smaller front feet typically don't register at all. And neither will most of the hind foot, except for the two central toes and claws, which bear the bulk of the beaver's weight. The marks left by these toes can look like deer or goose tracks. When the ground is particularly hard, only the claws of these two toes will register, leaving subtle, paired marks alternating at slight angles. You might find them as you walk along a river.

Another signature of beavers is created by the fleshy texture of the sole of the foot itself. The unique dimpled and pebbled texture leaves small, geometric patterns in mud. Often, it will show up even when there's little other evidence of clear tracks. Similarly, porcupine feet are textured like the pebbling on a basketball.

Prints left by a beaver's front and hind feet

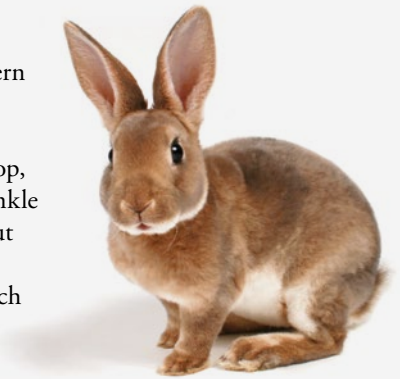
Deer Tracks

You can use track signatures to identify behaviors as well. Deer for instance, evolved to walk on their fingernails and toenails. The two cleats of a deer's front hoof are equivalent to the nails of a human's ring and middle fingers. These are flanked by two dew claws, which, on the front foot, are miniature hooves representing the pinky and pointer fingers. Deer have evolved entirely away from the fifth toe, or thumb, that's common on the front feet of many of the soft-footed mammals.

A deer's hind feet have dew claws as well. They are smaller than those on the front foot, and they are set closer together and higher up the leg. These dew claws don't always show in tracks. And if they do, there are only two reasons why: Either the hoof sank deep enough into a soft substrate such as mud, sand, or snow, or the animal was moving fast. When a deer moves at speed, its leg reaches farther forward at a steeper angle, which brings the dew claws into contact with the ground. The feet and legs may come down with so much force that the more extreme flexing of the foot creates the same effect. The hoof itself will splay outward, too, reflecting the force and energy created by speed.

All you need is one splayed track in firm ground that's showing dew claws to know a deer was there, and that it was running. You can then ask why. Was it spooked by something? Was it interacting with other deer? You can apply these concepts to all ungulates with dew claws, like elk or moose.

Rabbit Tracks



Rabbits also leave a signature track pattern when they stop or sit. When a rabbit is moving, only the four toes and heel pad of the hind foot show. But when they stop, the foot settles all the way back to the ankle joint. As a point of reference, think about what a cat or dog looks like when it sits. The lower portion of the hind leg—which is actually part of their foot—comes in contact with the ground. Therefore, instead of a classic track made just of toes and a heel pad, you see the entire length of the foot ending at the ankle joint, making a paddle-like shape.

A sitting rabbit's tracks

When a rabbit pauses or sits, you'll see the pair of paddle-like hind feet set side by side at about the width of the animal's body. The two front feet will be placed neatly just ahead of them. When you encounter this track pattern, you'll be able to see the full body size of the rabbit, tucked perfectly in a sitting position. Learning this pattern will help you recognize it in other animals' tracks, like bobcats or foxes, when they sit to hunt or survey the woods around them.

Practicing Track Identification

How can you put all this information into play? First, keep your eyes out for track signatures. You'll find them quickly. Second, do the best you can to identify partial or obscure tracks when you find them. It might be easier to turn away from tracks that you feel are too tough to interpret. But take some time to puzzle over them, and search for features that might help you make sense of what you're seeing.

Assignment: Analyzing Tracks and Accepting Mystery

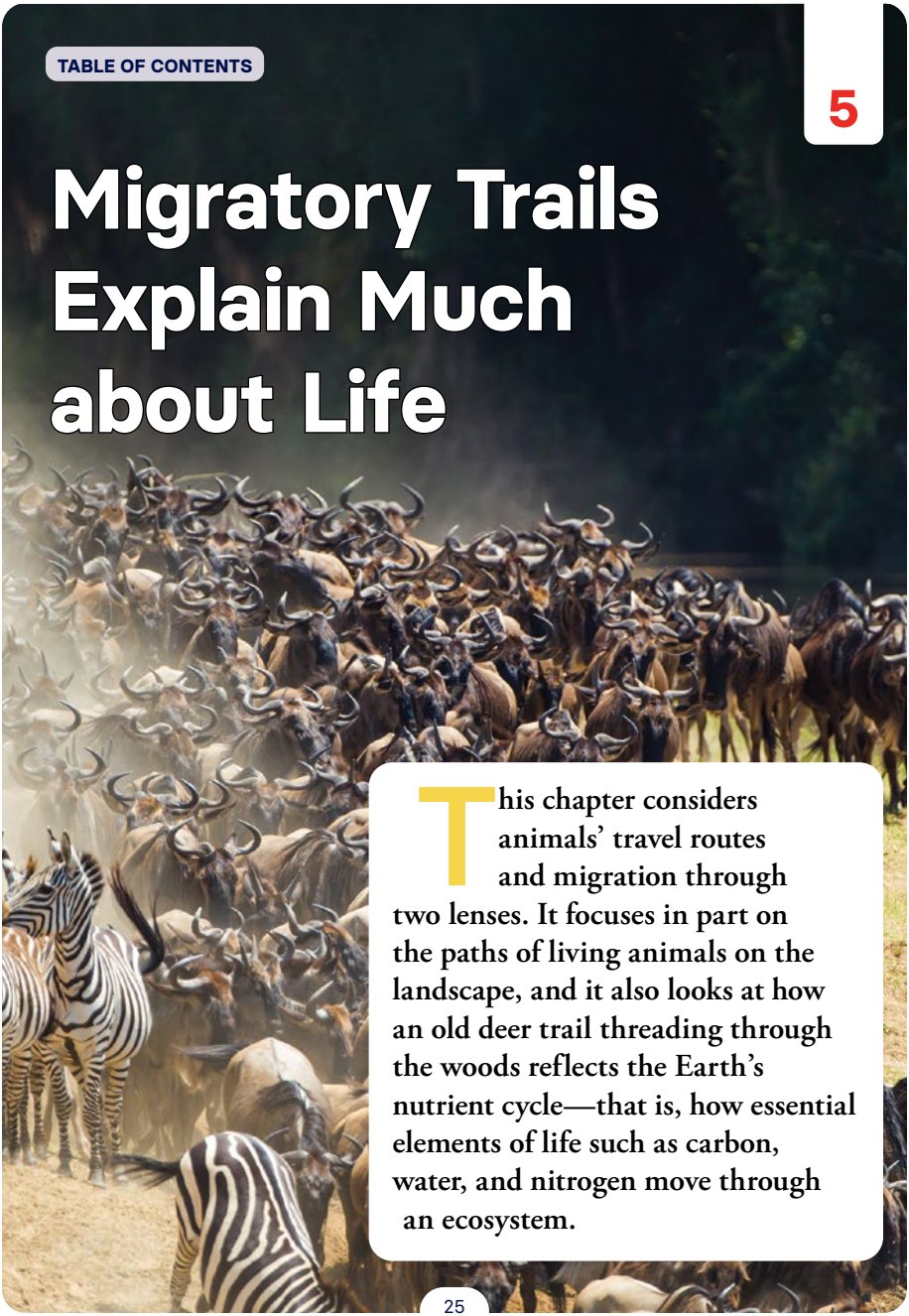
This chapter's field assignment is to find and analyze some clear tracks to learn from. You might look along river bars or dusty roads, for instance. Ask yourself: What features are the strongest, and what parts of the track are most likely to show up in firm ground? Cover different parts of the tracks to obtain different perspectives.

By doing this, you'll develop new ways of seeing and identifying. At home, you can also draw tracks from photos or illustrations, then challenge yourself to recall the details. Ask yourself how you'll recognize these features in the field when the going gets tough.

However, it's also important to accept that sometimes you won't know what something is, and you won't be able to figure it out. A huge part of tracking is acknowledging that some tracks and scenarios are undecipherable. Instead, you can log the moment as another wonderful reminder that the living world is complex and brimming with mystery.

5

Migratory Trails Explain Much about Life



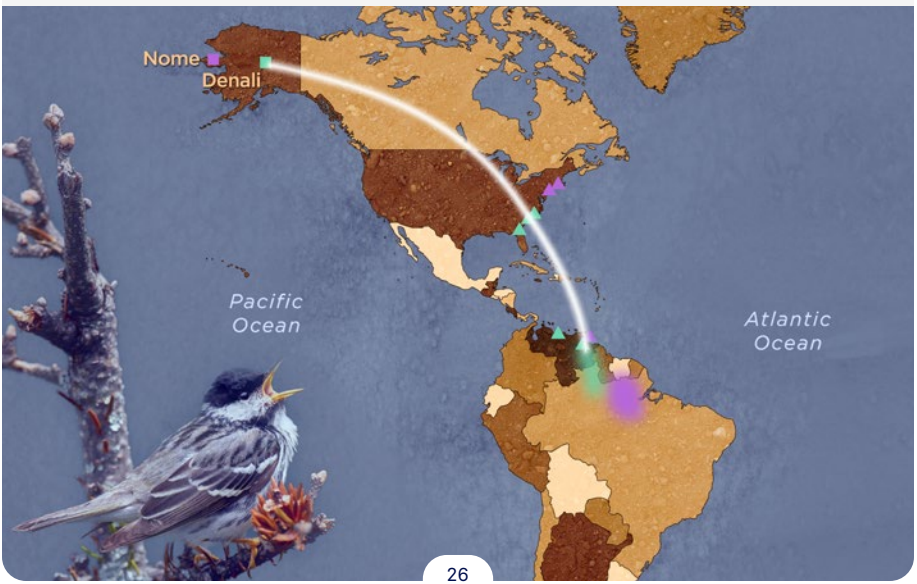
This chapter considers animals' travel routes and migration through two lenses. It focuses in part on the paths of living animals on the landscape, and it also looks at how an old deer trail threading through the woods reflects the Earth's nutrient cycle—that is, how essential elements of life such as carbon, water, and nitrogen move through an ecosystem.

Wanderings of the Blackpoll Warbler


A blackpoll warbler

One of the planet's most spectacular endurance athletes and long-distance travelers is the blackpoll warbler. The males are mostly black and white with a black cap, and they have mottled streaks running lengthwise down their sides and backs. They weigh around 12 grams—the equivalent of two quarters. Despite their tiny stature, some of these individuals fly from Alaska to Brazil and back each year, traveling more than 12,000 miles.

From Alaska, one blackpoll will head south across Canada, drifting roughly diagonally through Montana toward Florida to the Caribbean islands, then to South America. That's a huge expanse of the planet, so the tiny bird intimately knows more spots on Earth than most humans can even fathom. A blackpoll must become familiar with many species across the world, from resident birds to enemies such as snakes, foxes, and house cats.



In eastern North America, blackpoll warblers will fly from Newfoundland to Brazil, crossing some 1,800 miles of open ocean along the way. It's a lot to navigate. And it's incredibly risky, plus massively costly in terms of energy. That raises the question: Why do blackpolls do all that flying from one home to another?

Why Animals Move

Animals migrate for a number of reasons, including to seek warmer climates in winter, to find seasonal sources of food, and to mate and reproduce. But there are also routine movements day in and day out that aren't migratory (meaning seasonally driven). Everyday movements occur for many of the same basic reasons but on a smaller scale.

Animals move around to find water, food, safe places to sleep, and mates. As they travel about, many species establish regular routes and trails. These include shorter comings and goings around a favorite feeding area or a den.

Trails are the physical expression of what an animal needs spatially. Some trails are ephemeral, created by a fleeting resource. As soon as the resource is no longer available, the trail fades away. Other trails, however, like those worn in by hoofed animals year after year, can remain on a landscape for a very long time.

A hoofed animal's trail

Some of the most prominent trails are made by numerous animals that move together. These reflect the collective needs of a herd. Other trails are made by solitary animals and can be much more subtle. Interestingly, certain animals like a male mountain lion who spends most of his time alone will still follow the same routes that a long lineage of mountain lions followed before him.

Trails also inform and reflect the behavioral culture of some animals, such as elk and bighorn sheep. A herd of female elk—known as cows—that lead their young from high country to low are passing along their knowledge of travel routes and feeding areas. Among many species, knowledge of migratory routes is learned and not instinctual. If that knowledge is lost—whether the animals' memory of it is severed somehow, or the landscape changes so that an animal no longer recognizes the route, or the animal is simply blocked from it—that knowledge is gone forever.

Nutrient Movement

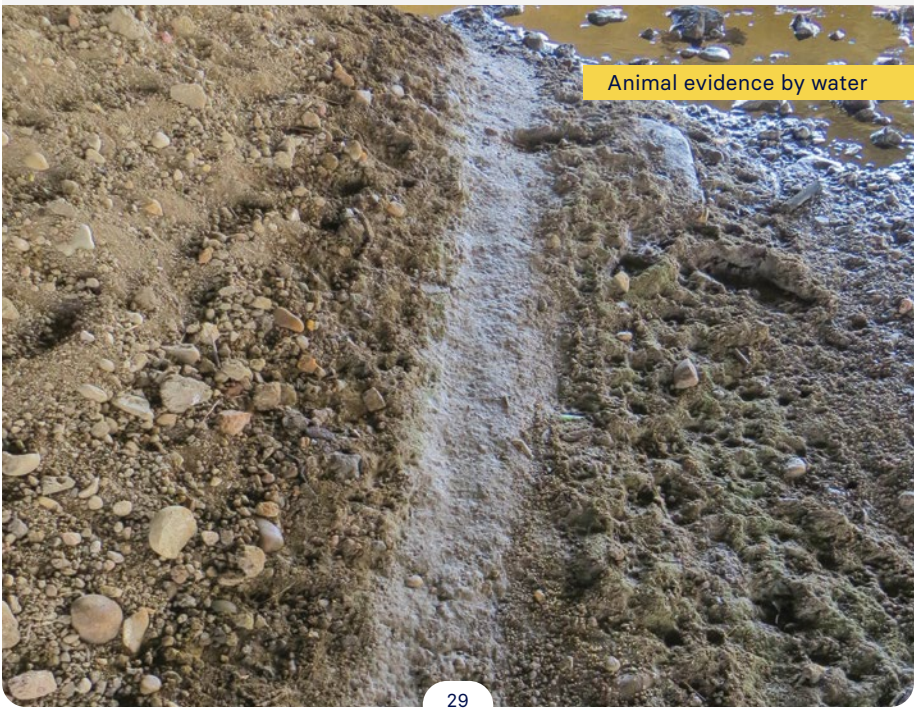
Animal movement benefits living systems, as nutrients are transported from place to place. Scat—an animal's droppings—is an obvious demonstration of this. For instance, a coyote might consume fruit along with some form of protein, like a rabbit or grasshoppers, that's then passed out of the coyote miles away. In this way, nutrients derived from one place are deposited in another.

Another type of path is the journey of those nutrients into the next organism. In the Pacific Northwest, there are salmon present in the creeks and rivers—and in the forest. The trees of the Pacific Northwest are suffused with the carcasses of countless thousands of nitrogen-rich salmon that returned to their waters of origin to spawn and die.

Plants turn sunlight into living tissue via photosynthesis. They soak up sunshine, pull carbon dioxide out of the air, strip out the carbon, and turn it into sugar. But plants need much more than just carbon. Living organisms require mineral nutrients such as nitrogen, phosphorus, calcium, and magnesium. These come from the soil. Plants aren't great at getting those minerals themselves, so they need the help of other organisms. That occurs thanks to a complex, living transport system.

Massive networks of stringy, rootlike, incredibly thin mycorrhizal fungi bind together entire forests. These are straw-like fungi that wind through the soil in search of pebbles to burrow into, then suck up their minerals. They also parasitize tiny insects and leech up the nutrients of animal carcasses that melt into the earth. Plants and fungi have a symbiotic relationship wherein plants get mineral nutrients from the fungi and give the fungi sugar in return. This bonds the plants and trees in a forest into a mind-bogglingly large, interconnected organism.

For their part, salmon hatch in particular rivers and creeks, then make their way to the ocean, where they feed and grow for the majority of their lives. When it's time, they journey back to the freshwater creek where they originated, spawn, and die. The salmon's large, meaty bodies are packed with nitrogen from the ocean. Animals such as bears, coyotes, raccoons, crows, ravens, songbirds, and deer mice spread those salmon carcasses through the forests. A network of fungi drinks up all that rotting or digested flesh that soaks into the ground, then passes it around.



Animal evidence by water

In some of the forests along good salmon runs, researchers have found trees in which 75% of their total nitrogen seems to have come from the fish that returned home to reproduce and die. This cycle of life expresses itself everywhere along the trails and pathways that organisms follow as they, too, live and die. Therefore, the animal trails you come across on outings are representative of how living systems work—and how nutrients flow through ecosystems.

Identifying Animal Trails

You can learn how to identify animal trails and glean information from them. First, make a short list of animals likely to inhabit the area you plan to explore. Next, start searching. Some of the best places to look are natural funnels—or pinch points—on the landscape. This might be an opening in a long stretch of fence, or through a particularly dense patch of woods, or among fallen trees. Also try to look for habitat edges. Those are places where two distinct types of habitat meet. Trails are often seen more easily there. In developed areas, seek out wilder places, like abandoned, weed-covered lots or waterways. In parks, search along the borders where the grass meets thickets.

Once you've found a trail, there are several clues to look for that will help you identify its maker. Your list will help because an essential part of tracking is knowing what species inhabit an area and what their size tends to be. Consider your options. For instance, is it deer-sized or raccoon-sized? Could it be a small mammal, like a wood rat or cottontail? Additionally, the location might offer insight into behaviors and preferences unique to a particular animal. For instance, the trails of beavers and otters often lead directly into water.

Next, study the ground for evidence of whether the path was made by hooves or soft-footed animals. Trails made from sharp, hard hooves tend to look like they've been cut or chopped into the ground and have steep sides. Trails made by the pads of soft-footed animals tend to be smoother-bottomed, with gentle, sloping sides—if any. All of this can change depending on the softness or firmness of the substrate, so keep that in mind, too.

Next, gauge the width of the trail and its position on the landscape. Its width will generally represent the width of the animal that made it. Check for areas where the trail has gone under something, too, because this will give you an idea of the animal's height and the spots it can comfortably squeeze through.

Assignment: Searching for Deer Trails

This chapter's assignment is to head out and look for some trails. Whether in the woods or the city, you should be able to find at least one animal trail. If you can, go somewhere you can look for deer trails because they're often visible enough to readily see. However, animal trails, including a deer's, aren't like human trails—they're not often long, continuous pathways. You'll mostly see shorter sections of a trail, where the animals funnel through a particular spot for some reason.

A deer trail

When you find a deer trail, first look for the primary direction of travel. You'll usually notice that the majority of tracks are headed one way. Ask yourself these questions:

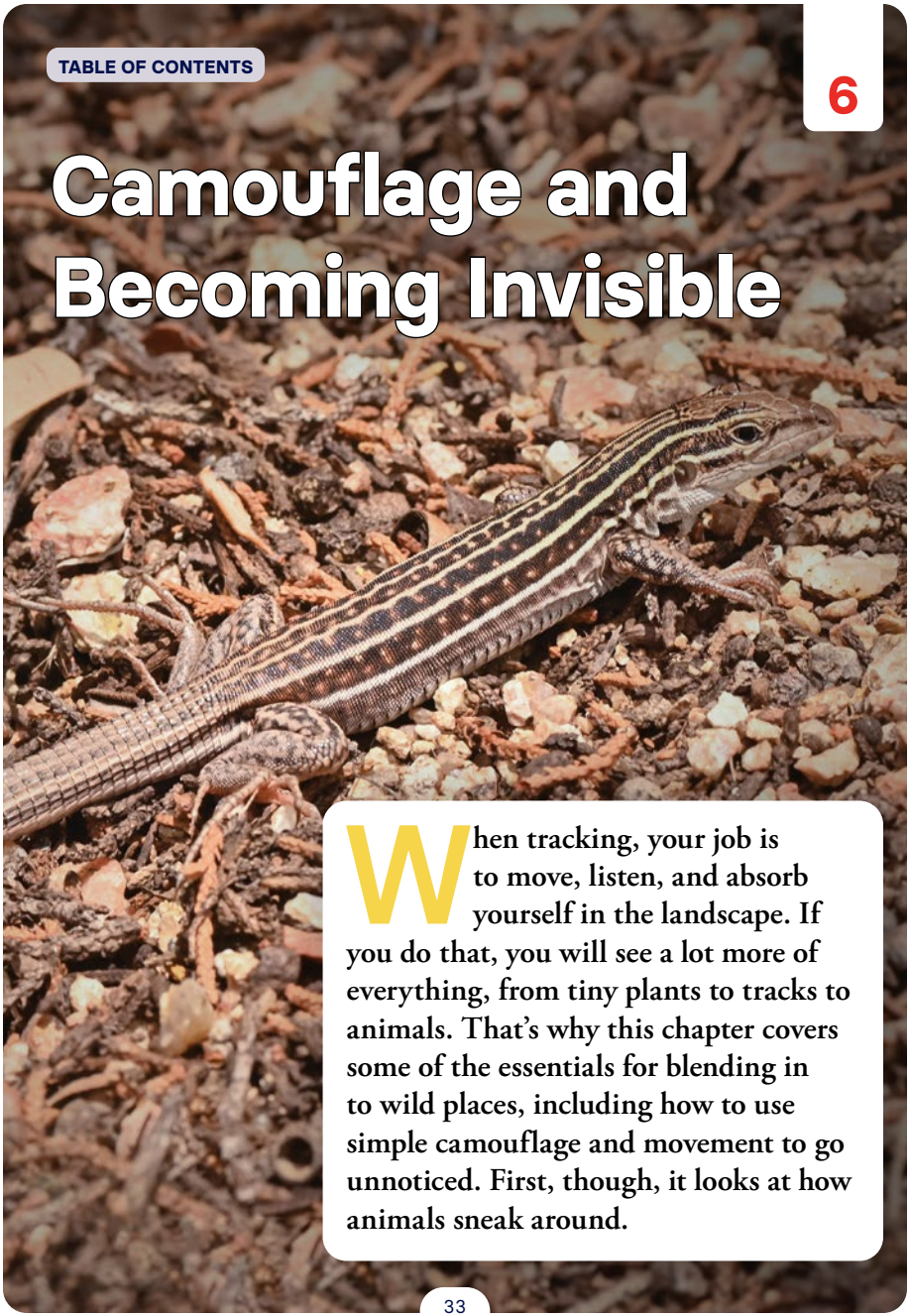
- How many individual deer came through? Alternatively, how many times did a single deer pass through the area to create the trail?
- What might the deer be moving toward or coming from?
    - Deer going uphill are often going to beds.
    - Deer moving downhill are perhaps traveling toward feeding areas and water.

Follow your trail for as far as you can. It might last for only 25 yards or so before the trail fades. Still, it will offer a treasure trove of information and new perspective.

While you're out, take a few moments to root around in the soil, too. Pull back the layers of last year's dead leaves and examine the microworld you see there. Look for the tiny white hairs of fungus and small arthropods like mites. Consider the network that provides the movement of nutrients and communication that ties the woods into one living organism.

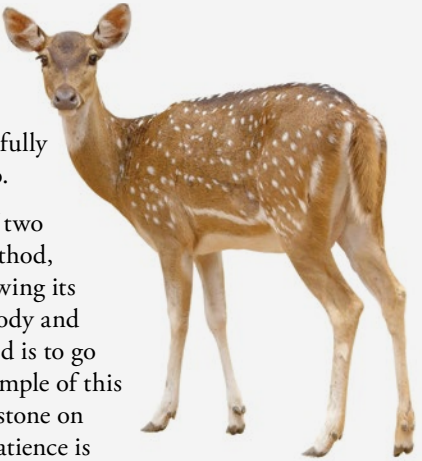
6

Camouflage and Becoming Invisible



When tracking, your job is to move, listen, and absorb yourself in the landscape. If you do that, you will see a lot more of everything, from tiny plants to tracks to animals. That's why this chapter covers some of the essentials for blending in to wild places, including how to use simple camouflage and movement to go unnoticed. First, though, it looks at how animals sneak around.

Animal Stealth



Generally speaking, wild animals are really good at being sneaky. For instance, even a giant bull elk can turn into a ghost and simply vanish. Bears and squirrels carefully sneak away from danger when they need to.

Animals achieve physical stealth in one of two ways or a combination of both. In one method, the animal goes into a bona fide stalk, slowing its movements and carefully controlling its body and the placement of its feet. The other method is to go completely still. Deer stealth is a great example of this technique. Deer are happy to stand like a stone on full alert for long periods of time. Their patience is something to behold.

Animals don't sneak all the time. That would be exhausting. Still, by default, many animals move in a gentle and relaxed state that enables them to pay attention to the world around them. This is the happy medium that you can seek to blend in to the woods.

Human Stealth

When you're trying to be sneaky, you'll need to adjust the way you move, namely by slowing down. Even if you're covered in the world's greatest camouflage, everything in the woods will flee from you if you're not moving correctly. Relax and reign in your typical walking speed to about one-half to one-third of your normal pace. As you saunter along, keep your head up to scan ahead and around. This will help you soak up all the sights that this slower speed affords you.

To take it up a notch, you can add so-called bobcatting. Essentially, that's moving like a cat that's casually exploring or hunting. Stroll for a short distance, then pause for about 30 seconds to watch and listen. Repeat this pattern. While you're doing this, keep a relaxed, carefree demeanor. If you appear too intently focused—like you're stalking something—it alarms other animals, especially birds and squirrels. They'll alert everyone within earshot to your presence.

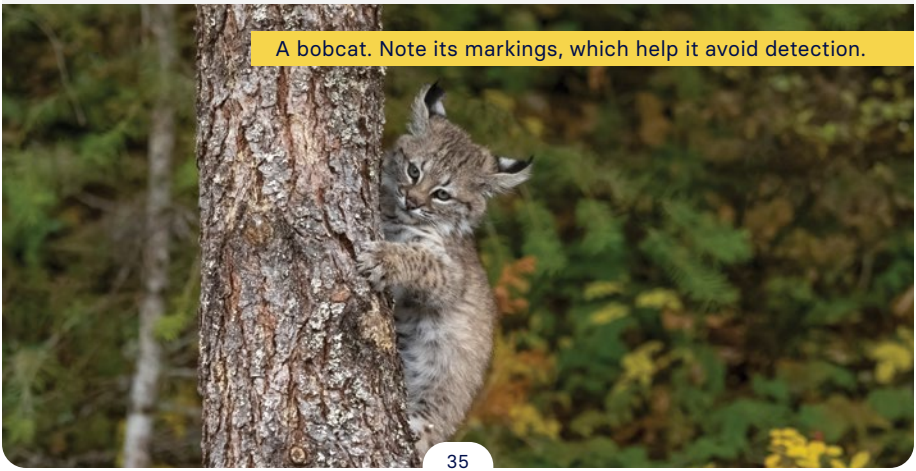
When you pause, look for any movement on the landscape. A movement could be the flicking of a deer's ear, or a bird flitting about in the woods, or brush moving in the wind. When you notice a movement, see if you can figure out what it is. If it's an animal, try to decipher what it's doing.

You'll also want to avoid any exaggerated gestures. For instance, you might be moving really well and then dramatically swing a leg over a log, or you might lurch to steady yourself against a tree. Even scratching your nose may stand out to animals. Be conscious of how you might flag your presence. Aim for discipline in each movement.

Additionally, it's helpful to practice being still like a deer. That is deceivingly hard to pull off. When people think they're being motionless, usually they're noticeably squirming and fidgeting about. And when you're trying to be as still as a deer, you may have the urge to move to find a more comfortable position. Relax into it, and stay still. If there's a breeze, you can sway ever so slightly. Praying mantises are great at this.

Camouflage

Many animals have unique colors and markings that help them blend in to the landscape. The camouflage of bobcats is one example. Camouflage helps animals avoid being eaten, and it helps them eat other animals. These patterns reflect the evolutionary arms race between predator and prey, one always trying to outpace the other. Yet some animals don't have elaborate markings. Many, such as deer, have mostly solid earth-tone coloration.



A bobcat. Note its markings, which help it avoid detection.

For tracking, you can think of camouflage as anything that keeps your appearance from standing out. That doesn't mean always wearing clothing with camouflage patterns. For instance, if you wear camouflage in the city, you're probably going to draw attention. Even in the woods, you can wear normal clothes while still striving to fade from sight.

While you're dressing to track, you can consider the overall color themes of a landscape and dress casually but effectively to blend in. Deer, with their simple earth tones, are role models. When on a hike, you might wear something like an olive-green hoodie and gray or beige jeans. That does the trick wonderfully in many areas. You can also opt for regular clothing with patterns that—like camouflage patterns—also disrupt your overall human shape. Plaid works really well for this.

If you're out trekking around in a shady, deep coniferous forest, dark colors can excel. But in lighter environments, like deciduous woodlands after the trees lose their leaves, go with lighter tones. Dark colors will stand out. In other words, keep going back to the idea of background, asking yourself: What's the prominent background? How well do certain clothes blend in?

A deer. Note its solid coloration.

When you're trying to be particularly sneaky, stick to the shadows as much as you can. Many times, this isn't practical or possible. But shade is usually more concealing than exposure to direct sunlight. In shaded areas, you can typically move more easily without drawing attention. However, walking in and out of shade and sun creates a noticeable, strobe-like effect.

As for footwear and clothing, try to wear soft-soled, flexible shoes or boots, and prioritize clothes that don't make scraping sounds when they brush vegetation or as you walk. Quiet clothes reduce the noise animals may hear, and they will also help you hear over the sounds you make.

Assignment: Practicing Stillness, Watching, and Moving

To start this chapter's assignment, head outside to a patch of woods, a park, or a quiet street, and first practice going still. Stop and listen for a moment to get a feel for where you are and how you're affecting your surroundings. Second, watch for movement—any at all. Third, when you start moving again, move along more slowly and act more relaxed. Even if you practice this only a few times while out on a walk, the landscape will start revealing itself in new ways, bit by bit.

When you spot an animal in the wild that hasn't fled, stay relaxed and occupy yourself with something else, such as a tree, a flower, or the clouds. The goal is to let the animal know you're not focused solely on them. It'll settle their nerves—or even pique their curiosity.

7

Bird Nests and the Stories They Tell

This chapter looks at the amazing information you can learn from bird nests, which reveal how birds think, what they look for to build with, and where they choose to build. Nests are a quintessential reflection of who a bird is and how it fits into the world. Bird nests also tell a story about the relationship between an animal and the landscape.

A Note of Caution

Bird nests represent a massive amount of energy expenditure and physical stress as well as intense competition for mates and nesting location. Despite all that effort, there is a high probability that a young bird will not survive its first spring. Relevant here is an important note of caution: As you track, be sensitive to birds' preference to be left alone during nesting season so that you can support bird life, not hinder it.

The nesting season is an incredibly vulnerable time for birds. This changes depending on where you live, but the most intensive times are usually around April, May, and June. Most inspections of bird nests should occur during the late summer, fall, and winter, when the residents are long gone. Birds are too vulnerable for trackers to disturb them when the nests are in use.

Also, you should avoid alerting birds' predators to a nest's location. For instance, try not to create paths perfumed with your scent, as this could lead raccoons, foxes, and others right to the nest.

Nest Styles

Birds make many types of nests, such as the following:

- cup nests, which are the most common and are made by robins
- platform nests, whose makers include coots
- pensile nests, which are suspended from the rim, like those of orioles
- globular nests, whose makers include magpies
- domed nests, like those of oven birds
- cavity nests, which woodpeckers are famous for
- burrow nests, like those of kingfishers

There are several hundred bird species that breed commonly in the United States. That is a high number, but with practical knowledge and a list of birds that breed in your area, it's possible to sort out who a nest belonged to.


1


2


3


4


5


6

1. cup nest
2. platform nest
3. pensile nest
4. globular nest
5. domed nest
6. cavity nest
7. burrow nest


7

A good starting point is considering how a nest is built and what its materials are. Birds must assemble a variety of materials that form and retain a nest shape. Nests have many jobs. At first, they cradle a handful of eggs and an incubating parent. As time goes on, the new home will contain a handful of rapidly growing young that are squirming about. They'll develop to nearly adult size, completely overstuffing and wearing down the nest rim and walls. The structure must also handle hundreds of trips by the parent birds as they come to feed the chicks. Through all of that abuse, the nest must be sturdy enough to remain fixed in place and not fall apart.

An American robin's cup nest

To meet these requirements, many nests are made of multiple parts, or layers, each of which serves a purpose. For example, a bird might start with twigs to create an initial platform and the structural outer cup. Once that's done, the bird may add weed stems and grasses to form a padded inner cup for insulation and padding. The classic cup nest of an American robin does a great job of demonstrating layered construction.

Birds that use mud in their nests also leave signs on the landscape you can look for. For instance, when collecting mud, robins scoop up several mouthfuls at a time and leave a series of beak-width troughs.

Nest Materials

There are roughly 10,000 bird species around the world, and most of them build nests, seeking appropriate building materials for their particular nest design. The materials are sourced from four broad categories:

- plants
- vertebrate animals (for example, bison fur)

- invertebrate animals (for example, spiderwebs)
- mud or other inorganic materials

In general, plants—alive or dead—contribute the majority of building material and can be found in every layer of a nest. Birds have materials they prefer and that best suit the nest they build. But birds will also choose from a variety of materials to fulfill a purpose, depending on what's available. Shreds of plastic bags might be used as bulking material, or twine might be supplemented for strands of grass.

When you come across a nest, consider where the bird might have sourced the building material. Nests around your home are always interesting, especially when they incorporate human-made materials. You might find clumps of hair from the family dog, or pieces of an old tarp that's out behind the garage. These elements give a mental map of where the bird collected them and the specific items it found useful.

Red-Winged Blackbirds' and Cliff Swallows' Nests

Two bird species and their nests help drive home concepts about nest building and materials. The first species is the red-winged blackbird, whose nests are commonly found in cattail marshes and other wetlands. First, a female blackbird finds a cluster of upright stems or stalks. She weaves them together with long strands of grasses or cattail leaves. This creates a basic platform. Once the platform is complete, she continues to weave upward to erect the nest walls, and then lines the structure with pond muck and a final layer of dry grasses.

Cliff swallow nests exemplify a different nest-building strategy. You may have seen a nesting colony of cliff swallows tucked under a bridge or along a rocky ledge. Cliff swallow nests look like inverted mud igloos stacked together like an apartment complex. Only about 5% of all bird species use mud in their nests, and an even smaller percentage use only mud. Cliff swallows are one of them.

Generally speaking, the female of a species is the primary nest builder. But cliff swallows are unique in that both sexes build. Building solely with mud takes some skill and a significant amount of work. A couple of cliff swallows might make up to 400 miles' worth of trips to collect materials.

Each nest is made of distinct individual globs, or pellets, slightly smaller than a marble. The nest is typically built with about 1,000 of them, and each pellet represents a single trip. The pellets have smooth textures. That's because swallows quiver their heads as they use their beaks to apply mud to their nest walls. The quivering liquefies the mud so that the glob will bind well.

Assignment: Researching a Bird

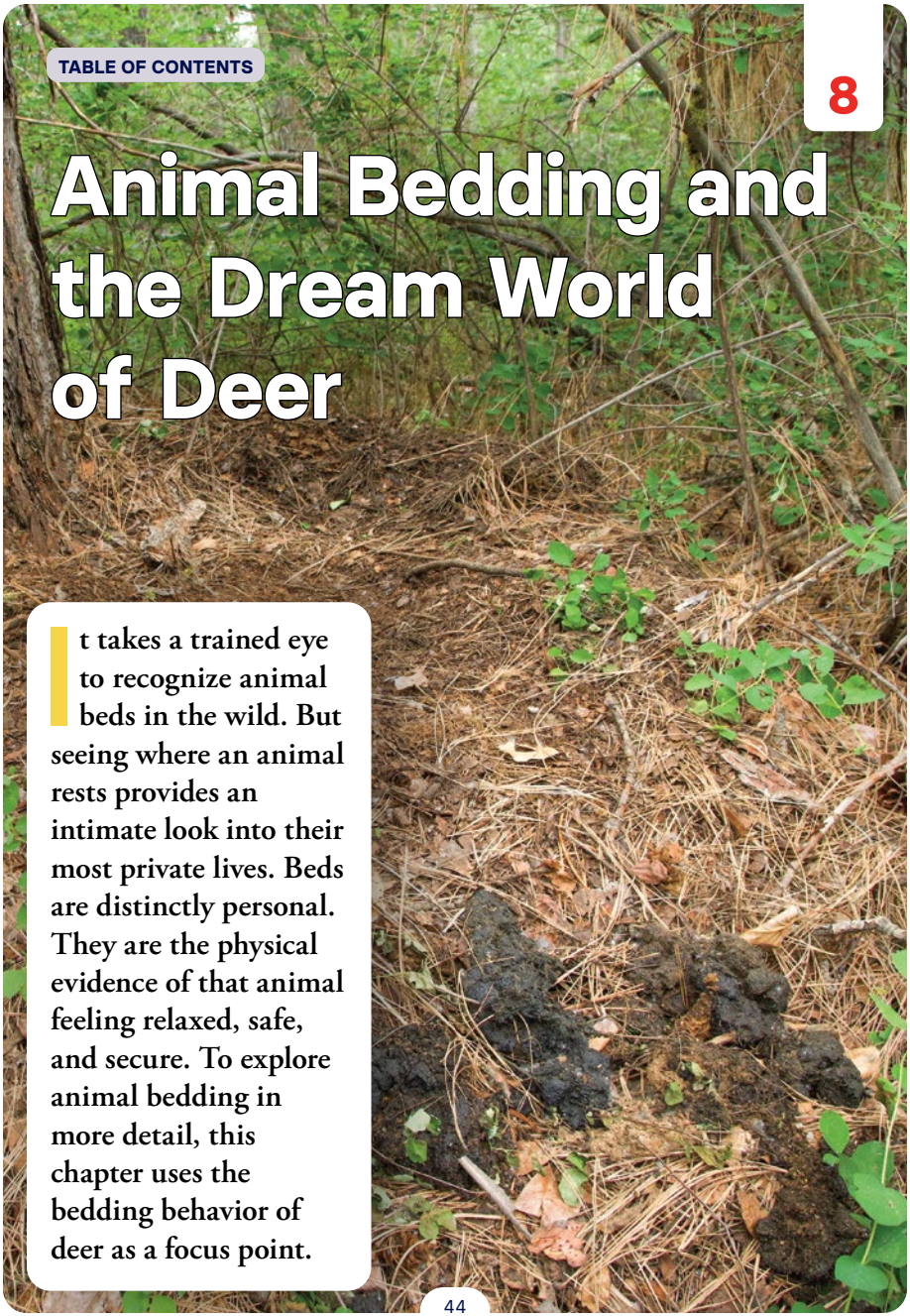
Before you begin this chapter's assignment, remember not to disturb bird nests when they are in use. With that in mind, pick a bird species that is common in your area during the nesting season. Once you've found a bird that piques your curiosity, use a field guide or online resource to learn as much as you can about their nest, where they build it, and what it's made of. With that in mind, head out to your local green space and begin your search.

When you find an old, out-of-use nest that you can examine up close, see if you can distinguish the nest's layers, its building materials, and the materials' sources. What can that information tell you about how the bird sees and utilizes the landscape?

Even if you can't identify the nest's maker at the moment, looking at nests this way will change how you see and appreciate birds in general. And if you have an idea of which bird made it, learn its habits. Find out where it goes in the winter and where it might be right now, somewhere out there on the planet you share with it.

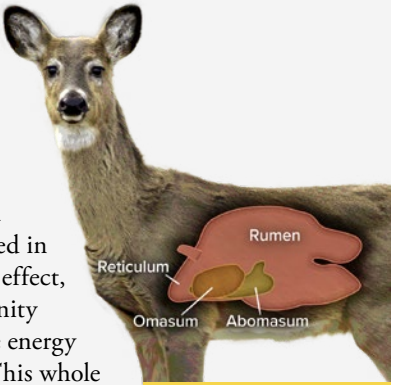
8

Animal Bedding and the Dream World of Deer



It takes a trained eye to recognize animal beds in the wild. But seeing where an animal rests provides an intimate look into their most private lives. Beds are distinctly personal. They are the physical evidence of that animal feeling relaxed, safe, and secure. To explore animal bedding in more detail, this chapter uses the bedding behavior of deer as a focus point.

The Basics of Deer



A deer's stomach

Deer belong to a group of animals called ruminants, including moose, elk, antelope, cows, and others with a unique, multichambered stomach that can efficiently break down incredibly tough plant cellulose. Ruminants' stomachs can do that thanks to a bubbling, churning vat of microbial life housed in the main compartment, called the rumen. In effect, deer eat plants to provide an internal community of microbes with food. In return, they receive energy from the metabolic waste of living bacteria. This whole process is closely linked to bedding behavior.

When deer are out feeding on the landscape, they are filling their main stomach compartment. Then they head to the safety of their beds. There, the animals ruminate, or chew their cud. Wads of microbe-soaked vegetation regurgitate back up from the rumen for further grinding in the mouth. This is what is occurring when you see a deer contentedly chew with a slow circular movement of the lower jaw.

Deer don't lie fully on their side like a dog. They remain mostly upright on their chest in the classic ruminating position because the contents of the rumen are sorted with the help of gravity. Ruminants don't sleep the way humans do, in long bouts. Instead, they mostly doze in short bursts. They can doze with both eyes open while chewing their cud. They can also enter short bouts of rapid eye movement sleep. If you see a deer's head drift backward and come to rest heavily on its body, this is likely what's happening.

Deer Beds

Anatomy is relevant to how ruminants build their beds. The wrists, or carpal joints, of a deer flex completely, like knees. When you watch a deer drop into a bed, you'll see its front half lower first, as the animal leans into the ground on its wrists. When it stands, it repeats the movement in reverse—straightening its hind legs to push the back end of the body up, and then pressing against the wrists to come to a standing position. Often, the deepest wrist mark indicates the last limb to come up off the ground.

Wrist marks on a deer bed

Ruminant beds are shaped a bit like lima beans. This is due to the fact that the animal lies in a slightly curled position and slightly on one side. The curved portion of the lima bean shape reflects the arc of the animal's back. The flatter side is formed by the front and hind legs folded in close to the body.

Even when the animal's wrists and legs don't leave clear marks, you can often assess the position of the animal's head by noting the bed's shape and taper. The impression made by the hind leg, rump, and stomach is larger and wider than that of the folded front legs and chest.

These features allow the tracker to interpret other things, too. When a group of animals bed together, you can often see how each individual was oriented. Deer often position themselves so that each can serve as a lookout. Similarly, bed sizes can indicate who made them. If each bed is roughly the same size, it's likely that a group of bachelors rested there. If you note a variety of bed sizes, this indicates does and their young. Single, well-worn beds might belong to mature bucks.

Appearances of Beds and Hair

Deer beds, and the beds of any animal, have a variety of appearances, depending on where they're situated and how they're used. For instance, in the case of deer, some beds are just a spot where the deer plopped down for a short while. Other spots see deer return time and time again, and these wear deeper into the ground. Some are in the open. Others are tucked into brush or beneath low-hanging branches. Each one might tell you something about the time of day, weather, or season.

The signs can be subtle, and when beds are challenging to clearly see, learning to look for hairs can be beneficial. If you come across a spot that looks like it's possibly a deer bed, but you can't make out any distinct features, try getting down on all fours to look for hairs.

Animal hairs can be tricky to identify, but deer hair—and that of other ungulates—is easy to recognize. In their beds, the most obvious are coarse, white hairs that are especially abundant during winter. They're easy to identify because unlike other hair, they're filled with little cellular air pockets which gives them a hollow quality. Pick one up and bend it in half. It'll kink at a right angle, like a straw.

Once you've seen a handful of deer beds, you'll get a sense for the places on the landscape that deer prefer for their bedding. After a while, your ability to predict these locations will sharpen.

Assignment: Learning about Beds

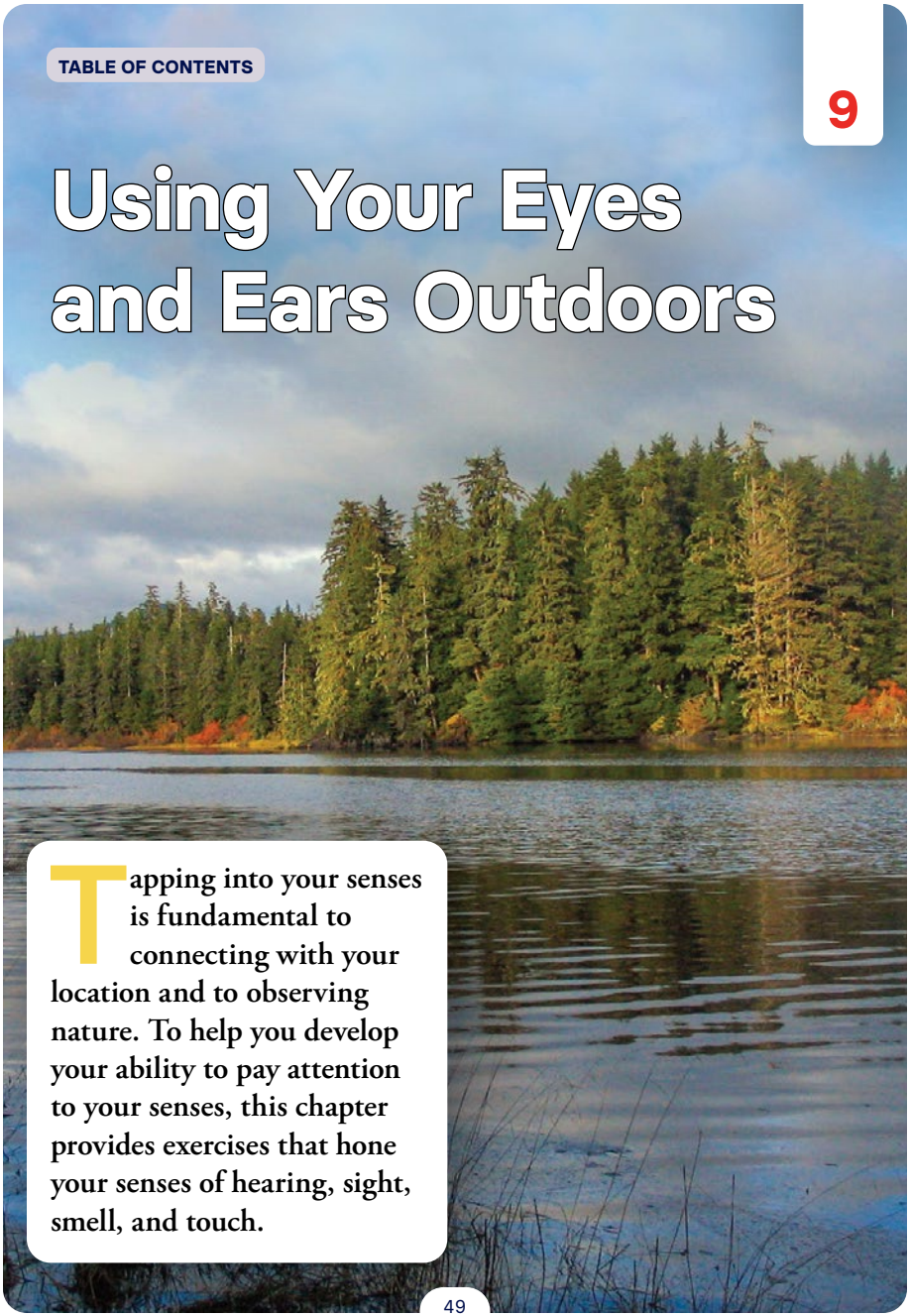
This chapter's field assignment is for you to think about what animals in your area make beds that you can find and see. Examples might include deer and rabbits. Many species don't leave much of a bed, so keep that in mind, too. Animals such as beavers and squirrels sleep curled up in cavities and burrows.

Next, pick up a good field guide and flip through its pages for clear examples of animal beds. This will provide your brain with images to search for when you wander the landscape.

Finally, go out and begin your search, especially for deer beds. They might be in the densely wooded or brushy areas of local parks and along forested hillsides. Look for tracks and droppings as you go. You'll want to move slowly and scan the landscape for spots that would be good for bedding. Even if you don't find anything right away, viewing your local woods through this filter will change what you see.

9

Using Your Eyes and Ears Outdoors



Tapping into your senses is fundamental to connecting with your location and to observing nature. To help you develop your ability to pay attention to your senses, this chapter provides exercises that hone your senses of hearing, sight, smell, and touch.

Sound

For the listening exercise, you'll have your eyes closed, so it's helpful to familiarize yourself with the steps before beginning or have the video episode playing while you do it. The steps are:

1. Close your eyes, so that you shut down that part of your sensory intake. Put your ears on full attention. Notice every sound you can. Pull out each sound and make note of its qualities—its textures.
2. Next, listen for the sound that's the farthest away from you. It might be traffic, a distant birdcall, or an airplane. You can practice focusing on the quietest sound, too—that is, picking out the subtlest thing from a whole symphony of noise.
3. Finally, explore the stereo capabilities of your hearing. Focus only on the sounds coming from your left side. And then shift to the right. Reach as far into the landscape as you can. This will help you realize how elastic your ability to listen is. Elasticity is useful for experiencing a three-dimensional soundscape loaded with nuanced information.

Sight

There are endless ways to change the information coming into your brain via sight. One example comes from working on your peripheral vision—that is, your wide-angle vision. This will be a shift from focusing on particular objects with your pupils. Peripheral vision is highly sensitive to movement. Peripheral vision is your primary form of night vision, too. That is why you can better see objects in the dark, like the forms of trees or stars, by looking just off to the side of them.

You can intentionally hone your peripheral vision, too. When you're focusing on an item, shift your gaze off to the side. Soften your gaze, then mentally scan around your whole field of view, noting paintings, house plants, dressers, or whatever else is around. Try noticing the details of an object as far out to the edges of your vision as you can. Notice the overall shapes, color patterns, and textures. You can also add exercises like counting the objects in your periphery to practice.

Practicing this outside with a full dynamic view can be impactful. You'll be using your eyes to create a giant screen of the world, and using the mind, not your pupils, to focus on things within it. The world becomes much larger, brighter, vibrant, and filled with motion.

Another basic exercise is simply to move your eyes. Usually, people move their whole head to look at something. But when you're trying to be still in the woods, big head movements are a problem. You can counteract that by moving your eyeballs to the object you'd like to focus on. Whenever you think of it, take a few moments to look around, but only by moving your eyes, not your head. Look to the side, up, and down.

One other exercise revolves around shifting your attention to particular objects. Look for the farthest objects you can see. Out in the woods, this technique will help you shift your attention from looking at only what's near you.

Smell

The human nose is really good at picking up scents. Wherever you go, ask yourself: What does this place smell like? How is it different in the morning than at midday? Even if you're not picking up much, just asking these questions will help you notice more.

Touch

You can also use touch to learn about the landscape around you. Take whatever chance you can to touch things. For instance, feel for yourself whether a tree's leaves are soft or leathery, or if the water in a creek is cold or warm from summer sun. Other interesting textures include the rough bark of a conifer tree or the leaves of a forest floor, which may be cool and wet from a recent rain or dried and crinkly. Just be careful not to touch anything dangerous or that you might harm.

Touching nature

One important element of exploring the sense of touch is to train yourself to be aware of wind direction. Each time you tune your sense of touch, part of your task is to feel the breeze on your hands, face, ears, or any exposed skin. Being aware of the wind's direction is one of the biggest factors in whether you are going to see animals or not. When you're upwind of animals, meaning the wind is moving in their direction, they are going to be aware of you long before you know they're there.

Assignment: Experiencing the Senses

This chapter's assignment for today is for you to step outside and turn on each of your senses. Wherever you are, when you put this into practice, find a place to sit or stand comfortably. Then, one by one, run through each of your senses and the exercises outlined in this chapter. After that, try engaging all of your senses at once, and watch how your mind bounces between stimuli, taking note of information on the landscape in different ways.

All of this can take quite a bit of concentration at first. But soon, you can just let it happen, allowing a universe of information to filter through. Stay relaxed and enjoy it. This kind of experience doesn't take long. Even a minute or two will leave you with a whole new feel for your landscape.

10

Marking Behavior: What a Funny Way to Talk

Marking is the primary focus of this chapter, which looks at creative ways in which animals modify the environment. There are a few primary modes to look for, including intentional markings made by feet, teeth, urine, or scat. Animals also scent mark by rubbing body parts against trees, rocks, and soft earth.

Scent Marking

A variety of glands emit animal scent. Depending on the species, glands can be on an animal's cheeks, by the eyes, between the hooves, on the pads and toes of the feet, on top of the head, along the back or legs, and so on. Where those glands are located also drives particular behaviors. As an example, anal glands and preputial glands add pheromonal secretions to urine or scats, conveying information like the animal's sex, status, sexual condition, and state of health. This explains why animals are so interested in scats and urine marks.

While marking behavior communicates information, it isn't always just about marking territory. A gray fox might delineate parts of her home range with scats to communicate with other gray foxes. But she might also show her disapproval of a coyote scat by leaving one of hers on top of it.

A home range is where an animal primarily spends its time. A territory is an area it actively defends from intrusion, whether that is a small zone around a den or the entire home range. Marking can occur in both. The highest concentration of marking typically occurs along territorial boundaries, on regular paths or travel routes, and around dens. In general, a male's home range tends to be larger than a female's, often encompassing the home ranges of several females. And males tend to mark more than females do.

Scats

Scats tend to be one of the more readily visible ways that animals announce themselves. Some of the more commonly seen examples are coyote scats, fox scats, and bobcat scats. Each of those species like to leave scats in similar places. When you find a scat along a trail, it signifies a spot of particular interest or importance to the animal that left it. A spot might be important because it is along a travel route, for instance. Coyotes, foxes, and bobcats will all create latrines as well, where multiple scats accumulate over time. This can signal a territorial boundary.

A mountain lion's scrape mark

Canines and felines both mark the ground with their feet but do so differently. After leaving a scat, a dog might perform a stiff-legged backward kick that tears up the ground and throws debris around. The scratch marks accentuate the original sign, and glands in the dog's feet leave scent, too.

Mountain lions do this as well, but they are more elegant. Mountain lions make their scrapes meticulously, standing in one spot and wiping their hind feet side by side in short, rhythmic strokes. The movement excavates a depression in substrate about 7 or 8 inches wide and 10 inches long, leaving a heap of debris to one side. The glands in their hind feet deposit scent, and they might leave a dash of urine on the scrape, too.

Rodent Scats

Many rodent species, including squirrels and chipmunks, are among those that place scats along travel routes. You can sometimes spot their scats along the tops of fallen logs or on wooden fences.

Bobcats, too, use a scat-and-scrape combination. Unlike lions, bobcats often leave a scat on the surface they've prepared with their scrape, which can make them easier to notice. Because there are many more bobcats across the United States than there are lions, they provide more evidence for trackers to find. And bobcats have a habit of marking prominent places along routes like trails and old roads. As a rule, mountain lion scrapes tend to be about two hand widths wide. Bobcat scrapes are just one.

Marking with Feet and Antlers

In the United States, a common mark comes from white-tailed bucks during the rut, or mating season, in the fall. The bucks use their front hooves to paw up a rectangular patch of ground, usually a couple of feet in length. Deer have interdigital glands between their hooves that deposit scent in the scrape. If you find a deer scrape, look above it for an overhanging branch or twig that the deer may have rubbed its face against, depositing even more scent. The deer will also scrape the ground to make antler rubs.

An example of the rub marks left by a deer's antlers

Bears are another notable mark-leaving mammal. They mark by biting, clawing, and rubbing against trees. They have especially smelly feet, which features lots of surface area and prominent glands. Because of this, bear tracks always catch the attention of other animals that come sniffing along.

Bears create trails that serve as scent posts to communicate with other bears. When a bear decides to mark a section of ground, it heavily twists its front and hind feet into the ground as it walks, wearing away at the substrate. And when that bear returns, or other bears come through the same area, they'll sniff around for information and step into the exact same spots, further grinding away at the ground. The result is a pattern of circular depressions on the forest floor called a habitual marking trail, or stomp trail. It's a way that bears talk to other bears.

Bears often create marking trails when there is something important, such as a feeding or bedding area, nearby. Some of the trails fade away as seasonal resources dissipate. But some have been made by countless generations of bears, stretching far back into time.

Squirrel Scents

Squirrels deposit scent with their teeth, and they are great animals for learning about marking behavior because they leave evidence in many neighborhoods. There are differences among squirrel species in how they mark and communicate. Some, like the red squirrels of coniferous forests, are highly territorial. Others, including gray squirrels and fox squirrels, are more socially oriented and tolerate one another's presence. They make communal marking posts.

A marking post created by squirrels

If either gray or fox squirrels inhabit your area, you can search for the signposts they create. You'll often find them near the base of a deciduous tree with thick bark, like an old hickory or cottonwood.


A gray squirrel

Look for trees with a slight lean. The protected side closest to the ground tends to be a popular spot. Squirrels use their sharp gnawing teeth to chisel into the bark, and then they'll rub their cheeks on it to deposit scent. Over time, the squirrels create large, visible patches. These spots serve as bulletin boards for squirrels to sniff and check who's around, adding their own bites and cheek rubs. Other gnawed areas also appear along the squirrels' travel routes. They may appear on wooden fences, deck railings, and other structures.

Assignment: Finding Marks

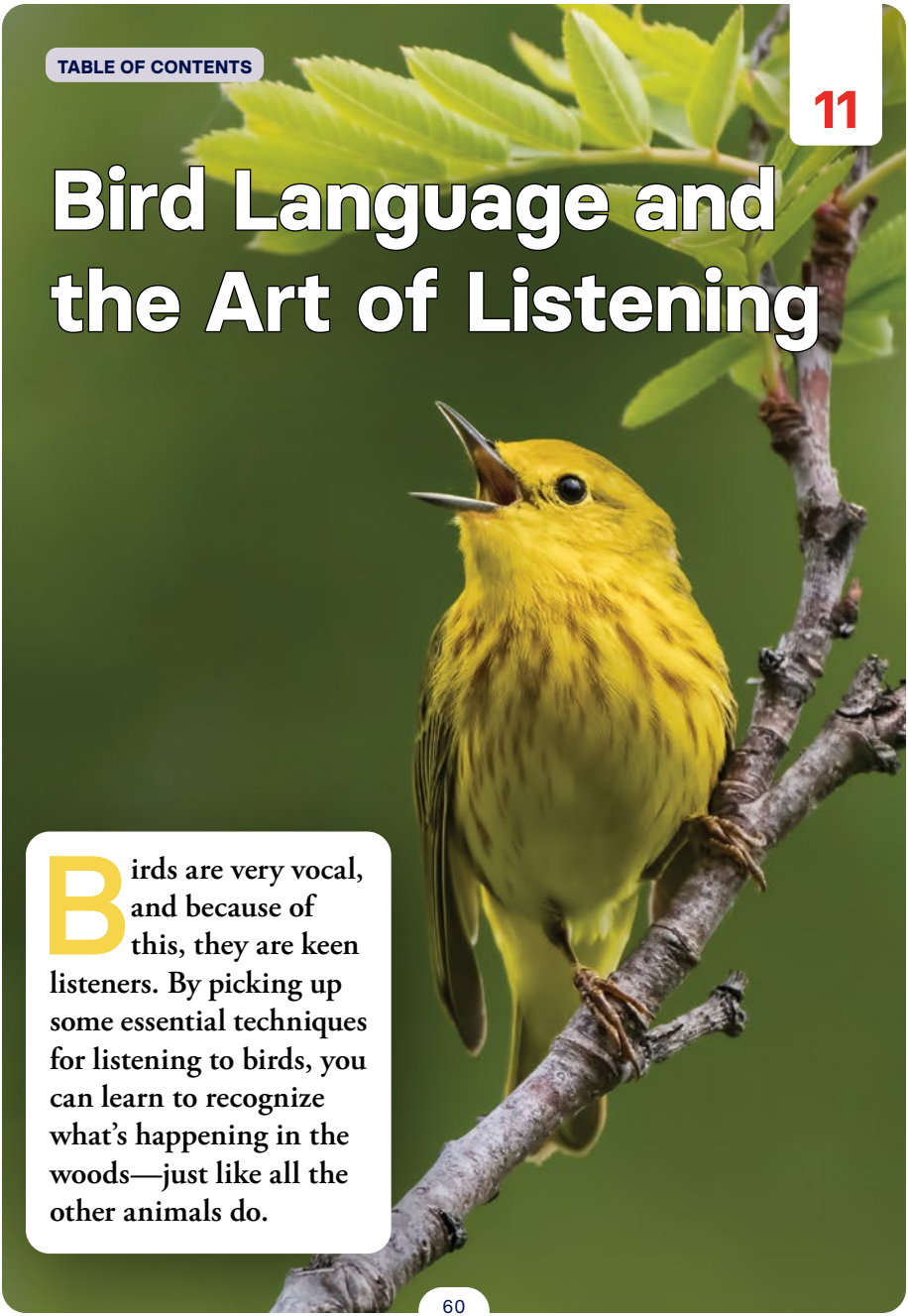
To start this chapter's assignment, head out and look for some signs of marking behavior around you. Even if you don't have immediate access to wilderness areas, try strolling through your local park. Look for scats, the bite marks of squirrels or chipmunks, and areas where dogs have scratched the ground. And when you can, search the wilder woods for other signs of markings.

A lot of times, animals are drawn to prominent features on the landscape. Therefore, if you see a feature like a unique tree, a large rock in an open field, or a log that leans into a pond, give it a look. It's likely that resident animals have taken notice, too, and have used those spots as a way of announcing themselves. This can help you narrow down where to begin looking for marks.

Another useful tool is a good field guide, which will tell you what species inhabit your area, whether they be beavers, muskrats, otters, or other animals. That knowledge will help you learn which marks to look for.

11

Bird Language and the Art of Listening



Birds are very vocal, and because of this, they are keen listeners. By picking up some essential techniques for listening to birds, you can learn to recognize what's happening in the woods—just like all the other animals do.

Communication with Purpose

Birds don't make noise without a reason. There's something conveyed in each vocalization. To understand what that is, pay attention to two things: the inflection of each vocalization you hear and birds' body language.

For example, picture birds that are foraging on the ground or picking seeds from a feeder. The calls they make to each other are mellow and chattery. They're alert and vigilant, but their bodies are relaxed. Life is good.

Now, imagine that a cat has skulked onto the scene. The birds take notice. Their calls take on a harsher tone. After hearing the alarms of the others, birds that haven't seen the cat yet also go into full alert. Their bodies tense up. They stretch their necks to get a better view, and they hop rigidly from branch to branch with palpable agitation. Some might flick their tails, their whole body pumping with each alarm call.

The point is that it is relatively easy to see and hear animals saying that something is not right (or that everything is good). Understanding the languages of other animals isn't a frivolous pursuit. It's a practical skill that's useful in wild places. It can even save your life.

But you don't need the presence of danger for listening to birds' calls to be rewarding. Being alert, aware, and tuned in will allow you to learn more about what's happening in the woods. For instance, you might learn that there's a predator around, like a bobcat, an owl, or a snake. You'll also know when you're causing a disturbance, letting you adjust your behavior to avoid disrupting the woods.

Listening requires you to stop and check in, which gives an immediate feel for where you are. And tuning in to all the voices out there creates a deep sense of connection to place. Each landscape has a unique soundscape that broadcasts a symphony of information about the living world.

Soundscape Ecology

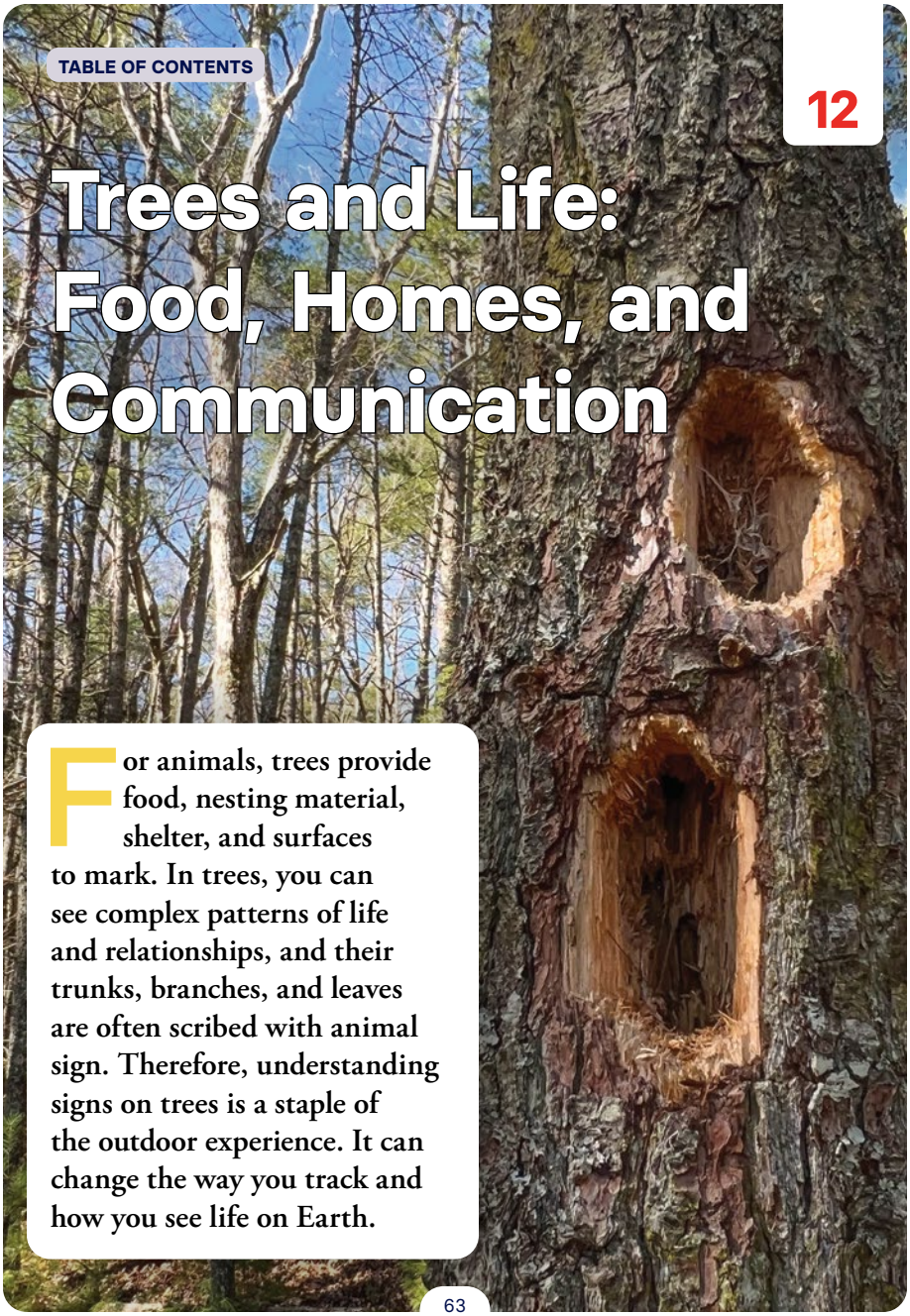
Soundscape ecology is the study of how living organisms interrelate acoustically with each other and with their environment. Bernie Krause, the father of soundscape ecology—and an expert at recording natural soundscapes—made incredible contributions to people's understanding of ecosystems this way. He began to point out in the 1960s that one of the best ways to get to know a place is to listen to it. He spent the better part of his life recording and studying more than 1,300 habitats. As he put it, "Careful listening gives us incredibly valuable tools by which to evaluate the health of a habitat across the entire spectrum of life."

Assignment: Learning from Birds

This chapter's field assignment is for you to listen to and watch birds around you, paying attention to inflection and body language. You'll start to notice all sorts of behavior, such as relaxed birds preening, young birds fluttering their wings as they beg for food from their parents, and upset birds yelling at intruders. Fostering this practice will help you tune in to what birds are saying, no matter where you are.

12

Trees and Life: Food, Homes, and Communication



For animals, trees provide food, nesting material, shelter, and surfaces to mark. In trees, you can see complex patterns of life and relationships, and their trunks, branches, and leaves are often scribed with animal sign. Therefore, understanding signs on trees is a staple of the outdoor experience. It can change the way you track and how you see life on Earth.

Three Categories of Evidence

Animals use trees in three prominent ways, all of which leave evidence. First, animals use trees for communication, which occurs whenever an animal makes a mark as a form of expression. Second, animals use trees for food. Third, animals use trees for homes or for building materials. To study these types of evidence, this chapter focuses on red squirrels, which are highly energetic tree squirrels that populate coniferous forests across North America.

Communication

Red squirrels are intensely territorial. They are quick to fill the quiet woods with rapid, frantic barks to trill alarms. Essentially every activity of a red squirrel's life—from feeding and nesting to communication—occurs among trees.

In a stretch of forest, you might find red squirrels spaced about 100 feet apart, each one on constant lookout for—and in communication with—their neighbors. They all know who the other squirrels are as well as where their nests are. Red squirrels are also aware of each other's favorite perches, cache locations, and travel routes.

Red squirrels communicate vocally and with signposts. Most commonly, they'll make bite marks atop low, horizontal branches near the trunk, then rub their cheeks on the exposed wood to apply their scent. They'll also make bite marks on exposed tree roots or at intersections of crisscrossing branches high above the forest floor.

Food

One reason red squirrels mark so intensively is how they gather and store food. Red squirrels primarily eat the seeds of tree cones, and so they spend the majority of their time collecting and caching cones. They create numerous small stashes of cones across their territory. But they also maintain massive cone stashes, which are called larders—thereby putting most of their eggs in one basket, so to speak.

While red squirrels are highly capable cone collectors, they are also thieves. Researchers have found that a squirrel might steal about 25% of its food from other squirrels' caches. But while one squirrel thief is slinking around a neighbor's provisions, someone else is stealing its food in turn. This leads to agitation evident in their barking and trilling.

Another of a red squirrel's signs is a pile of cone scales left behind after its seeds are eaten. Such a pile is called a midden. The size of a midden can vary from just a few cones to massive multigenerational heaps. Some middens might be 40 feet in diameter and rise to knee height.

Nesting

Red squirrels often nest in tree cavities such as natural hollows and woodpecker holes. One of their favorite nesting materials is long, fibrous bark from the trunk and branches of a tree like a cedar. Red squirrels aren't the only animals who know that bark fiber is great material. Many other rodents collect it as well, and once you're aware of this type of sign, you'll be able to recognize it wherever you are.

You might find bark stripped off a juniper tree by wood rats or ground squirrels, or inner bark pulled from dead willows or cottonwoods. As you develop your skills and find missing bark, you'll have a good idea of what type of animal is responsible and their intentions.

A Keystone Species

Because they're equipped to excavate roomy cavities into solid wood, woodpeckers have the honorable distinction of being keystone species, which means that other species depend on them. For example, in the Pacific Northwest, more than 50 wildlife species nest or roost in the former nesting cavities of woodpeckers.

Cambium

Just inside a tree's hard, protective outer layer of bark is water-rich vascular tissue largely responsible for providing nutrients and water to the entire organism. This inner layer is known as cambium. Animals from moose to beavers to field mice love the stuff. Cambium feeding is typically found on the trunks and branches of deciduous trees, but it appears on conifers, too. Its presence depends on the time of year, where you are, and the species.

When hoofed animals (also known as ungulates) feed extensively on tree cambium, it's often in severe winter environments, at a time when most plant life has died and is buried in snow. In more temperate climates, plant life ramps down, but there are still many things available to eat all winter. Therefore, the deer and elk in places like that don't rely on the inner bark as much for a primary food source.

Marks typical of those bears make when feeding on cambium

But in mountainous areas where snow abounds, you'll find archetypal feeding evidence from elk and moose. These animals whittle away patches of a tree's outer bark to get at the cambium beneath. They do this with their chisel-like lower incisors, using sweeping, upward movements of their heads. Often, two primary teeth do the cutting work, and sometimes they'll leave a tidy pair of marks where they've sampled the bark but didn't feed extensively.

Female elk also use their incisors to mark trees. They carve away a small patch of bark and rub their faces and necks on the exposed, sticky wood, leaving scent and some telltale hairs. In this way, the sign is like that of red squirrels' territorial bite marking.

In some areas, bears eat huge quantities of cambium and leave massive swaths of evidence. They do this mostly in the spring and early summer when sap is flowing well. This makes the bark skin-like and easy to peel away from the trunk. Bears use their teeth and claws to tear off large sections of bark from the ground up, leaving tattered strips dangling from farther up the trunk and big pieces on the ground. The exposed wood is slippery and watery.

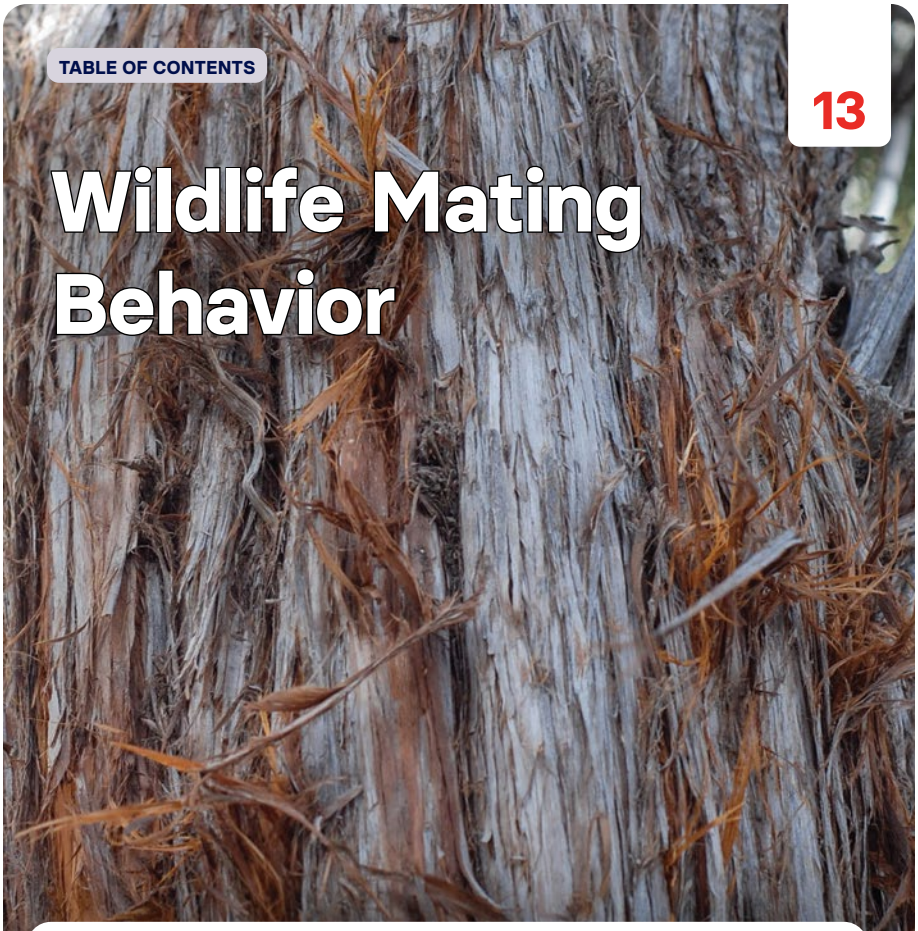
When animals feed on cambium, they usually leave strong signs of intensely targeted calorie extraction in one area. The teeth will have been scraped into living tree tissue.

Assignment: Treating Trees as Canvases

To undertake this chapter's assignment, look at trees as canvases for animal behavior. Search for squirrel markings, woodpecker holes, insect evidence, and other interesting features you can find.

13

Wildlife Mating Behavior



Animals of every kind engage in reproduction, putting every ounce of their being into raising the young. It's among the most exciting and miraculous aspects of life on Earth. The more you know about wildlife breeding behaviors and when they occur, the more you can turn your eye to seasonal evidence each behavior leaves on the landscape, such as new trails, rubs on trees, nests, and the tracks of young animals.

Deer Behavior

Deer are an interesting case study for animal breeding. A mature buck doesn't hang out with other bucks during the rutting season like he does at other times of the year. Instead, he will be worked up, pumped full of breeding hormones, and not especially tolerant of other males. You might find his lone tracks. You may also find ground torn up as the spot where two bucks clashed.

Buck rubs are common and useful for tracking purposes. These are spots where male deer have ground their antlers against small trees or where they've thrashed brush. As a tracker, your first job is to assess how the sign was made and what type of tool the animal used to make it. A buck rub has several features you can look for. When a buck grinds his antlers against a tree, the upward and downward motion frays the bark at the top and the bottom of the abraded area. Adjacent small branches are often rubbed bare, too, or broken and twisted, all of which is hard to reproduce with teeth or claws.

When you've determined the marking animal was a buck, you can think about time windows. Because bucks make rubs made during the rut—mating season—you can think back to a cold, misty morning in November, even if you find the rub on a hot mid-July day. And come mid-October, you can start looking for fresh rubs. But this changes depending on where you are, so do some research to find out what's happening in your region.

Buck rub

Generally, you can look at buck rubs as communication or expression. A buck makes them to tell other bucks that he means business. Buck rubs also let nearby females know the buck is around and eligible for mating. These marks are also loaded with olfactory information. Bucks use their antlers to prepare a surface, then apply scent to it from glands on their heads.

Two types of antler marks are worth considering. Larger abraded surfaces on small trees and saplings indicate a slower, more methodic grinding away of material. The other type, seen in brush, is thrashing. This happens when an animal is amped up on hormones. He will aggressively attack a bush and absolutely trash it. This mimics sparring, too.

Ungulates, Coyotes, and Bears

Ungulates—deer, bison, and moose—enter the rut in fall, and they rearrange their social structures around this ritual. In late spring, their young begin to show up on the landscape, as do the pups of coyotes and the cubs of bears.

Antlerogenesis

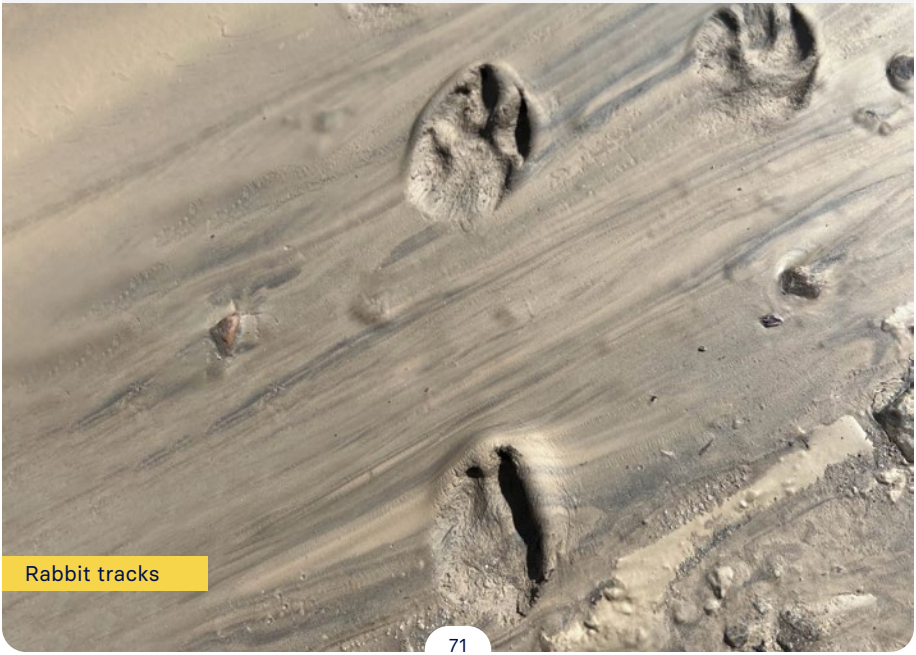
Antlerogenesis is the process of growing a new set of antlers every year. Antlers are among the fastest-growing tissue in the animal kingdom. A bull moose can put on half of a pound of antler material a day.

Cottontail Rabbit Behavior

Cottontail rabbits are also interesting animals when it comes to breeding. Females can produce 35 offspring a year in six or more litters. Their mating ritual involves males and females taking turns jumping over one another. Males rush females and urinate on them, too. This behavior starts in early spring and goes through late summer or fall, so trackers have ample opportunities to see it.

Rabbits have unique tracks, making them intriguing animals for trackers. Many other animals have exposed, fleshy toes and pads on their feet, but rabbit feet are completely covered in hair. When a rabbit propels itself forward, it loads the entire weight of its body onto its hind feet and springs forth, pushing off the toes.

On firm ground, the only visible tracks a rabbit leaves are the marks from the concentrated points of pressure: the hind toes and claws. Because of those hair-covered toes, the marks they leave tend to be conical. Rabbit hind feet have four toes, so the typical pattern consists of two sets of four toe marks. Once you know what they look like, you'll recognize them everywhere.



Rabbit tracks

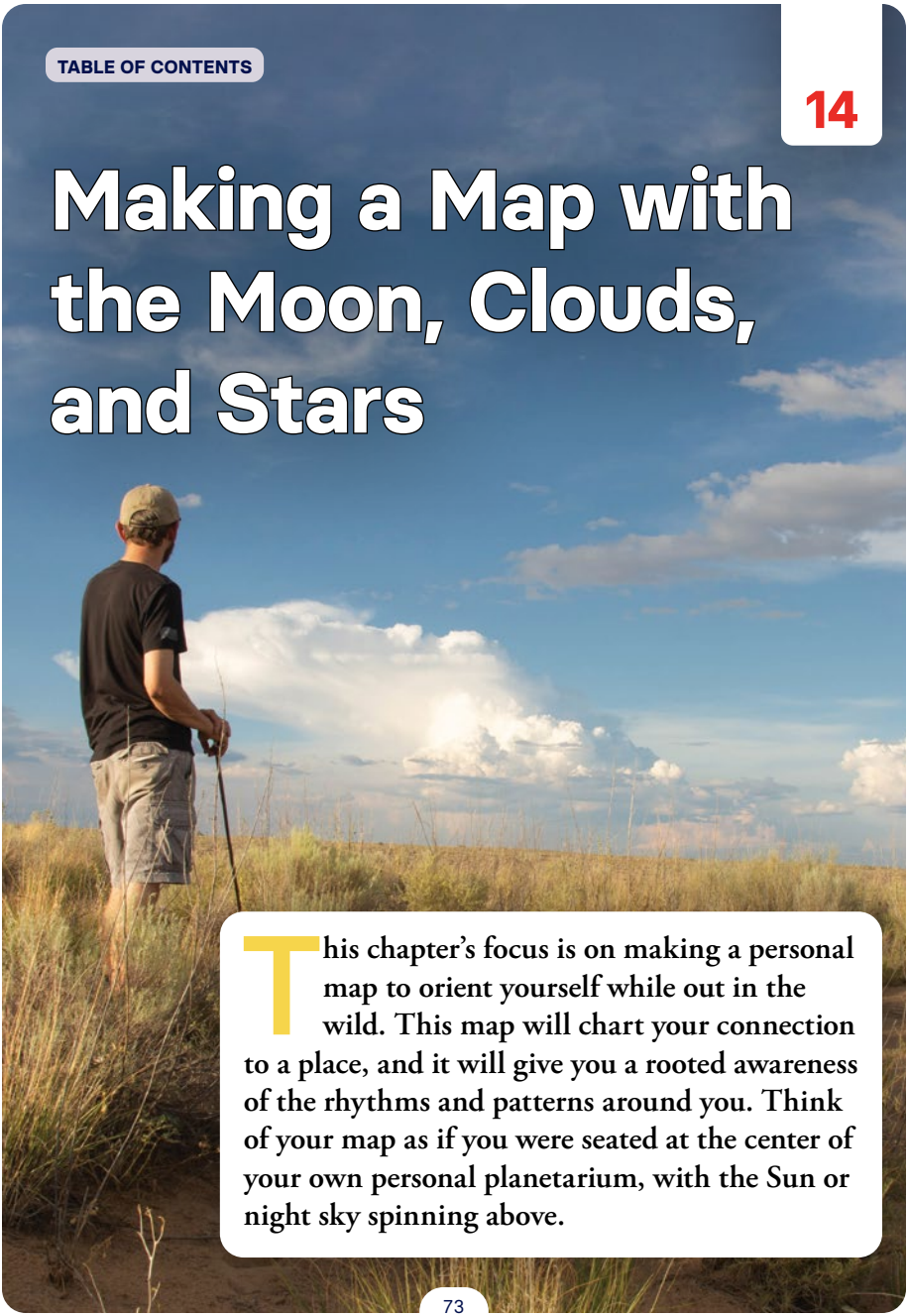
During their energetic displays—whether for breeding or some other interaction—rabbits leave evidence called rabbit dancing. To see this evidence, look for the signature patterns of the hind feet along with twisting slashes of the rabbits' claws. It's fun and satisfying to recognize this in tracks. If you live in an area with many rabbits or hares and some clear ground, it's almost guaranteed you'll begin to see rabbit dancing.

Assignment: Rubs and Dancing

To complete this chapter's assignment, keep an eye out for buck rubs and rabbit dancing the next time you're out in the woods. No matter what tracks or sign you see, think about the fact that each fragment of an animal's life is part of a larger story. That knowledge will guide your eyes.

14

Making a Map with the Moon, Clouds, and Stars



This chapter's focus is on making a personal map to orient yourself while out in the wild. This map will chart your connection to a place, and it will give you a rooted awareness of the rhythms and patterns around you. Think of your map as if you were seated at the center of your own personal planetarium, with the Sun or night sky spinning above.

The Basics

To build an internal map, start by focusing on the four cardinal directions (north, south, east, and west). A compass is tremendously helpful here. A smartphone's location app or a GPS device will work to start, but you'll eventually want a real compass, as that will work in areas with little or no connectivity. A real compass will also serve you well should your device(s) run out of batteries.

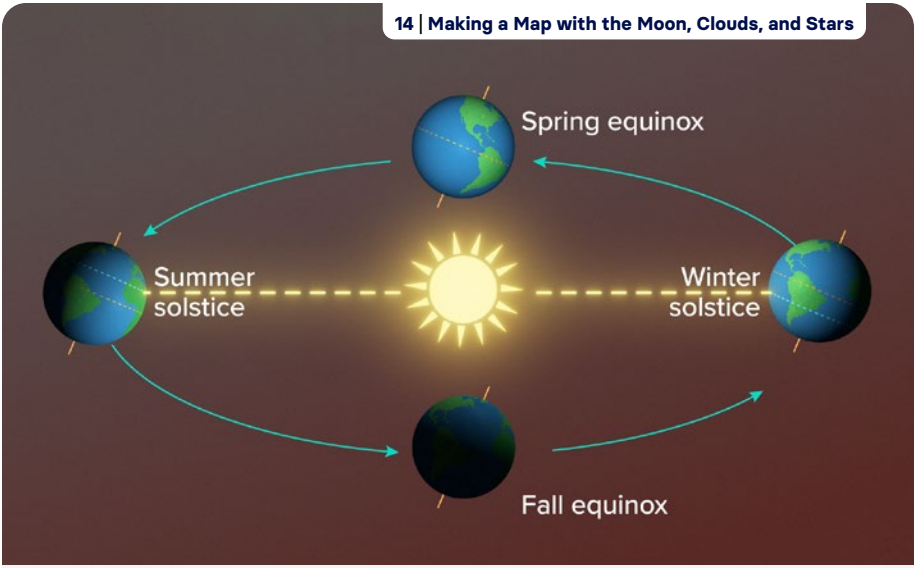
If you're unfamiliar with how to use a magnetic compass, line up the needle so that you are pointing north. Depending on where you are, you'll want to adjust for magnetic declination. Essentially, Earth's magnetic field pulls the needle away from true north by varying degrees depending on where you are.

If you're in the midwestern part of the United States, magnetic interference is minimal. But if you're out in the northeast or on the West Coast, it makes a difference. You can learn about declination—and how to orient your compass—with an online search. Once you have a compass, get in the habit of pulling it out often to note the position of nearby objects or landmarks, such as buildings, the Sun, a hill, trees, or statues in a park.

Tracking the Moon and Sun

As you pay more attention to the four directions, you can also start tracking the movements of the Sun, Moon stars, and clouds, starting with the Moon. The Moon is more elusive than the Sun. Its appearance and pattern of movement change constantly, so it's harder to predict where the Moon will show up on the landscape and where it will exit.

You will be at the center of your map for this learning activity. Find a location that provides a decent view of the sky. If you live in a city or in a dense forest, you'll need to find a spot where you can see where the Moon rises or sets on the horizon. The goal is to find a consistent point of reference. Without viewing the moonrise from the same vantage point, you cannot visually comprehend that its place on the horizon changes each day.



Basics of the Sun's movement are helpful to learn, too. Every 24 hours, the Earth makes a full revolution on its axis. In a year's time, the Earth makes one 580-million-mile trip around the Sun. Since you view the Sun from the ground, each day, it appears to rise in the east and set in the west. However, the Sun rises from due east and sets from due west only twice a year: during the spring and fall equinoxes.

After the spring equinox in the Northern Hemisphere, the Sun rises farther and farther north of east until it reaches its northernmost point on the summer solstice—the longest day of the year. It then begins to march back southward. After the fall equinox, it rises farther and farther south of east until reaching the southernmost point at the winter solstice.

The daily and annual cycles of the Moon are entirely different from those of the Sun. At one level, the Moon and Sun traverse a similar pattern: rising and setting in different places on the horizon, moving northward or southward. But sunrise and sunset locations change much more gradually each day. And while it takes six months between the summer solstice and winter solstice, the Moon moves much more quickly, reaching its northernmost and southernmost rising points in just 14 days—half a lunar cycle from full Moon to new Moon. Therefore, it's much easier to predict where the Sun will rise and set on the horizon.

Waxing or Waning?

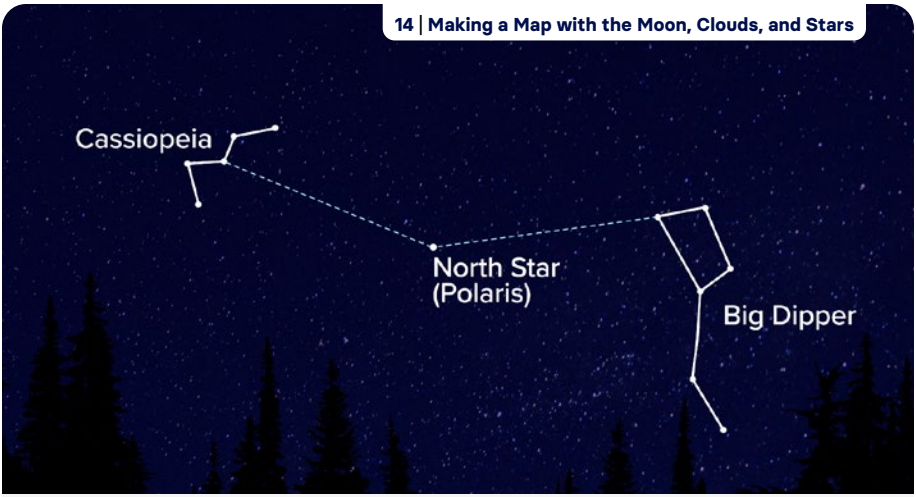
Here's a tip to immediately tell whether the Moon is waxing or waning: Look for the spherical side of the Moon—the illuminated side without Earth's shadow. If it's rounded like the letter *p*, the Moon is "pregnant," or waxing. If it's rounded like the lowercase letter *d*, then the Moon is "diminishing," or waning.

To learn more about the Moon, find an app or an online lunar calendar that shows the Moon's current phase as well as where it rises and sets in your region. The app or calendar should also tell you how much later the Moon will rise tomorrow, plus whether it will rise farther to the south or to the north. Once you've established that, you can begin to track and predict the Moon patterns.

Orienting Yourself with the Stars

Using the stars, you can orient yourself on a clear night, even if you don't have a compass with you. Two constellations, Cassiopeia and the Big Dipper, sit opposite each other, with the North Star (also known as Polaris) centered between them. Earth's axis is in perfect alignment with Polaris, so the entire night sky rotates counterclockwise around that star.

The Big Dipper is a grouping of seven stars that forms the shape of a ladle with a long handle. The two stars at the end of the ladle—farthest from the handle—point right to the North Star, which stands out brightly among the other stars near it. Finding the Big Dipper, Cassiopeia, and the North Star is a great practice for directional orientation.



Landscape Features and Clouds

Landscape features are orientation tools. For instance, knowing where you are in relation to local ponds, lakes, and rivers can help you visualize the terrain around you. Knowing the direction in which creeks and rivers flow provides perspective of the land and how water flows in and out of the area. If you live in an arid environment, think about the ravines and canyons around you, plus where water would be if it was present and the direction in which it would flow.

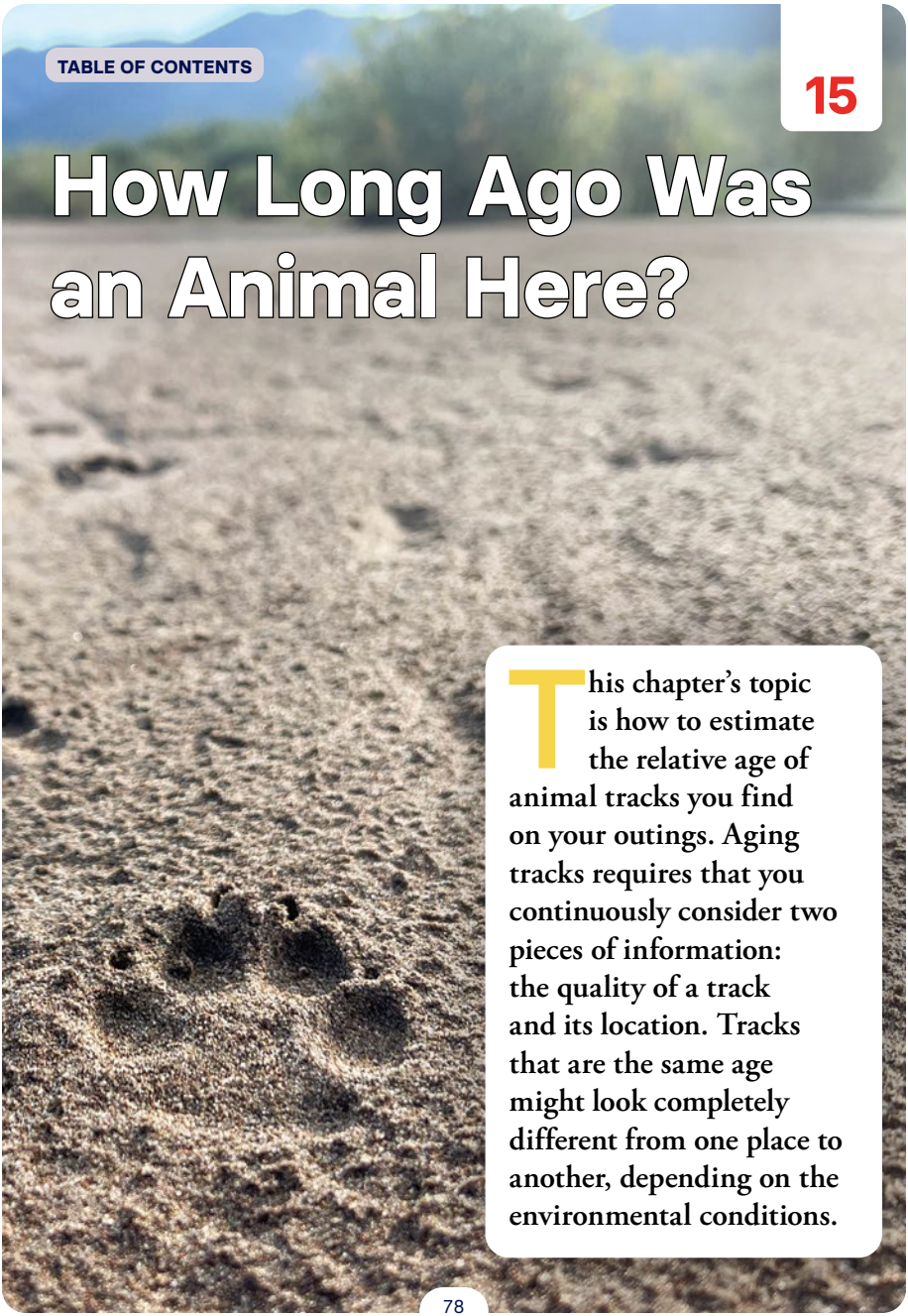
Clouds are also valuable orientation guides because they typically travel in a consistent direction. In a given area, for example, they might mostly move to the northeast. They're also highly visible and usually around in one form or another.

Assignment: Sketching Your Area

This chapter's assignment is to create a sketched map of the area where you live. You don't need to be elaborate, but include as much as you can, fitting in elements such as prominent buildings, hills, or mountains. Also add creeks, lakes, and the direction clouds usually move. Orient everything to north, south, east, and west, and pinpoint where you are. You can also show where the Sun and Moon currently rise and set. This assignment will help you start to notice a growing sense of place.

15

How Long Ago Was an Animal Here?



This chapter's topic is how to estimate the relative age of animal tracks you find on your outings. Aging tracks requires that you continuously consider two pieces of information: the quality of a track and its location. Tracks that are the same age might look completely different from one place to another, depending on the environmental conditions.

Tracking in a Weathered World

You will never track in a static environment. The landscape is constantly changing. One single area can have a variety of soil types, plants, trees, rocks, and slopes. Other elements like wind and rain affect conditions, too. Accurately estimating the age of a track is largely a function of knowing what the weather has been doing. It's difficult for even the best tracker to accurately estimate the age of an older track if they have no idea when the last rain was, if the wind was blowing, or whether it was sunny or cloudy.

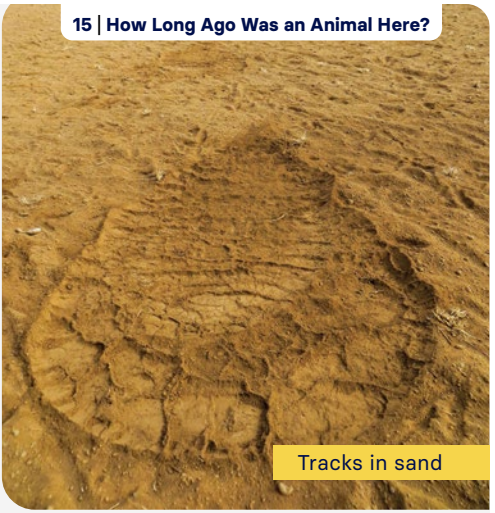
Keep this in mind as part of your tracking practice. At home, you can watch the weather and note events like storms and gusts of wind. If you're headed out to explore a new area, you can look online to see its recent weather conditions.

Soils respond to weathering in particular and consistent ways. Learning a few basic principles will help you know what to look for to assess the aging process. Ordinary beach sand provides a cornerstone for understanding these principles and how all substrates erode.

For instance, in a damp sandcastle, grains of sand balance in small columns, and they stick out at impossible angles like a pincushion. The moisture in the sand serves as adhesive and allows them to hold their shape. As they dry out, though, the bonds between each grain of sand weaken. Eventually the structures topple over, and the sand takes on a smoother, softer appearance. That's one form of weathering: simply drying out and crumbling under gravity. When precipitation meets sand, the latter melts into a semiliquid slurry, taking on a smooth, worn appearance.

When you examine a track closely, you can imagine it as similar to damp sandcastle. Ask yourself: Are the edges sharp and detailed? Are they precariously stacked in tiny pillars of grit or dirt? If not, what elements may have been at work, and when?

Your task as a tracker is to evaluate the qualities of the track while keeping in mind the potential effects of recent conditions. You can apply this conceptual framework to every track you find. Each substrate is different, but across them, you'll begin to see similar details and be able to assess their degradation accordingly.



Tracks in sand

Evidence of a badger digging in sand

Turtle tracks baked into mud

Keep in mind that it's much easier to determine the age of fresh tracks. The older a track gets, the more layers of events a tracker has to sort through, and the harder it becomes. But the more you know of major weather events in the last days, weeks, or even months, the better you'll be able to place the time of all the tracks you find.

Scat as a Clue

Scat can make it easier to age tracks. For instance, trackers usually find deer scat in the form of dark, dry pellets, meaning it has been on the ground for a while. If, instead, it's lime green and covered in goo, the scat was left very recently. Just like tracks, though, scat ages depending on its exposure to the elements. If the area is cool, shady, and damp, those refrigerated conditions preserve the scat, while sun, heat, and wind will speed up the aging process.

Fresh deer scat

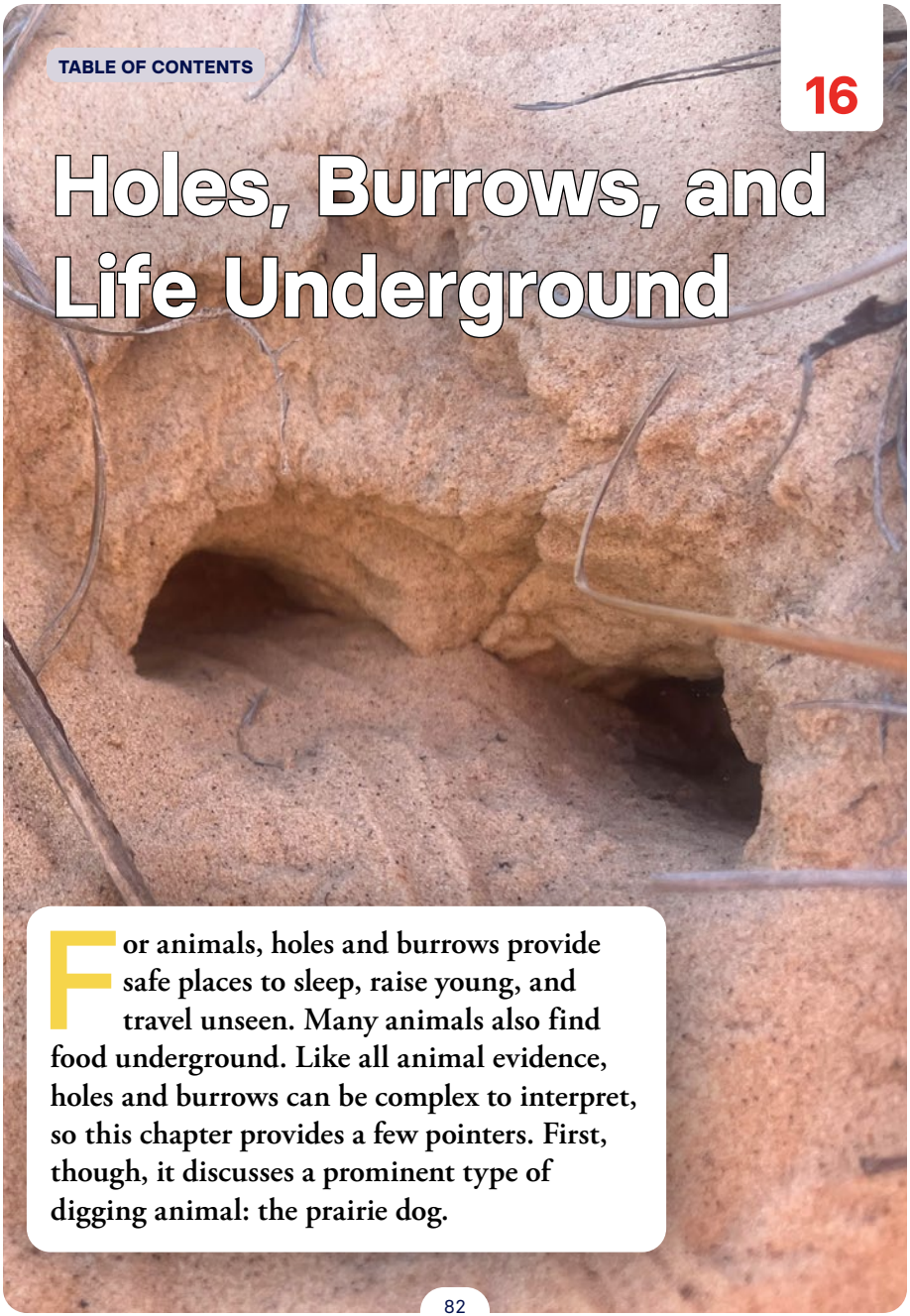
Assignment: Tracking Tracks

For this chapter's assignment, start by strolling around your neighborhood or into a nearby forest or field. Look for some animal tracks to assess through the filters of time, wind, and weather. You can also make your own tracks in your yard or somewhere nearby, creating a new set each day. Note how they change over a week. Analyze how other items change over time as well. For instance, mulch may change in appearance, and leaves on a broken branch may dry out and curl as time goes on.

The world is filled with the evidence of thousands of events across vast amounts of time. Sorting through some of them will enhance your overall tracking ability and is a satisfying way to view the layers of life through a new lens.

16

Holes, Burrows, and Life Underground



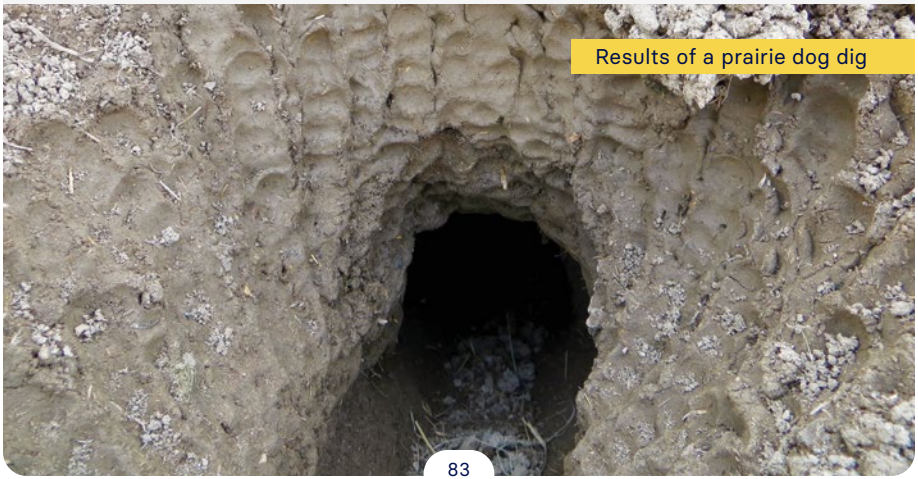
For animals, holes and burrows provide safe places to sleep, raise young, and travel unseen. Many animals also find food underground. Like all animal evidence, holes and burrows can be complex to interpret, so this chapter provides a few pointers. First, though, it discusses a prominent type of digging animal: the prairie dog.

Plight of the Prairie Dog

Prairie dogs are quintessential animals designed to blend life above the ground with life below it. They're just as comfortable scampering on an open range as they are in their humid tunnel systems. Prairie dogs build massive, multigenerational tunnel complexes that at one time covered large stretches of North America.

By excavating, prairie dogs aerate several tons of earth each year. They mix topsoil with deeper soils, exchanging the nutrients. In doing so, they change the composition of local plant communities and create foraging opportunities for other species, such as pronghorn. Their burrow systems also provide homes and nesting locations for still other species, including burrowing owls. Prairie dogs' presence increases biodiversity.

There were an estimated 5 billion prairie dogs before 1800. But because of their numbers and the holes they created, newcomers to North America considered them problematic. Holes can break the legs of sheep, cattle, or horses. Prairie dogs eat vegetation, but settlers wanted foraging grounds for their animals. In short order, humans nearly wiped prairie dogs off the map. In the present, as conservation-minded people again see prairie dogs as essential, efforts are underway to try to restore native prairie and manage livestock and rangeland more holistically.



Results of a prairie dog dig

Learning about Dig Sites

To learn about animals that dig in your region, research which ones engage in extensive digging and burrowing. Common examples include moles, pocket gophers, and skunks. Raccoons frequently dig up items along the edges of rivers and creeks. Other animals, like rabbits, create holes for nesting and occasionally unearth roots to feed on. Knowing about these behaviors goes a long way toward identifying holes' makers.

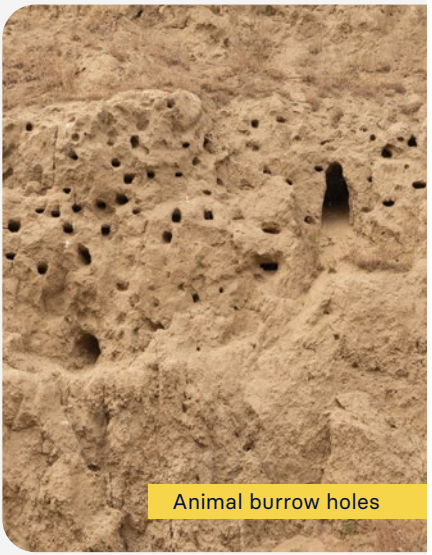
When you happen across animal-created dig sites in the landscape, traits such as the size of the hole or burrow are important clues. Typically, a hole an animal spends time in is roughly the same diameter as the animal that created it, though smaller animals sometimes enlarge their holes with time and use. Still, smaller animals don't want a hole that larger predators can stroll into.

Dig Site Shapes

The shape of a hole or burrow often reflects the shape of the animal that created it. For instance, a kangaroo rat has tiny front legs and long hind legs that it uses to bound along. Their burrows typically have a flat bottom and are rectangular, taller than they are wide, and about the height of the kangaroo rat itself.

A lizard, on the other hand, is built low to the ground. They rest on their stomachs when they're not scampering about. And lizards' burrows often reflect their shape, taking on a layout that has a flat bottom, is shaped like a half-moon, and is wider than it is tall. The burrows of arthropods such as wasps and scorpions are similar.

Once you get a feel for what type of body might have created a hole—and its size—making some educated guesses becomes a lot easier. An American badger, for instance, has a squat, wide body and short legs that make it designed for a life of digging and burrowing.



Animal burrow holes

A badger hole

Badgers are mustelids—belonging to the weasel family—but they are built like a large version of a mole. The burrows they create are often half-moon-shaped, with flat bottoms and a curved upper ceiling. Their tunnels are just large enough to fit a digging badger. Like lizards, badgers are low to the ground. They can rotate their thick, stubby forearms so that they're able to scoop dirt to their sides and kick it out behind them. A great feature for identifying a badger hole is claw marks that appear on the sides and upper portions of the tunnel walls.

In contrast, canines can't rotate their forelimbs the way badgers do, so they mostly throw dirt back between their hind legs. A typical canine like the coyote is tall, with long legs. If a coyote digs a burrow for a den, the shape of the burrow is usually narrow and much taller than the badger's, reflecting the shape of the coyote and how it's designed to dig.

Animal Equipment

When assessing the evidence at a burrow, you can also think about animals' equipment. Badgers and bears, for example, are incredibly strong. Their claws are long, thick, and able to tear at the ground. Even their casual, explorative digs have different qualities than the digs of other animals.

Badgers and bears easily tear through thick roots and move rocks and clots of hard-packed earth that other animals such as coyotes and foxes can't budge. Pay attention to the width, depth, and position of claw marks in broken earth. These signs, along with broken roots and hairs, all help us with an animal's identification.

Dig Sites' Purposes

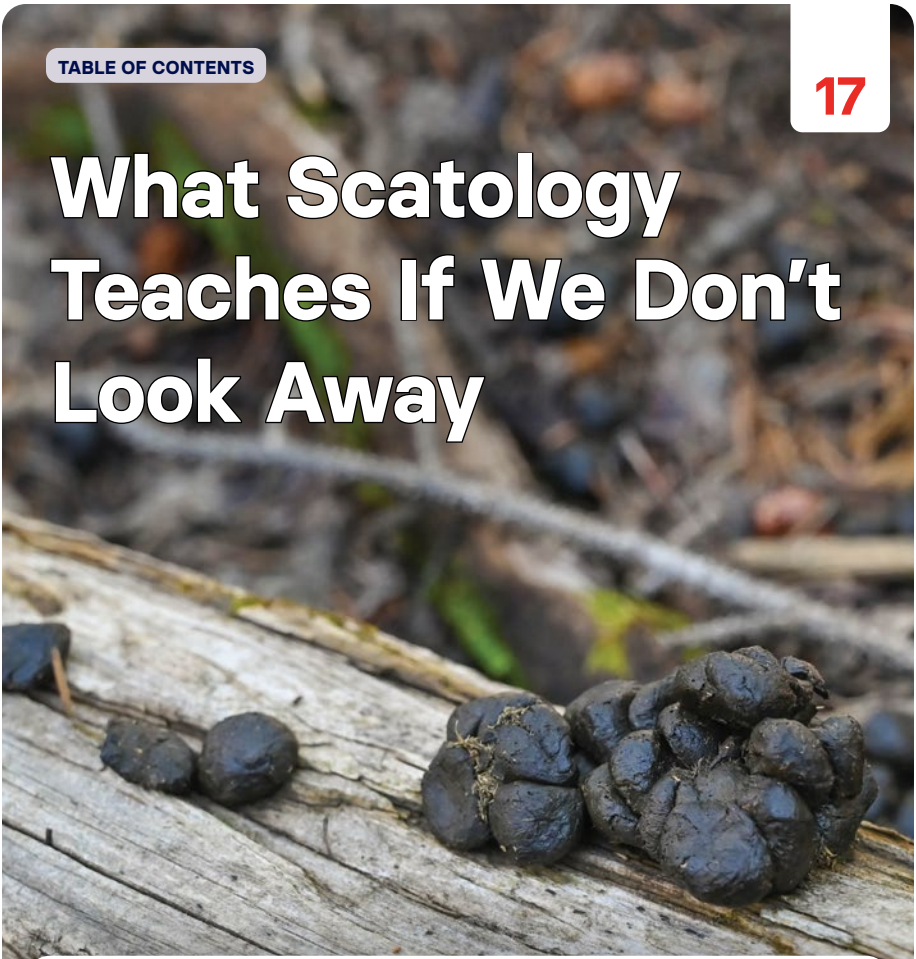
The reason a spot exists is relevant for animal identification as well. If you can see the back or bottom of the dig site, that usually signifies foraging. The animal likely dug up something to eat, such as a mushroom, a grub, or something it had buried beforehand. The digger could also have been investigating a potential meal. Additionally, holes sometimes come from a predator who excavated the burrow of another animal. In a case such as that, you might see an exposed tunnel system, or wads of soft, fibrous nesting material that were pulled up and ripped apart.

If, by comparison, the dug-up area is a tunnel that winds down out of sight, it might be a den, a resting spot, or a sign of foraging for other animals that live below the ground. The dig site's apparent age and the condition of its throw mound are identifying traits, too. (A throw mound is made of dirt the animal has pushed up near the entrance.) For instance, imagine a hole that looks old and has a weathered but recently used throw mound. Such a hole is likely from an animal that lives there permanently, like a prairie dog or ground squirrel. By comparison, spiders, eastern chipmunks, and some other animals scatter the earth they've excavated to make their holes inconspicuous.

Another key trait is the slope of an animal's tunnel. A tunnel might plunge straight down or run perpendicular to the surface. Wolf spiders and tiger beetle larvae use vertical tunnels to wait for prey. Eastern chipmunk holes also drop vertically into the ground. By comparison, holes with gentle slopes are common among animals such as kangaroo rats, ground squirrels, and lizards.

17

What Scatology Teaches If We Don't Look Away



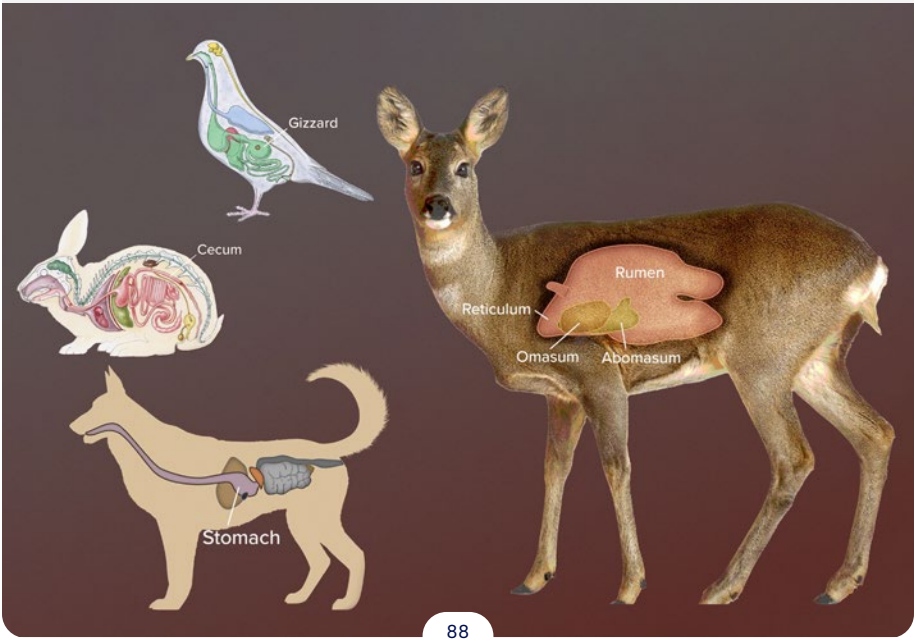
Animal scats are a quintessential representation of community ecology. A study of scats is really a study of food systems, resource availability, and how animals have evolved to capture and digest the different things they eat. Some animals eat only animal flesh. Some eat only plant flesh. Others eat both. They manage food consumption differently, and studying their scats lets people infer much about their lives.

Digestive System Setups

Dogs and cats, like humans, have a basic digestive system designed around single-chambered, or monogastric, stomachs. They depend on highly digestible foodstuffs such as meat. The avian digestive system, by comparison, has entirely different organs like the gizzard, which grinds food like teeth but after the food passes through the stomach.

Ruminants such as deer, elk, and cows have multichambered stomachs that house a complex microbial community to help break down foods like plant cellulose that are otherwise very hard to digest. Pseudoruminants such as rabbits, beavers, and horses eat a lot of plant cellulose, too. But they don't have ruminant-style stomachs. Instead, they have an enlarged cecum, or pouch, at the top of the large intestine. That's where microbes go to work after food passes through the stomach.

The differences between those systems provides context for why scats appear different among various species. Scat varies just as animal tracks do, reflecting a particular morphology that helps us correctly identify the animal that made them.



Making Scat Assessments

To make accurate scat assessments in the field, a few core principles are important. First, it's essential to know the size of the animals likely to inhabit a particular landscape. Lacking that, it's hard to make guesses about who might have made a scat. One of the best techniques is to learn the weight of animals in your area. For instance, knowing that an average mountain lion is often three times heavier than a coyote helps put into perspective the massive size difference in their scats.

Second, the appearance of scats changes depending on diet, time of year, and even weather. This increases the complexity of the interpretation. Third, it's important to understand general scat morphology: the shapes and characteristics of different animal droppings. Lastly, keep in mind that many animals habitually leave scats in particular ways and locations.

Focusing on Deer

Deer are one of the most accessible doorways to the natural world. They're sign-making machines because they eat massive amounts of vegetation, their sharp hooves cut up the ground, they bed all over the place, and they leave plenty of scats—all of which takes a skilled eye to see and interpret.

In ruminants like deer, a slurry of bacteria, protozoa, and fungi break down the plants they consume. The metabolic waste products—the excrement—of those microorganisms are volatile fatty acids that provide ruminants with 60% to 80% of their energy needs. Essentially, deer live on bacteria excrement. And masses of dead bacteria are their primary source of protein, too.

The largest stomach compartment in the ruminant, where food goes first, is called the rumen. This is the container for that microbial slurry. Deer quickly eat as many plants as possible, filling the rumen like a basket, because eating tends to be a vulnerable time. Then they go back and bed down, where the true digestion begins. A rumen chamber is a churning vat of fermenting pulp. Deer intermittently regurgitate wads of that pulp back up into the mouth for a second chewing. This is called chewing cud, and deer seem to be peaceful during it.

Rumens are big, accounting for more than 80% of a ruminant's entire stomach. In cattle, the rumen might hold 30 gallons or more. An average deer can carry 2 gallons or more, and elk many times that. This is also why deer and elk lie in an upright position and not on their sides. They have to stay upright in order to keep things working properly inside.

The digestive process of deer is dynamic, and the appearance of deer scat can change dramatically. Typical deer scats are distinct, oblong pellets. When deer eat particularly succulent vegetation, such as softer plants with high water content, the individual pellets may mush together. In general, the woodier the food source, the more pellet-like the scat will be. But as the moisture content goes up, the scats get softer and amorphic.

Deer scats are great for scat aging—that is, determining when a scat was made. Many deer scats are dark and dry. When fresh, though, they're often a brilliant lime green and coated in mucus. Deer scats change dramatically in size depending on the size of the individual as well. That means every time you find deer droppings, you can consider whether the producer was a large buck, a doe, or perhaps a yearling or fawn.

Dry, pellet-like deer scat

Lagomorph Scats

Sometimes, people confuse deer scats with those of the rabbit and hare family—the lagomorphs. Rabbit scats tend to have a spherical shape. In dry climates, they may look like shriveled raisins. By comparison, typical deer scats are longer and more capsule-shaped.

The consistency of rabbit scat is different from a deer's, too. It's coarser, like ground wood. That's because rabbits are pseudoruminants. They maintain a fermenting process, but that process is not as efficient as that of a true ruminant. Instead, rabbits are coprophagic, meaning they re-ingest their first round of scat. This often occurs at night. The excreted product is clean plant material loaded with enzymes and good bacteria.

Coyotes and Bobcats

Another two North American species whose scats are frequently confused are coyotes and bobcats. Coyotes eat just about anything, including fruit, green vegetation, berries, and acorns. And their scats are easily mistaken for the scats of other animals that feed on the same resources, including foxes, raccoons, and small bears. Coyotes and bobcats place scats similarly, too, as signposts of territorial use and communication. You'll often find their scats in the middle of a prominent travel route, like an old logging road, or where trails intersect.


Bobcat scat

When you find a scat filled with hair and bone, this question will help you determine whether it came from a wild canine or feline: Is the scat ropey and twisted with long, tapered ends, or is it blocky and heavily segmented, with blunt, rounded ends? The first description is typical of canine scats, and the second is characteristic of cats. Cat scats tend to have a more uniform appearance, too. They're smooth and compact.


Coyote scat

Another tip for identifying and distinguishing between scats is to grab a stick and press down on the sample. Wild canine scats are often spongy, meaning you can crush them fairly easily. Bobcat scats, on the other hand, are amazingly dense. A cat's digestive tract might have something to do with that trait. Cats are obligate carnivores, meaning they depend entirely on meat to survive, and they have short digestive tracts. They have a tough time digesting plant material. By comparison, many wild canines are omnivorous.

A Note on Safety

If you're going to investigate scats, keep safety in mind. Wildlife droppings can transmit diseases and parasites, particularly if the excrement came from a meat eater. Don't go picking through scats with your bare hands. Even older scats can pose a threat if you breathe the dust particles of broken-apart samples.

Assignment: Identifying Animals from Scat

For this chapter's assignment, over the next few days, take time to notice the cycle of life all around you. In the woods, look for any scats you can find made by deer, rabbits, carnivores, birds, or insects. Evaluate the size of each animal, what it might be, and what digestive process it uses.

18

Is That a Front or Back Foot? Left or Right?

The most fundamental aspect of track identification is basic knowledge of animals' foot morphology—the design of their feet. Animal design is fascinating. The design of the foot often says something about how a species interacts with the environment. For example, the front feet of the American badger reflect a life of digging. Its toes and foot pads are thick, powerfully built, and webbed for shoveling, with long claws.

Cats versus Dogs

Cats and dogs are good starting points for learning about foot morphology. Cats have protractible claws. Those have led to one of the most common misconceptions about their tracks, which is that cat tracks don't show claws while dog tracks do. However, large dog tracks are often mistaken for those of big cats, like mountain lions.

Just because an animal might have prominent claws doesn't mean the claws will show up in a track, especially on firm ground. Even the large claws of domestic dogs frequently don't show. For that matter, wild canines—such as coyotes and foxes—have dainty, slim claws that ride high on the toe. Therefore, their claws are often nowhere to be seen in their tracks. In fact, the claws of gray foxes are even semi-protractible, and they frequently don't show up.

Rather than focusing on the presence of claw marks, it's more effective to understand the morphology of rest of the track. Dogs and cats have similar foot structures. Both have big heel pads and four large toes that typically register. Both have claws, too, that may or may not show.

But there are a lot of differences to key in on. The single most useful question is: What makes up the majority of the track—the toes or the heel pad? In canines, it's the toes. In felines, it's the large, meaty heel pad.

Canine tracks

Some of the morphological differences reflect behavior. Felines incorporate their front feet in the act of capturing and injuring prey, and the heavy build of their front feet reflects that. Canines' more slender feet are good for traveling long distances in a trot and some light digging.

Dog and mountain lion track

The shapes of the heel pads and toes that make up the tracks of dogs and cats are different, too. The cat's heel pad is trapezoidal, reflecting mass, whereas the dog's is more triangular. The toes of cats are more teardrop-shaped and similar to one another, but dogs' outer two toes are shaped differently from the leading two, and they look a bit like inward-facing triangles.

Tracks' overall symmetry matters, too. A dog's track is nearly symmetrical. But a cat's front paw is built like a human hand. On a human hand, the pointer finger is considerably longer and positioned higher than the pinky. The middle finger is the longest. The front feet of cats are built the same way and are therefore asymmetrical.

Front versus Hind Feet

The front and hind feet of animals are often significantly different from one another. Think about our own hands and feet. We're not the exception among animals—we're more the rule. The ability to differentiate between front feet and hind feet of all animals is a basic tenet of our skill. It helps us make accurate identifications, tell individuals apart, identify gait patterns, and interpret behavior from tracks.

For instance, consider raccoons. Their front feet are a lot like human hands, with a wide, flat palm pad and long fingers. However, their hind feet share more morphological features with human hands. And understanding that is going to completely reshape how you see tracks.

On a human hand, the four fingers all attach in a row at the top of the palm, while the thumb connects much farther down and to the inside. A raccoon's hind foot is exactly the same: It has four fingers attached in a row on top, with the thumb dropped down and to the inside.

Raccoon right front

Raccoon right hind

If you see the thumb of a raccoon's hind foot in a track, you can compare it to your hands to determine if the track came from the right or left hind foot. In contrast, the thumb and pinky of a raccoon's front foot come off the same plane of the palm. They're directly positioned level and opposite one another. All five toes make an even arc.

The ability to distinguish right feet from left feet and front feet from hind feet in a raccoon track helps when identifying other animals, too. For example, the front and hind feet of otters show the same pattern. The thumb and pinky of the front foot come off the same plane. But on the hind feet, the toes are positioned much like you would see in a typical dog track, and each thumb drops down to the inside. If you compare an otter hind-foot track to a human hand and find the thumb, you can immediately tell if the otter's left or right hind foot made the mark.

River otter right front

River otter right hind

Practice: Dogs versus Coyotes

As practice, you can try distinguishing between two species whose tracks are commonly mistaken for one another: a domestic dog and a coyote. Here are some notable traits of coyote tracks:

Coyote right front

Coyote right hind

- The front track of a coyote is sleek, compact, and tidy.
  - The four front toes are shaped the same, and the claws, if they appear at all, are thin, dainty, and bladelike.
  - The claws and the toes all point straight ahead or angle slightly inward.
  - The claws of the side toes often nearly touch the sides of the leading two toes.
  - The heel pad of the front foot is usually longer than it is wide and is fairly symmetrical.
- The features typical of the front track are even more accentuated in the hind track.
  - In a coyote's hind track, the two side toes are tucked closely behind the front two toes.
  - The claws are even daintier.
  - The heel pad often registers only as a button about the size of one toe.

For comparison, here are some prominent traits of a domestic dog's tracks:

- The front track tends to be blocky rather than sleek and oval.
- The two leading toes are oval in shape, but the sides often appear like inward-facing triangles.
- The claws are blunt and thick and can radiate outward rather than pointing straight ahead.
- A dog's front heel pad is often wider than it is long and is typically more asymmetrical than a coyote's, drooping down and to the outside.

Bird Tracks

Bird tracks are everywhere, too. The classic bird track features three toes facing forward and one facing back. This is typical of songbirds and other birds, such as crows, that easily grasp onto branches. But some birds have fully webbed feet, like geese. Some have webbed toes, like coots. Some, like woodpeckers and owls, have X-shaped or K-shaped tracks.

Assignment: Four Animals, Four Sets of Tracks

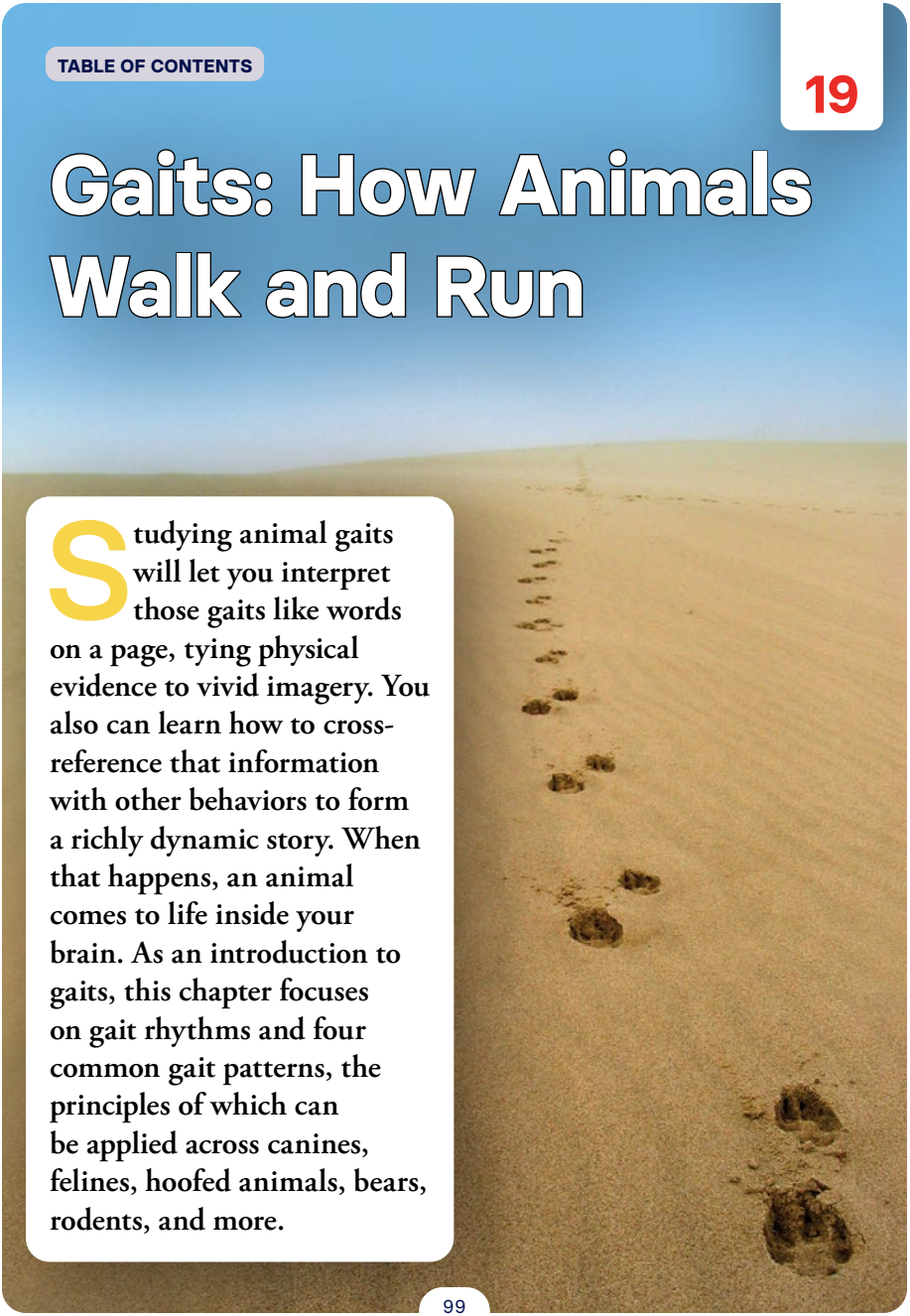
This chapter's assignment is for you to try to find the tracks of four different kinds of animals. The more you look, the more you will find. At first, you'll want to search in places with concentrations of good, clear tracks, such as riverbanks and sandbars, dusty roads and trails, and the protected areas beneath bridges along waterways.

As you search, strive to develop your observations. Practice the basics, like considering how many toes are in a set of tracks, identifying the shapes of pads and claws, and differentiating between front and hind feet as well as right and left feet. The more you ask, the more you'll see—and the more you'll learn. Even if you meet with some frustration here and there, keep in mind that you will learn quickly.

Some trackers like to sketch the tracks they find. Alternatively, you might take some photos so you can compare them to examples in field guides. Even when you can't get out to search for tracks, you can practice identification while flipping through the photographs and illustrations in a field guide.

19

Gaits: How Animals Walk and Run



Studying animal gaits will let you interpret those gaits like words on a page, tying physical evidence to vivid imagery. You also can learn how to cross-reference that information with other behaviors to form a richly dynamic story. When that happens, an animal comes to life inside your brain. As an introduction to gaits, this chapter focuses on gait rhythms and four common gait patterns, the principles of which can be applied across canines, felines, hoofed animals, bears, rodents, and more.

Gait Rhythms

As animals' feet contact the ground, they form rhythms. Walks and trots fall into one category of rhythm, and lopes and gallops into another. Each time you come across a string of tracks, the very first question you want to ask yourself is the following:

- Is the pattern a steady, unbroken rhythm that stays consistent and evenly spaced for long stretches?
- Alternatively, is it a broken rhythm displayed in the form of distinct groupings of four tracks with a gap in between them?

If the pattern is steady and unbroken, the animal was moving at a walk or a trot. If the rhythm of the tracks is broken, the animal picked up speed and was moving at a lope or a gallop.

When four-legged animals such as deer walk, they're often moving in a direct-register walk. The front foot reaches forward to land ahead. The hind foot then comes up and steps right into the spot the front foot just occupied. Hence, it's directly registering. But the position of where the hind foot touches down can change, depending on speed. All of this applies to trots as well.

Analyzing Walks and Trots

Imagine that you've found a series of deer tracks, and you've established that the pattern is a steady, unbroken rhythm. This means you're looking at a walk or a trot. To start determining which, ask yourself:

- Do the tracks make a zigzag pattern, and are they placed fairly close together?
- Alternatively, are they a straighter line of tracks with a longer distance between them?

Gait diagram showing walking and trotting

When an animal walks, the stride is short, and the trail is wide to support the animal's weight at that slow speed. It will leave a zigzag string of tracks. But as soon as the animal picks up speed, their stride will get much longer, and their feet will land in a narrow line.

Evidence of a bobcat's overstep walk

Another tool for walk-or-trot assessments is looking at the distance from a pair of front and hind tracks to the next pair of tracks on the same side of the body. When the animal is walking, that distance will approximate the hip-to-shoulder length of the animal. In a trot, though, that distance will be much longer.

Lopes and Gallops

Imagine that you've now found another series of tracks. These were made by a dog. The pattern makes a broken rhythm—groups of tracks with an obvious space between them. That means you've found tracks from an animal in a lope or a gallop.

When an animal lopes or gallops, the movement mechanics are similar. Imagine a canine running in slow motion. It pushes off the ground with its hind feet, propelling the body forward. The two front feet reach out ahead and land. Then, the body curves at the spine as the hind feet come past the fronts and touch down. The front feet then lift, and the movement repeats.

Lope and gallop diagram

Each grouping of tracks in the resulting gait pattern represents all four feet, which have landed in the same vicinity. The first track in the group of four is always a front foot. And the only difference between a lope and a gallop pattern is that in a gallop, the two hind tracks register ahead of the two front tracks. In a lope, they don't: The pattern is often front, hind, front, hind.

Loping is an easy, relaxed gait, and it's a primary mode of travel for some animals, like otters. Gallops are more explosive, full-out expressions of speed and power. This pattern appears when animals are engaged in excited play, when predators are in full pursuit, and when prey animals are running for their lives.

Variations

Direct-register walks are common when an animal such as a dog, deer, or cat is moving at a mellow pace. But when the animal starts walking faster, the hind foot—which might normally touch down right where the front foot was—drifts ahead of where the front foot landed. This is known as an overstep walk. It's especially common among canines. If you come across a tidy, tightly bunched line of canine tracks, you're almost certainly looking at an overstep walk. In these walks, the foot pattern goes front, hind, front, hind, front, hind. Such walks are common in domestic dogs and coyotes.

Tracks left by a bear's overstep walk

Side trots are a pattern specific to canines. They occur when a dog moves at a trot but angles its body to one side. This occurs so that the feet can glide freely past one another without bumping into each other. You can often see this trot in a domestic dog that has retrieved a stick and is returning to its owner.

On the ground, the tracks from a side trot are well spaced, and each hind track is set ahead and to one side. If you find this in the wild, you can surmise that the animal might have been paying particular attention to something off to the side.

Stopping Patterns

When an animal stops, two primary variations occur in the tracks. First, when the animal pauses mid-step, the front foot comes to rest next to the other front foot, instead of reaching out ahead. This forms a T-stop, the front feet making the horizontal line of the *T* and the hinds the vertical line. T-stops indicate that something caught the animal's attention and caused it to pause to gather information. The front foot may even step outward and point at the direction of attention, or toward something the animal sniffed or nibbled.

Another iteration of a stopping pattern appears when the hind foot that's farthest back steps forward to rest next to the other hind foot. All four tracks form a square, indicating a so-called box stop.

Evidence of stops and pauses tell us that an animal heard, saw, or smelled something that it was interested in. The evidence may also point to where other members of the herd were, or it might indicate fear or curiosity. You can also glean information by considering what happened after the stop. Did the animal continue on at ease, slow down, or break into a trot or lope?

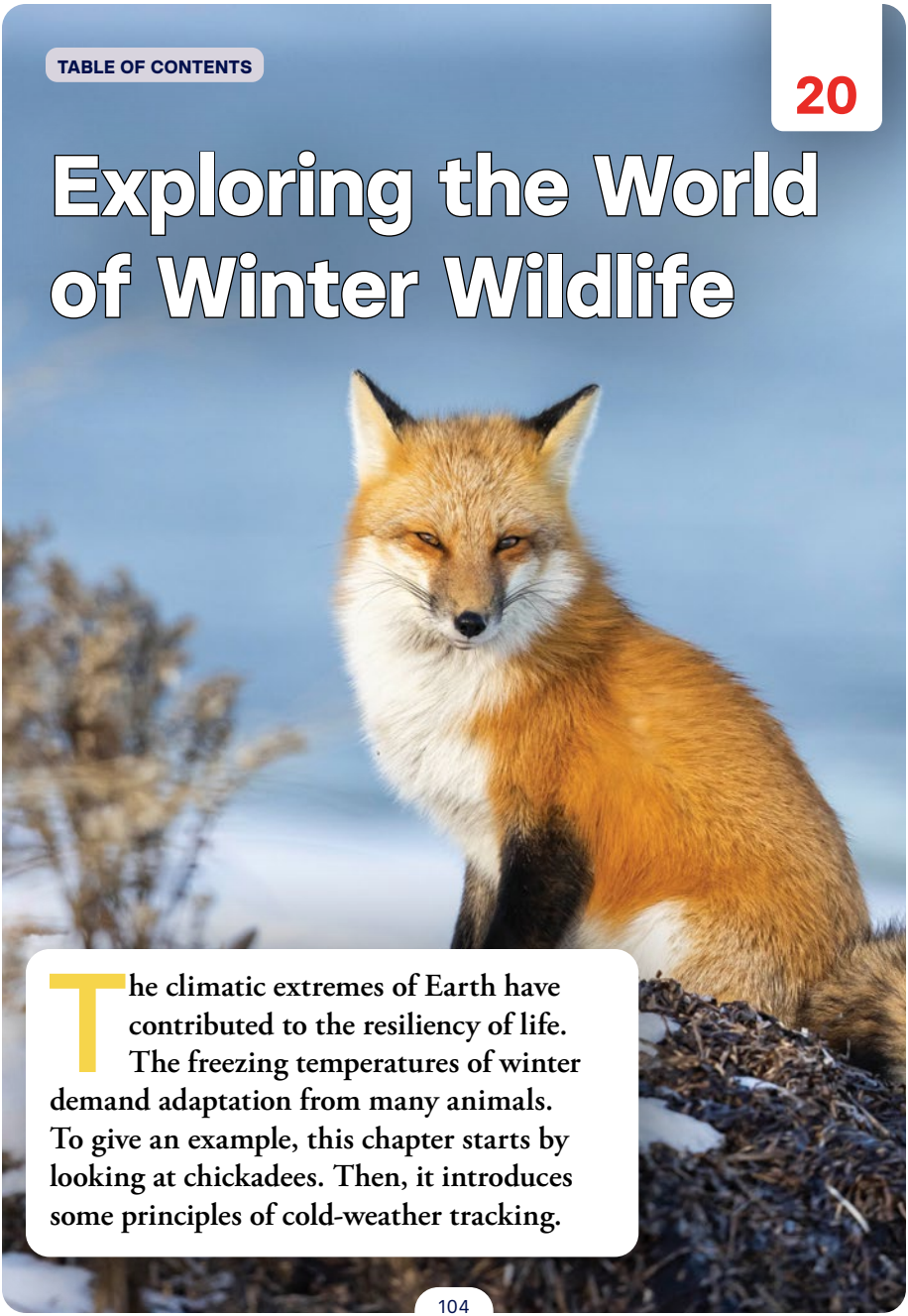
Assignment: Three Gaits

To complete this chapter's assignment, find three different types of gaits. Take pictures of them or sketch them in your notebook. Note the track prints of the front and hind feet. Find the rhythm. Observe the general spacing between tracks and between groups of tracks. Even if you find just one track, build an interpretive narrative of what the gait might have been. How was the animal moving? Where would the other tracks be?

Lastly, observe any animal you see. Watch a cat or dog, the squirrels bounding across the street, crows walking in a parking lot, or any other nearby animal. This is helpful because much of tracking relies on being able to conjure an animal's movement in your mind.

20

Exploring the World of Winter Wildlife



The climatic extremes of Earth have contributed to the resiliency of life. The freezing temperatures of winter demand adaptation from many animals. To give an example, this chapter starts by looking at chickadees. Then, it introduces some principles of cold-weather tracking.

Cold-Resistant Chickadees

A chickadee

Chickadees are famous for their ability to survive long, dark winters. They're curious, tiny birds, and several species live in North America. Those in the far north and at high elevations typically stick around through the harsh winter months. They do a lot to endure snowy northern conditions, which feature 18-hour nights.

A chickadee's body temperature normally registers at about 108° Fahrenheit. It and other songbirds that stick around through the winter months must keep their internal furnaces burning to fend off death by freezing. To do that, they put on large amounts of fat—but not the way a bear does, fattening up in the fall and then hibernating until spring. Instead, chickadees work to fatten up every single day because they burn most, if not all, of their body fuel at night.

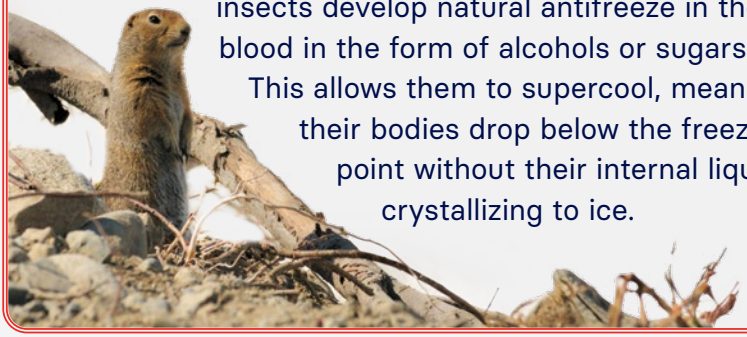
During daylight, a chickadee will dash around in search of food, stuffing itself as much as it can. It gains up to 7% to 10% of its body weight with fat before the Sun sets. It's the equivalent of a 150-pound person gaining (and later losing) about 15 pounds of fat every day. A sizable amount of their winter food comes from insects.

As night settles in, a chickadee squeezes into a cranny—perhaps under a loose slab of tree bark—and enters a state of torpor. Torpor is in some ways similar to hypothermia, where the body temperature drops to dangerous levels. Torpor and hypothermia are both characterized by major reductions in body temperature and metabolism, but with one major difference: Torpor is highly controlled, whereas hypothermia results from an uncontrolled plummet of body temperature and function.

At night, chickadees lower their body temperatures by 12° to 15° and slow their metabolisms. To keep the internal fire going, they shiver. This maintains their body furnace on low, conserving fat stores and energy, allowing them to live through long and very cold nights. And then they start the whole process again, racing about in a mad dash to pack enough fat back on for the following night.

Hibernation

Hibernation is a form of torpor, but it occurs over a prolonged period of time, lasting for days, weeks, or months. Many forms of life utilize this strategy. Some animals, such as arctic ground squirrels, spend three-quarters of the year nearly frozen. Some amphibians and insects develop natural antifreeze in their blood in the form of alcohols or sugars. This allows them to supercool, meaning their bodies drop below the freezing point without their internal liquids crystallizing to ice.



Principles of Winter Tracking

In the winter, there are usually fewer animals around than during the summer. There will be fewer birds, no reptiles, and so on. But the number of tracks that can be seen—and followed—goes up exponentially in the snow. You can focus on the behavior of particular animals, including how much ground they cover, where they go, what they feed on, and where they sleep. If you come across some interesting animal tracks—even if you're not sure who made them—follow the trail as far as you're able to.

Pay attention to trail patterns. The way an animal moves might change depending on how deep the snow is. Moving through snow takes a lot of energy, and energy is precious to a living organism. A long-tailed weasel might change its lope to a strange, tightly spaced bound. Wild canines that often trot—such as the red fox—might be forced to walk instead.

Rabbit bounding tracks

One gait pattern, the bound, is a particularly important one to look for in the winter woods. Bounds are characterized by a compact, boxy grouping of four tracks. The pattern is created when an animal leaps off of its hind feet and stretches forward with the front feet in a flying Superman-like pose. The fronts touch down, at which point the spine curves so that the hind feet sweep past the fronts, land, and push off again.

In snowy areas, try to sort out the sizes of the bounding patterns you encounter. Once you grasp a track pattern and attribute its size to particular species, it becomes easy to distinguish between mice, wood rats, hares, squirrels, and other animals.

It's also helpful to make a list of animals you expect to see in your tracking area. Look for their particular track patterns. For instance, perhaps you'll come across the drag marks typical of walking deer, as they lift and pull their long legs forward in the snow. Raccoons make unique, paired tracks.

Extreme Tracking Conditions

Winter may throw extreme changes in tracking conditions at you. Sometimes snow is deep and powdery. Sometimes it's wet and slushy or crunchy and frozen solid. Each condition affects the way a track appears—and changes—over time. If it was freezing at night, and the snow was hard, an animal passing beneath the stars might have left no trace at all. Once the day warms up, the same animal might leave deep, slushy tracks. Areas in deep shade will stay frozen longer than those in direct sun.

Each time you find a set of tracks, go through a mental checklist based on your understanding of recent weather conditions.

- Were the tracks made in wet snow or when the snow was frozen?
- Have the tracks melted? If so, how much?
- Is the animal you're tracking mostly active at night or during the day?

Assignment: Observing Tracks in Snow

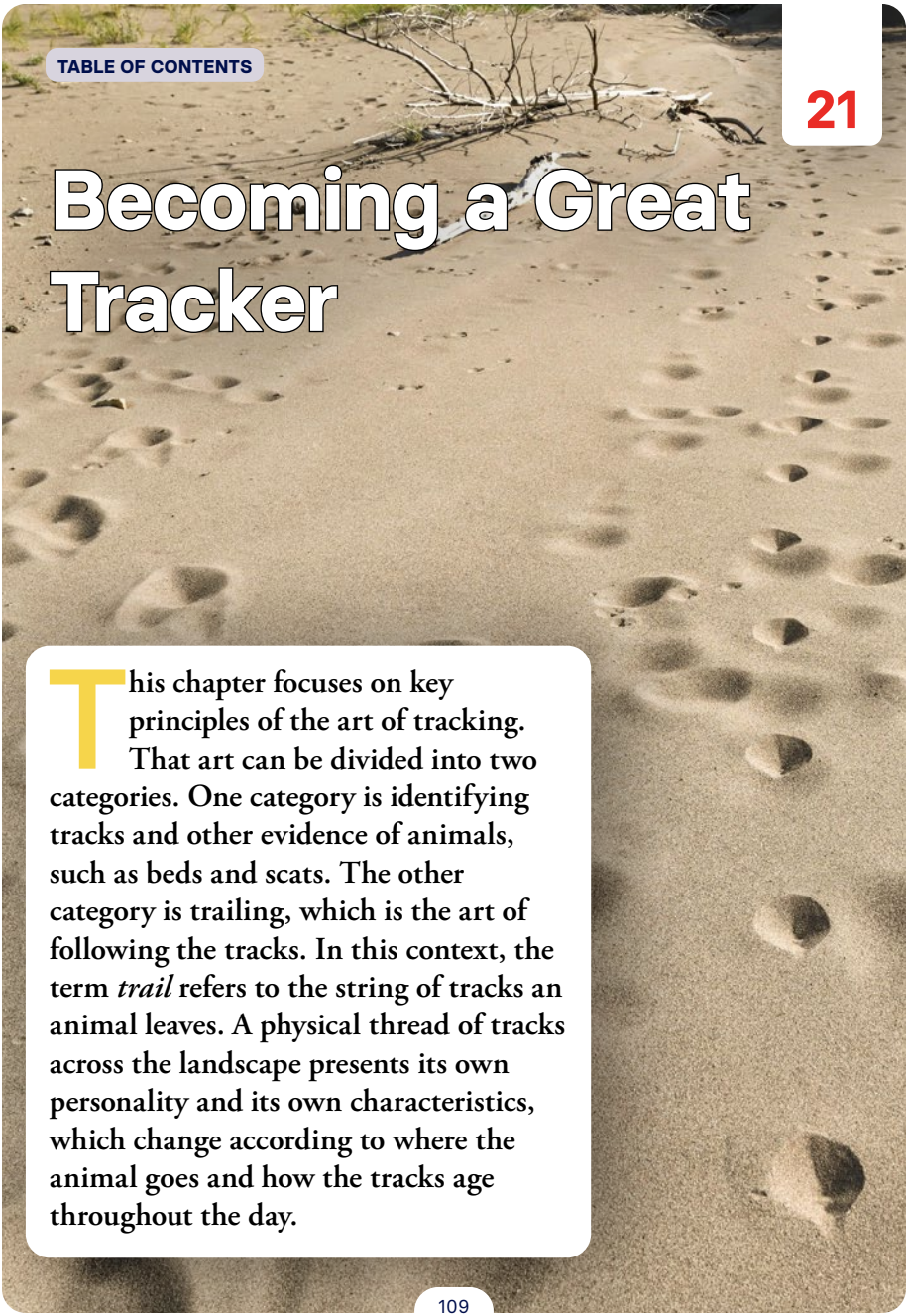
This chapter's assignment is relevant if you're in an area where it snows. When the conditions allow, head out and look for tracks in snow. Follow any tracks you find for as long as you can. Snow provides a unique opportunity to see long stretches of an animal's activity, including where they go, how they move, what they eat, and what interests them.

Look for as many different sizes of bounding patterns as you can find. Try to attribute each to a particular species. You'll quickly learn the gait patterns of common animals in your area. Any unusual or new patterns will jump out at you as likely coming from a different species.

Additionally, try to assess each track set you encounter for when it was made. Lastly, look under slabs of bark and in other nooks and crannies and see if you can find dormant insects or egg cases, as insect evidence is often present but hidden in winter. (Try not to disturb the insects or eggs, though.)

21

Becoming a Great Tracker



This chapter focuses on key principles of the art of tracking. That art can be divided into two categories. One category is identifying tracks and other evidence of animals, such as beds and scats. The other category is trailing, which is the art of following the tracks. In this context, the term *trail* refers to the string of tracks an animal leaves. A physical thread of tracks across the landscape presents its own personality and its own characteristics, which change according to where the animal goes and how the tracks age throughout the day.

Calibrating Your Eyes

Calibrating your eyes for tracking involves tuning in to how tracks look in different substrates you will encounter. Examples include hard-packed ground and decaying pine needles. As your brain learns what to look for in each scenario, tracks will become much easier to see. Even the best trackers calibrate their eyes to every new trail and continue to adjust as the trail changes throughout the day. Your eyes will learn what to see as you go, so be patient with yourself.

You can practice calibrating your eyes wherever there's a small patch of ground, gravel, or some other substrate. Step through it or scuff it with the ball of your foot. Then take a step back and study the track you've made. Take note of how the track looks slightly different from the ground around it. For instance, the track might be darker or lighter, and it might feature twisted or broken material. You can step farther and farther away from it, too, watching how the track changes in appearance.

Porcupine tracks

Gateways

New trackers are often so intent on finding the next track that they fail to look ahead and predict where the tracks are going—and then they lose the trail. To minimize this issue, you can cast your attention ahead to gateways, or obvious routes that the animals have to choose from to move through the landscape. A gateway could be a gap in a brushy area or an opening between densely spaced trees that funnels animals' travel.

By considering potential gateways, you can make educated guesses about which way an animal went. Then, you can move efficiently to where you're likely to pick up the trail again. You can glance around for tracks along the way; however, doing that won't always be your focus. You'll begin to see that landscapes consist of a complex matrix of routes. Your job is to choose the ones that make the most sense for an animal to have taken.

Track Traps

Track traps are patches of ground within potential gateways where you might be able to find clear evidence of a track. Often, the ground or forest floor that an animal is moving across doesn't leave much to be seen. But there are usually spots where detecting tracks is easier, such as a bare patch of dirt or a small ravine that you can see out ahead.

To look ahead for tracks, keep your head up as much as possible. If a tracker's head goes down, their entire universe becomes a small patch of ground, and it's impossible to stay attuned to the surrounding world. When tracks become exceedingly difficult to see, you can shift your eyes closer to your feet, but try to keep them looking out ahead as much as possible.

Anchor Tracks

Even when you're doing everything right, you'll sometimes lose the trail. It's part of the process. This is where anchor tracks are useful. An anchor track is the last known track along the trail that you're 100% sure of. If you lose the trail, you can always return to your anchor to reorient yourself and to assess where the trail could have gone.

Experienced trackers know that keeping track of the trail behind them is as much a part of trailing as moving forward. To put this principle into practice, as you move along a trail, take note of the tracks you're confident of. Look around so that you'll recognize where they're located. Landmarks such as boulders and trees can help you orient yourself as you wander forward and back.

This approach to following an animal's trail is sometimes referred to as systematic tracking. Here's a summary: Continue along the most likely route, and if you don't find your trail, return to your anchor and check other possible routes. Knowledge of the animal and its behavior will help. The more you put yourself inside the mind of the animal, the easier the trail will be to find.

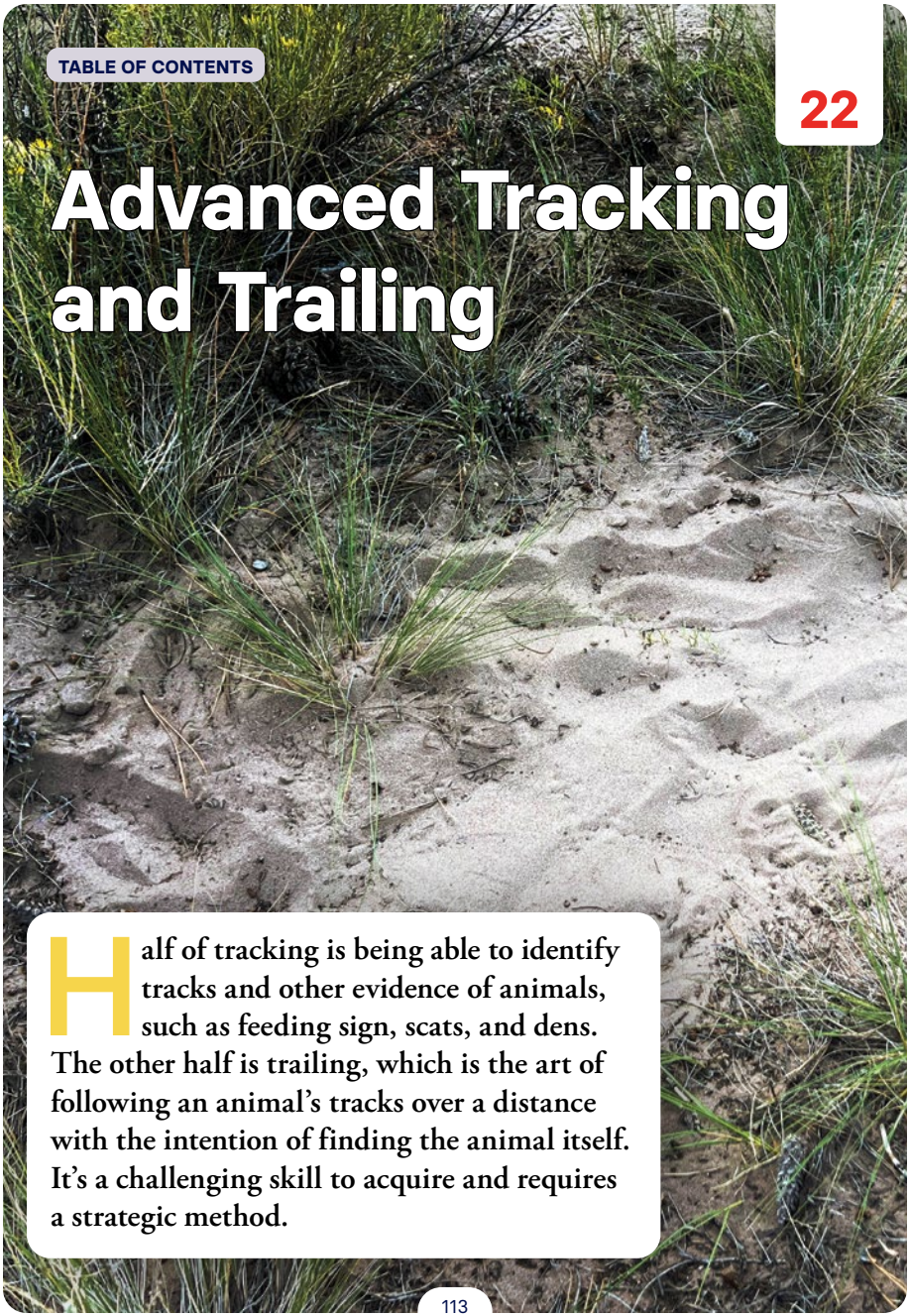
Assignment: Trailing Practice

This chapter's assignment is to practice trailing by going for a walk and then backtracking yourself. A technique called kick-tracking is useful here, and it works this way: As you walk through areas that don't register tracks very well, gently scuff your foot into the ground to create a slight disturbance. It should be barely perceptible enough to challenge your eyes and match your skill.

Once you've covered what feels like a good distance, turn around and track yourself back. You can go as far as you'd like. You can always search for animal tracks as well, kick-tracking along the way where necessary. If nothing turns up, you'll still have a trail to follow simply by turning around.

22

Advanced Tracking and Trailing



Half of tracking is being able to identify tracks and other evidence of animals, such as feeding sign, scats, and dens. The other half is trailing, which is the art of following an animal's tracks over a distance with the intention of finding the animal itself. It's a challenging skill to acquire and requires a strategic method.

Three Principles

To stay on a trail, you should follow three principles. One is to keep your head up as much as possible to look for gateways—obvious routes and pinch points animals choose as they travel. Another is to look for track traps on those routes. Track traps are areas like a patch of bare ground where you might expect to see tracks. This way, you will know what routes to check and where to check for tracks along them.

Lastly, make note of an anchor track—the last known track that you're 100% sure was made by the animal you're following. If you lose the trail, you can always return to this anchor to reorient yourself to alternative routes the animal might have taken.

Losing and Finding the Trail

It's inevitable that you are going to lose the trail sometimes. It happens to the best trackers in the world. However, the ability to stay on the trail is not what sets skilled trackers apart. Rather, they stand out for their ability to find the trail again when they lose it.

Example of a track trap

Think about the potential routes ahead of you like spokes on a wheel that radiate outward from your last known track. Often, three or four routes are likely, though there might be more—or fewer—depending on the terrain.

In the beginning, trackers who have lost the trail will search one route, return to their anchor, and then check the next. If that doesn't turn anything up, they start over. This works well but takes time.

More experienced trackers turn to a more advanced method: Instead of returning to your anchor each time, cut across from one spoke to another, glancing back to find your anchor position to orient yourself. With this method, you can sweep across the area to intersect the line of travel.

Working with the Wind

Another detail to pay attention to is the wind. If an animal's trail leads you to an area where it might be bedded, and the wind is at your back, you need to figure out a way to get the wind at your side or in your face to go undetected. Therefore, you might want to leave the trail and carefully loop around to see if you can spot the animal.


A bear track in mud

As part of this practice, make a habit of continuously monitoring the sensation of air currents on any exposed skin. Build it into your routine so that as you scan terrain, you feel the air on your hands, ears, and face. This provides another sensory layer of experience, which will help you encounter a lot more animals in the woods.

It can also be useful to have a visual indicator of wind direction. If there's dusty soil at your feet, pinch a bit between your thumb and fingers, and let it drop slowly into the wind. However, sometimes the grains might be too heavy and the wind too gentle to tell you much of anything. An alternative trick is to take a pocketknife and lightly scrape the back of one of your thumbnails. The resulting shavings will be extremely light, and they should drift well in the slightest breeze.

Remember, though, that wind swirls around a lot. It's important to familiarize yourself with how the air moves on hillsides and ridges, how it changes at night or in the morning, and how it shifts as the day warms or cools.

Other Evidence

As you move down an animal's trail, it's also important to be aware of any other evidence in addition to the tracks you're following. Animals share the landscape and constantly influence each other's behavior and movement. For instance, if you noticed a bear's tracks earlier, it might explain why the deer tracks you're following suddenly bolted into the woods.

It's important to use your ears. Any sounds around you are part of the larger story. Pay particular attention to the calls of birds and the chatter of squirrels. They can alert you to the presence of an animal ahead of you. And if they're alarmed by your presence, other animals are paying attention, too.

Assignment: Movement

This chapter's assignment will give you a feel for what it's like to move slowly and steadily on an animal's trail while paying less attention to its tracks. Before you begin, take a moment to quiet your thoughts, relax your shoulders, and breathe. Let the quiet of the woods settle in. The idea is to aim for a calm, comfortable, clear state of alertness when you track an animal.

Once you've mellowed out, start to move down the trail, but pay as little attention to the tracks as possible. Imagine you're out for a leisurely stroll, soaking up the natural beauty. Look for signs of other animals. Feel the wind. Let yourself enjoy the region's sights and sounds. Note the routes and track traps ahead.

In time, each element of the practice will become a seamless experience. You'll effortlessly alternate your focus between the winding thread of tracks and the world around you. Even when you're not trailing, these practices can elevate your experience outdoors.

23

What the Beaver Teaches Us about Our Planet

Animals who are members of keystone species are disproportionately influential on other life in their ecosystems. For example, mountain lions leave carcasses on the landscape that provide meals for countless other animals. When a keystone species is removed, rapid changes occur in a particular ecosystem, and there may even be a full collapse. However, research is making it apparent that every species impacts the state and fate of every other species. The importance of each species changes as others are removed. Therefore, any species may be a keystone under the right circumstances. To explore that concept more, this chapter focuses on the American beaver.

Basics of the Beaver and Their Threats

American beavers are North America's largest rodent. They're 50 to 60 pounds of tree-gnawing, dam-building aquatic lumberjack. They're also highly social animals. They have amazing coats of fur that at one time was prized around the world, which led to sad circumstances for them. During the 19th century, hunters' and trappers' rabid pursuits of beaver pelts shaped Americans' expansion across the North American continent. Eventually, slaughter nearly led to the species' obliteration.

Today, beavers are getting more credit for the amazing things that they contribute to environmental and ecological well-being. They are the quintessential keystone species, often referred to as ecosystem engineers because of their outsized ability to alter landscapes and life systems.

Beavers drive ecological change like almost no other animal. For example, they have the ability to transform a forested landscape with a narrow creek running through it into something else entirely: a vibrant wetland loaded with a variety of life forms. Beavers create pond systems by building dams and stemming the flow of water. They cut down trees for food, and the rising water kills other trees. Their ponds collect sediment, and the whole process eventually creates meadow systems and moist, verdant floodplains.

While the early fur trade nearly destroyed beavers for profit, humans have also waged war on their rebounding population. Humans tend to dislike things that challenge their control of a landscape. Beavers can quickly cut down huge trees, fill a creek bed with water, and flood a street or an irrigation ditch. As a result, they're often considered a bane to farmers, foresters, and lawn lovers.

However, the climate is evolving. As that happens, floods, droughts, and fires are becoming more common, so humans have been looking for ways to protect important habitats. Beavers are proving their worth in that regard.

A small beaver dam

Recent research shows that beaver ponds, instead of increasing flood risks, mitigate large floods. They recharge depleted water tables. They increase biodiversity.

Beaver ponds also purify water, trap sediment, create habitats for fish, and spawn new ecosystems in areas that human engineers have struggled to fix themselves. Beavers heal drought-stricken watersheds with relative ease—and without huge price tags. Beavers do incredible things—often better and much faster than people can—if humans just let them do their work.

The Story of Beavers

In a landscape, different signs tell the story of busy beavers, and you can find such signs yourself. A good starting point is their impressive dams. Beavers have an intense compulsion to stop flowing water. The sound of a burbling stream played on an audio recorder spurs captive animals into action.

Beavers cut down leafy trees for food. They lop the trees' tops into manageable sections and eat the bark much the same way that humans eat corn on the cob. This leaves sticks of all sizes lying around, which are perfect building materials. When a beaver finds a spot along a creek where they want to engineer a dam, they'll haul peeled sections of branches and begin to form a wall. As they add to it, they'll dig up mud and pond muck, then pack it between the branches to form a thick, hefty, and impermeable barrier that begins to hold back water. As the water rises, they'll keep adding to the dam, which can become very long. The largest dams span half a mile. On smaller creeks, look for a series of smaller dams, one pond cascading into the next.

Beavers also leave communication signs. Like all animals, beavers communicate through marking behavior. And because they're so social, they tend to mark frequently. Most commonly, they construct scent mounds that serve as message boards.

Scent mounds come in multiple forms. For instance, beavers will collect muddy debris at the water's edge, then waddle onto the bank with it clutched in their forelimbs. They'll pile the debris into a small heap that can range from a few inches to a foot or more in height. Then they'll twist their rear end and tail across the mound, depositing scent. Beavers have anal and castor glands that release a substance called castoreum. This has been used for centuries in perfume and vanilla flavoring. Castoreum has the sweet, earthy aroma of willow bark.

A group of beaver scent mounds

Another example of scent mounds is found in silty substrates, like along a sandy river bar. Beavers will claw lightly at the ground with their front feet and deposit the scent directly onto the freshly dug soil. If you spot one, you'll likely see a few scratch marks and a smooth spot where the beaver dragged its tail over the sand. Once you know what to look for, you'll see this sign everywhere that you find beavers. If you see a lot of scent mounds, you're likely at the territorial boundaries between families.

Lastly, beavers patrol long stretches of riverbank and lakeshore to cut shrubs and trees. They'll grab a few fresh branches in their mouth and lumber back to the water with the foliage dragging along the ground at one side of their body. The marks look as if a leaf rake has been dragged in the sand. You'll often see perfect evidence of a tail drag, too.

Tail and branch marks left by beavers

Lessons from Beavers

Beavers have much to teach people about themselves. Humans are a hyper-keystone species: the influencers of influencers. Humans have completely transformed more than 50% of Earth's land mass for purposes of habitation, agriculture, logging, mining, and other uses. In the United States alone, people have laid 4 million miles of road. It's hard to find a spot anywhere on the planet unchanged in some way by human existence.

As of 1,000 years ago, only about 300 million humans inhabited the entire planet. That means that the number of all hoofed animals—such as deer, elk, moose, bighorn sheep, mountain goats, pronghorn, and bison—in North America alone probably approached the number of all humans worldwide. By the early 1800s, though, the human population hit the 1 billion mark. And in the two centuries since, the population has skyrocketed to nearly 8 billion. People now outnumber all wild mammals by about eightfold. That growth came with plenty of ecological cost.

Yet we are amazing, too. Humans can, and do, effect positive change, such as bringing back many of America's bird species from the brink of extinction. Around the turn of the 20th century, humans had wiped out most white-tailed deer, but today, there are around 30 million of them in the United States. In many ways, biodiversity is a renewable resource if given the right attention and care. But people have to be aware of why diversity of life is important and remember how to see it.

At the same time, there's a depressing phenomenon referred to as shifting baseline syndrome: Each new generation tends to accept as normal the progressively degraded, depleted natural environment that they were raised in because they lack the experience, memory, and traditional knowledge of what the wild world was like in the past. A child who plays at the edge of a fairly lifeless pond in suburbia tends to think that's all there's ever been, and they miss many signs of what other life might still be there. But a few decades ago, the same area might have been a large stretch of undeveloped woods, a place where deer came to drink at that pond, where otters hunted for fish, and where beavers swam, with songbirds singing above.

Individual people might not be able to change the trajectory of the human species alone. But there is one very important thing you can do: You can learn to see the life around you, appreciate its importance, and celebrate it as part of who you are—and as part of what it means to be human. You can join the ranks of a global network of ecological monitors, and—like the beavers—help life along. And the more you know and care, the more you can pass on to others.

You can start in your local area. Pay attention to what animals and birds live around you and what they're doing. Learn what biologists are studying in your area and how you might be able to help. Tune in to local conservation efforts. Consider growing native plant species in your garden. And share with others what you're learning.

The world depends on people like you. As the famous astrophysicist Carl Sagan wrote, "If we do not speak for Earth, who will? If we are not committed to our own survival, who will be?"

24

Testing Yourself: The Wildlife Tracking Exam

In the early 1990s, an organization called CyberTracker Conservation was established to preserve traditional wildlife tracking expertise, which at the time appeared to be in danger of disappearing. The first tracker evaluations were conducted across the Kalahari Desert in South Africa to identify skilled indigenous trackers. Thirty years later, this evaluation process is now the worldwide gold standard for training and assessing professional wildlife trackers. Tracking is an invaluable skill. Qualified trackers are employed to conduct wildlife surveys, assess wildlife corridors, analyze carnivore kill sites, set camera traps, study elusive species, and engage the public in conservation efforts.

CyberTracker Conservation's mission is to build tracking knowledge and integrate tracking as a beneficial skill set for research, conservation, and ecotourism. To that end, the organization has certified thousands of people around the world. To give you an idea of the process, this chapter takes the form of a quiz. It isn't an official tracker evaluation, but it is a good way to see where your knowledge stands now. After the last question, answers follow.

Quiz Questions

1. **Up to 75% of the life-sustaining nitrogen in some forests of the American Northwest appears to come from the ocean. What is the source of this nitrogen?**

   A: salt water

   B: salmon

   C: fungi

2. **What are pinch points, or gateways, that you can look for while following an animal's tracks?**

   A: where the animal stops to feed or bed

   B: where the animal's tracks join those of other animals

   C: natural funnels—such as the opening in a fence or between boulders—that channel the direction an animal chooses

3. **Which of the following methods of camouflage are effective at disguising the human presence in the wild? More than one answer is correct.**

   A: wearing plaid

   B: speeding up on the trail

   C: standing still

   D: acting like you're eating something

4. **What insect made these tracks? And what direction was it moving in?** ↓

5. What annual mileage does the blackpoll warbler often cover?

   A: 4,000 miles

   B: 8,000 miles

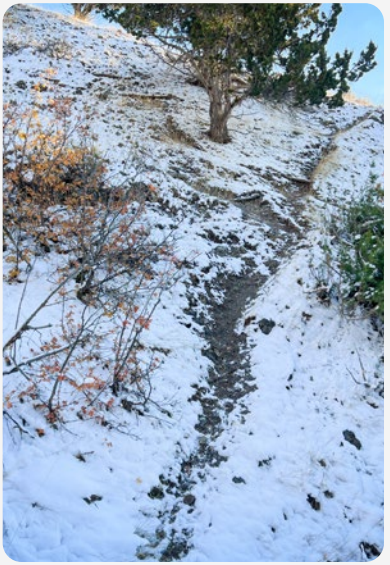
   C: more than 12,000 miles

6. In analyzing the anatomy of a bird feather, can you identify the calamus? The rachis? The vanes?

7. This is a flight feather from a bird wing. What kind of bird did this feather came from? Is it a primary or a secondary feather? And what wing type does it represent: the elliptical wing, the high-aspect-ratio wing, the high-speed wing, or the slotted high-lift wing? ↓

8. What is the single best question to ask yourself to determine whether a track like this belongs to a dog or a cat? ↓

9. This is an old deer trail. What characteristics distinguish a game trail made by a hoofed rather than a soft-footed animal? ↓



10. This is an array of rows of little holes—sap wells—neatly drilled into the trunk of a tree. What made the holes on this tree trunk? And what are they for? →

11. How many types of bird nests can you name?

12. Which animal's nest is this? What can you observe about its construction? →

13. What are the most important factors to consider in making an accurate assessment of when a track was made? (This is the skill known as track aging.)

14. Is this bird relaxed or agitated? ↓

15. Is this bird relaxed or agitated? →

16. In this image of the night sky, is the Moon waxing or waning? →

17. In this deer bed, how was the animal's body positioned? Where was the head located? Where was the back of the animal? ↓

18. This is a series of large circular spots worn into the forest floor. Each is about 8 to 10 inches in diameter. What animal do you think made them and why? ↓

19. What do the grooves that run the length of this deer antler represent? ↓

20. Can you distinguish deer scat from rabbit scat? Describe the differences.

21. Is this the scat of a bobcat or a coyote? →

22. What do the shape and size of a burrow tell us about the animal that dug it?

23. Imagine you've come across a string of evenly spaced coyote tracks that are set close together. The tracks appear in the following pattern: front, hind, front, hind, front, hind. What gait does this represent? ↓

24. Imagine you're out in the snowy woods, and you've come across a fresh trail, made up of boxy groupings of four tracks with distinct spaces between groups. Describe this gait pattern. What gait is it? And why is it important? →

25. List two reasons why it's important to focus on more than the ground in front of you. For a stretch goal, list three.

Quiz Answers

1. The answer is B: salmon. When it's time to spawn, salmon navigate back to their creek of origin—sometimes hundreds of miles—to breed and die. Their carcasses decay into the creeks and are fed on by other animals. The nitrogen and other nutrients gathered in the ocean are then passed along mycorrhizal, or fungal, networks and cycled into plant and tree life.

2. The answer is C: natural funnels.

3. The answers are A, C, and D. Plaid works well for disrupting the human shape. (The earth tones of a deer are another good choice. An example outfit is an olive-green hoodie and gray or beige jeans.) As for standing still and eating something, the former is good because speeding up might draw attention from animals, and the latter is good because acting like you're eating something disguises the reason for your presence.

4. These are the tracks of a ground beetle that moved from right to left. Beetles have three feet on each side of the body, and each foot lands in the same spot, leaving groupings of three footprints. The beetle's tracks are like arrows pointing in the direction of travel.

5. The answer is C: more than 12,000 miles.

6. The calamus is the quill. The rachis is the shaft. The vanes are the webs on either side of the shaft.

7. This feather came from a Canada goose. It's a primary wing feather—responsible for propulsion. And it's a slotted high-lift wing type. The flight feathers of geese, eagles, and herons are similar to one another because they each share the slotted high-lift wing type.

8. If you're thinking of the physical animal rather than its footprint, the answer is counterintuitive. A common mistake is to look for the presence—or absence—of claws on the track. But dog tracks commonly

don't show claws. Therefore, the question you should ask yourself is: Does the majority of the track consist of the heel pad or the toes? For dogs, the answer is toes. For cats, it's the large, meaty heel pad.

9. Trails made from sharp, hard hooves appear to have been cut or chopped into the ground over time. They often have steep, well-defined sides. Trails made by the pads of soft-footed animals tend to be smoother-bottomed, with gentle, sloping sides or no sides at all.

10. This is the sign of a sapsucker. Sapsuckers are a type of woodpecker and create these sap wells to feed on tree sap. They slurp up the sugary liquid and also eat the insects drawn to the wells. Woodpeckers are important because the tree cavities they create to raise young are subsequently used by dozens of other mammal and bird species.

11. This question is open-ended, but some common nest types are the cup nests made by robins; platform nests, like those of the American coot; pensile nests, like orioles', which are suspended in the twigs of trees; magpies' domed nests; woodpeckers' cavity nests; and kingfishers' burrow nests.

12. This is the nest of a cliff swallow, common across North America. These nests are built solely of mud. Cliff swallows are master masons. They carefully build their nests to last, layer by layer. When you see one of their nests in winter, you are seeing evidence of an animal that is currently in Brazil or Argentina.

13. The most important factors are weather, substrate and location, and animal behavior.

14. This bird is relaxed. She's alert, but there's no tension in her body. She's grooming her feathers while casually keeping an eye out.

15. This bird is agitated. Notice the craned neck and the sharply directed focus.

16. This Moon is waxing. Look at the spherical side—the clear, illuminated side without Earth's shadow. If it's rounded like the letter *p*, the Moon is "pregnant," or waxing. If it's rounded like a lowercase *d*, then the Moon is "diminishing," or waning.

17. The two rounded marks made by the deer's wrists (also called knee marks) indicate where the head of the animal was. The curve indicates where the back of the deer was.

18. This is the habitual marking trail, also known as a stomp trail, of a black bear. It's one way that bears talk to other bears in the area. Marking trails signify something important, such as feeding and bedding areas, wallows, and marking posts where they've bitten, clawed, and rubbed nearby trees.

19. The grooves were blood vessels that fed the antler when it was alive and growing.

20. Deer scats are typically capsule-like, whereas rabbit scats tend to be spherical. Keep the quantity of scats in mind, too. Deer have a different digestive system than rabbits, and they often leave larger piles and quantities of pellets.

21. This is bobcat scat. The typical scats of wild canines that have been eating other animals are ropey and twisty, with tapered ends. Feline scats tend to be blockier and heavily segmented, with blunt ends.

22. The shape and size of a burrow often reflects the body shape and size of the animal that dug it. For instance, the den of a long-legged coyote and the burrow of a kangaroo rat often have entrances taller than they are wide. On the other hand, the short, squat American badger often has a burrow that is typically wider than it is tall. The same goes for lizards. Such information is useful for identifying many other burrowing animals, including insects.

23. This is a classic overstep walk common to coyotes and other canines as well as mountain lions and bears. It's immediately recognizable once you learn the pattern. It signifies a fast walk as the hind foot steps past where the front foot landed.

24. This is a bounding pattern—a set of four tracks wherein the two front feet are typically positioned behind the two hind feet. By discerning between the various sizes of bound patterns you come across in winter woods, you can identify a wide range of species, from deer mice to squirrels to hares. This is possible even if the tracks themselves aren't clear.

25. First, you're establishing the location of your anchor tracks to work back to if you lose the trail.

Second, you're looking for gateways—the most likely paths an animal takes to pass through the woods.

Third, if your head is down, you might miss the animal itself.

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