

Discoveries

News & views from Discovery Southeast

Winter 1996

Under the snow

Kathy Hocker

Subnivean (sub-NIV-ee-an): pertaining to the world beneath the surface of snow

Our Southeast Alaskan mammals have a number of different strategies for dealing with winter. Three—marmot, jumping mouse, and bat—find sheltered spots, settle down and allow their body temperatures to drop to just above freezing; they are our only true hibernators. Some—such as bears—go into a torpor but do not undergo this radical, controlled hypothermia.

Many mammals, however, remain active throughout the winter. Of these, some are snow surface dwellers: predators like lynx and wolves, and prey animals such as snowshoe hares. These feed, hunt, and rest on top of the snowpack.

Some, such as moose and deer, have difficulty walking on deep snow and must wade through it. Some mammals take advantage of the subnivean environment. These are the mammals we rarely find many traces of beyond an occasional tunnel entrance, and we may forget their presence. But the cool, dark, silent world of the subnivean in Southeast Alaska is an eventful one

The short-tailed weasel emerges from the cover of the spruce tree and pauses. Snow fills the clearing; it reaches two feet up the surrounding evergreens and weighs heavily on the branches of the alders and willows. A few snowshoe hare tracks dot the firm surface, and some of the willow tips are nipped off, but the weasel can smell no hares now. She shivers once and begins to move again. The air is crackling with cold—it is almost twenty

below—and her body is so small that she must move almost constantly to keep from becoming hypothermic.

She is little more than bone, muscle, skin and blood at this time of year. Hunger is a constant agony. She bounds across the snow, edging around the clearing and leaving a trail of diagonally- paired tracks. She searches the familiar territory of her hunting route, but she smells no prey. Something in the way the air moves warns her of danger. She leaps to the side and is showered with snow as something plunges down through the surface a whisker's length away. In the moment before she bounds to the shelter of a tree, she catches sight of fierce round eyes and a hooked beak. From relative safety she watches the owl heave itself out of the snow and wing silently into the treetops.

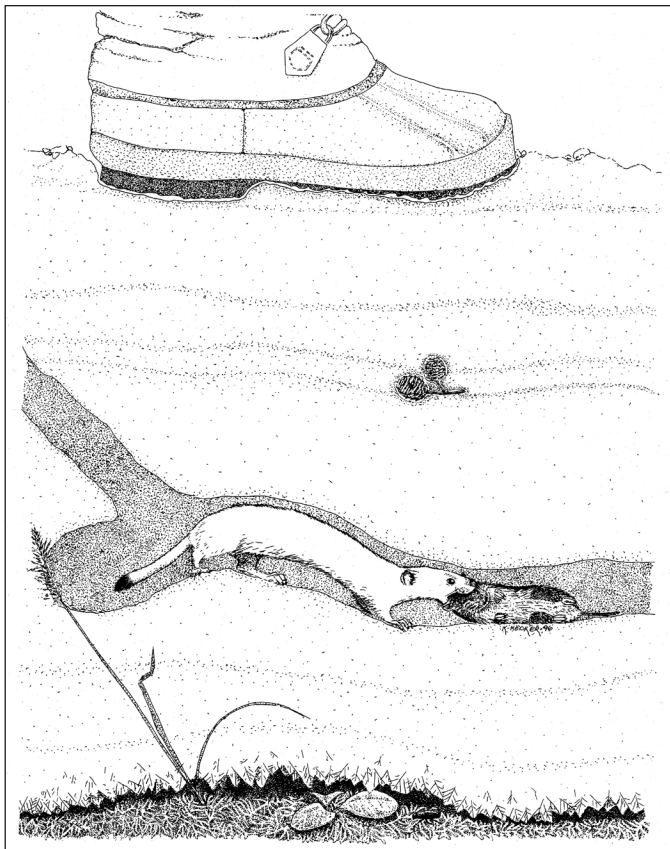
Half an hour later, as the sun rises, her body is still humming with fear from the encounter. She is running closer to the edge of the evergreens when she catches a scent that stops her. After a few moments of exploration



In this issue

Under the snow.....	1
Naturalist profile: Steve Merli.....	3
Winter tracking	4

Banner: Are you wondering whose footprint is pictured above? Ask any 4th grader in Discovery's Nature Studies Program. They'll tell you the only local beach track with 5 webbed toes belongs to river otter.



she finds the source: a hole in the snow surface. Relatively warm air is pouring out, and it carries a scent of earth, hair, and blood. She dives into it. Partway down, she cuts away at an angle, swimming through the soft snow and working her way downward. As she descends, the light dims.

At depths of over a foot in the snowpack, only 1-to-5% of the surface light penetrates. Even though the sun has risen above and the light in the clearing is dazzling, the weasel travels through near darkness. But as the light dies, the temperature increases. Although the outside air temperature is below zero, the temperature near the bottom of the snowpack is almost 25°F above. In human terms, 2 feet of fresh snow is better insulation than 2 feet of fiberglass! Even older snow is excellent at holding heat in.

The weasel bursts through the last inches above the ground, surrounded by the tinkle of breaking ice. She is in a kind of chamber at the base of the snowpack. Its floor is moss and its low ceiling is made of millions of large, delicate ice crystals that break as she brushes against them. She knows that this chamber is not excavated by any mammal, because there is no strong scent, so she moves on through it, sniffing.

The cause of the opening is the temperature differential between the bottom and the top of the snowpack. The metabolic warmth of decay in the soil (same process that makes compost piles steam in cold weather) causes crystals of snow just above the soil surface to *sublimate*: to change from the solid (ice) to the gaseous state. This water vapor then diffuses upward through the snowpack. The resulting empty spaces just above the soil are important passageways for the regular subnivean dwellers and for hungry weasels.

She has caught a strong scent now, and pushes her way through the dimness toward

Board of Directors

Lynn Humphrey, *President* • Bruce Gifford, *Vice President* • Linda Van Houten, *Secretary* • Carol Griffin, *Treasurer* • Bob Briggs • Annie Calkins • Stephanie Hoag • Bob Janes • Susan Jordan • Connie Keithahn • John Lindback • Catherine Pohl • Joe Powers

Staff

Executive Director: Susan Goes • **Program Director:** Kristen Romanoff • **Naturalists:** Richard Carstensen • Kathy Hocker • Steve Merli • Clare Pavia • Greg Streveler • Janice Troyer

Editor: Susan Goes • **Writers, illustrators:** Richard Carstensen, Devin Hibbard, Kathy Hocker

the source. Under her feet, moss and broad round leaves of pyrola are resilient and alive. Because they are able to partition the formation of potentially deadly ice crystals in their tissues, these evergreen plants are able to survive through repeated freezing and thawing cycles above the snow. Here in the subnivean they thrive in the relatively warm climate and are even able to photosynthesize, using the little light that penetrates. They also metabolize their stored sugars and starches to create new buds, ready for thaw. But the consequences of their metabolism (combined with the respiration of the mammals under the snow and the bacterial decay) may be dangerous: carbon dioxide formed can sometimes be trapped, and levels of it in the subnivean air may become excessive. The tunnel the weasel entered from may have been excavated by a vole as a ventilation hole.

The weasel has found the source of the smell; it's just ahead. It's a roundish ball of grass and fibers that smells powerfully of prey. She jumps forward and bursts through the side of the nest into a warm chamber which is lined with the down feathers of a winter-killed magpie. It's empty. After searching in the darkness for a few seconds, she heads out into one of the nest's exit tunnels.

The nest belongs to a red-backed vole, one of the weasel's most important winter prey species. Voles (which look like round mice with short tails and small eyes) do not hibernate. Once a snowpack has been established, they move out of their summer burrows and construct nests on the ground surface. Throughout the winter they work constantly beneath the snow, creating elaborate tunnel systems leading to food sources. While they are not ordinarily social animals, some evidence shows that they may make communal nests with several voles sleeping together for warmth. Other small mammals have similar winter strategies: deer mice stay active under the snow, as do shrews.

For any of these tiny mammals, the presence or absence of snow in the winter is a matter of life and death. Snow protects them from temperatures that can easily kill them, and provides a refuge from many of winter's hunters, such as owls and lynx.

But the weasel is as much at home in the subnivean as are the small prey she hunts. She has moved along the well-packed tunnel for several yards now, and the scent of the vole is maddening. She squeezes around a corner, and a sharp smell causes her to stop: the vole paused here to catch and eat a spider.

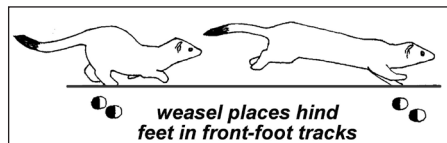
A few more steps take her past an upward-slanting tunnel. She smells in it a snow-buried alder cone, now stripped of its seeds.

She is close now, and pauses to listen. Scratching sounds ahead tell her the vole is only a couple of feet away. She moves slowly forward until she is sure of the distance, but she is not a stalking predator—she relies

mostly on speed and surprise. She runs forward the last few inches and pounces. Her front paws knock the vole over and in the moment before it can right itself, she catches it behind the head. For her size (she weighs less than 5 ounces) her jaws are extremely powerful. She breaks the vole's neck with one bite.

Although she is capable of carrying the vole a considerable distance, she does not need to—it is safe to eat here. She consumes the whole animal—bones, skin, and fur—and licks the tunnel floor. Her hunger has calmed. She follows her own musky scent back to the vole's nest, where she curls up to rest.

In an hour she will wake, hungry again.



Naturalist profile: Steve Merli

"Where the oceans and mountains meet is a very powerful place" comments Discovery Foundation Naturalist Steve Merli. "Living here on the edge of the continent makes us 'Edge People' and gives us a unique opportunity to discover the wildness around us and in us."

Helping children discover this wildness is what Steve does with his Nature Studies classes at Glacier Valley Elementary School. Now in his fifth year as a Discovery Foundation Naturalist, Steve brings a rich background in biology and earth science to his work. A Southeast Alaska resident since 1981, Steve grew up in New Jersey and Kentucky and received a B.S. in Recreation and Park Administration/Environmental Education from Eastern Kentucky University as well as a secondary science teaching certificate from the University of Montana.

As he walks into a classroom, Glacier Valley fifth graders swarm around him: "Hi Mr. Merli." "Mr. Merli, Mr. Merli, look what I made!" Smiling like a brazen film star he greets the kids and heads to the front of the room. Minutes later, 27 school children are spilling onto the Jordan Creek trail behind their leader.

"Nature Studies gives kids an opportunity, or at least an invitation, to take a look at a world that is outside of human endeavors," says Steve. In his classes students learn about science by relating it to their own lives. When kids, tromping through the woods, come across a bear track, they are instantly more alert. "That track says 'come in'—come back into your body and be more aware. You, too, are a part of this land, this earth," Steve explains. "Video games and malls cannot ask us to participate with

ourselves or our environment in this way."

Beyond the satisfaction of sharing nature with kids, Steve's work includes unusual job benefits: *"I know the way the stream runs in different seasons. I can climb the same tree several times a year and watch porcupines wander through"* When asked which animal he is most like, he breaks in before the question is finished and says *"mountain goat."* Then he pauses and explains. *"They live in steep places on mountain sides in terrain that I'm well suited to. And I am built like one: short, stocky, good balance."*

Just before class ends, Steve offers the kids some advice about putting their Nature Studies lessons into practice: *"Everyone should take a hike at least once a month to a place that gets you away from the sound of people. When you get there, sit down for a few moments and be totally still. What do you notice?"*

Helping children learn how to observe is a key element in Steve's—and all the Discovery Foundation's—Nature Studies classes. So, the next time you explore the Jordan Creek trail near Glacier Valley school and encounter a group of 10 year-olds being absolutely quiet, you'll know that Steve Merli was there first!

Steve with son Lucas
Richard Carstensen, 1993



Winter tracking

Richard Carstensen

It's 5° Fahrenheit. Waist-deep snow covers sedge meadows bordering a frozen creek. Patchy spruce forest on uplifted tidelands frames the meadows, enclosed in turn by hemlock old growth. Just upstream from the estuary, this is the encrypted site of an annual late-summer spawning frenzy, but in January you'd be hard pressed to prove it. Perhaps the sharp-nosed carrion seekers are still rooting pieces of salmon from the drifts.

A naturalist friend has recommended this place for a teachers' workshop on tracking and sign interpretation, and it's everything he promised. Overlapping trails of weasel, mink and otter braid back and forth down the powder-coated creek ice. Deer mice and masked shrews have dashed between outlying spruce saplings, signing their names with drag marks of long tails. Our bundled line of teachers sluffs along on crosscountry skis, studying beaver-gnawed willows and admiring the flayed wing prints of launching ravens. The skin of soft 2-day-old flakes over wind crust makes a fantastic 'chalkboard' revealing even the individual toe prints of mice in choice crannies.

We ski up into the forest to see how the larger rodents have fared through this cold spell. Cones peeled by squirrels and spruce twigs nibbled by porcupines litter the floor. Then comes our planned climax, my friend's most exciting discovery, saved for a class puzzler. Round prints 4 inches in diameter



Mink tracks in damp sand

with indistinct toes form a walking pattern with 14-inch stride.

A big animal, but it barely indented the snow. Lynx! Although snowshoe hares—the prey of choice—seem absent this year, the lynx has hunted along the creek for the past 2 weeks. We follow the trail, trying to learn what it's been eating. Squirrels? Voles? Weasels? Playing with these questions, we retreat to the warmth of our car heaters.

If you know Juneau really well, you may recognise the above location. Of all places I scouted within short distances from a road, it had the greatest diversity of sign. Certainly all the desirable habitat features were present: stream, elaborate intermingling of meadow and forest, closeness to the sea. But what it lacked was just as significant. My friend who lives nearby and often skis here has never seen tracks of domestic dogs and cats in this area, and he'd like to keep it that way. He'd kill me if I named it.¹

Tracking field trips are a major part of our Discovery Southeast Nature Studies program. Each winter we lead hundreds of children into the woods in search of the traces of wild animals. Because our field sites include many of Juneau's favorite hiking and skiing destinations, our naturalists have frequent opportunity to compare sign densities of wild and domestic animals. Within range of cats from nearby houses, mouse, wren and weasel tracks are scarce. Where dogs accompany skiers it's hard to find sign of anything but squirrels and porcupines. A hiker with even a well-behaved dog may have more impact on wildlife than a

¹ PS 2010: On subsequent winter visits I found much more dog activity here, and correspondingly diminished diversity of wild animal sign.

	Methodist Camp	Mendenhall Rec Area	Fish Creek	Jordan Cr Trail	Duck Creek
weasel	●	●	●	◇	◇
mink	●	●	●	◇	
otter	●	●	●		
marten	●	◇	◇		
lynx	◇	◇			
bear	●	●	●	●	
wolf	●	●			
deer			●	◇	
beaver	●	●	●		
porcupine	●	●	●	●	◇
muskrat	◇	◇			◇
squirrel	●	●	●	●	◇
mouse/vole	●	●	●	●	◇
hare	●	●	●	◇	

party of 10 people. It's no bureaucratic whim that excludes dogs and cats from wilderness trails in all National Parks. Yet in our own backyards a cat can legally kill a songbird that a person could be fined for possessing.

These days I do a lot of backyard tracking. My Water Watch job has assigned me 2 years of *unnatural* history homework on Duck Creek, Southeast Alaska's most developed watershed. Interweaving roads and driveways, loss of forest cover, and intense human and pet activity preclude most wildlife from the creek margins. Tracking on Duck Creek—where 10,000 chum salmon once ran all

Mammal sign at some of Discovery's tracking sites.

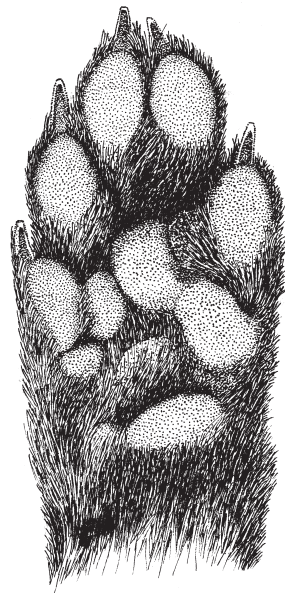
● = sign seen regularly. ◇ = recorded but unusual. The most depauperate site—Duck Creek—is overwhelmed by human and pet activity, and isolated by roads. The most diverse site, Saturday Creek beaver marsh system at Methodist Camp, is off trail, and rarely visited by people with dogs.

[PS 2010: I created this table in 1996, and there have been a few changes in animal abundance over the intervening years. Deer have increased near roads throughout the CBJ, and tracks can now be found regularly at all sites except Duck Creek. Muskrats appear to have declined.]

the way up to today's Taku Boulevard—I yearn for a more nature-literate public; a community who welcomes its full complement of wild neighbors, or at least notices when they're missing.

Contact with wild things is a basic human need, but that contact is usually unsavory to the recipients of our affection. Tracking and sign interpretation can be a beautiful way to respect shyness. Beginning trackers may dream of following a deer to its bed, but are soon distracted by the stories in the tracks themselves. Fluent trackers even use their skills to politely avoid some wildlife encounters.

People and wild things *can* share wild land. Conservation grows from considerate, educated curiosity, a dash of guilt, and for inspiration, a few well-spaced jolts of awe. One or two close-up bears or orcas per lifetime is all the nervous system really wants. Two summers ago, a large male mink nearly ran across my lap as I hunched under a rain-hammered tarp on the beach fringe. In my memory he has the momentum of a flung anvil, an unholdable wildness. From now on, all I need are mink tracks.



← 1 1/4" →

Feet of mink and other members of the weasel family have 5 toes, but the little toe often fails to register in the track. In tracks showing only at the 4 larger toes, you might confuse it with a dog or cat print. Notice, however, that the pad is more asymmetrical. Compare with mink prints in sand on preceding page.