

The Subnivean—the world beneath the snow

by Candace Ward

Beneath the thick snow exists an active, unseen world to our human eyes. Called the subnivean meaning “under the snow,” this area exists as an air space above the ground’s surface and below the snow pack.

Warmth from the ground melts the insulating snow above it. As water vapor freezes on the under-surface, small tunnels usually no more than 2 inches high are formed. The temperature in these snow tunnels remains above freezing even when outside temperatures drop to subzero digits.

The subnivean world is a cozy, winter home for mouse-like voles. Grass, leaves, roots, mosses, lichens, fungi, and seeds are all abundant beneath the snow. Voles gather these foods and store them in chambers carved out of snow. They also construct separate sleeping compartments with grassy nest-like beds.

Tiny shrews, small insectivorous mammals somewhat smaller than voles, create subnivean snow tunnels too. Naturalist Dr. E. W. Wilson once traced a subnivean shrew tunnel that was over a mile long on the Yukon River.

Shrews have one of the highest metabolisms of all mammals with heart rates of up to 1200 beats per minute. These small creatures hunt for mites, centipedes, spiders, and beetles in the unfrozen ground beneath the snow. Shrews must daily consume the equivalent (depending on the species) of one to three times their body weight. If they don’t find enough insects and other invertebrate prey, they will kill and eat voles or other shrews to satisfy their high energy needs.

Have you ever noticed in spring after the snow melts away the numerous small trails that traverse your lawn? These trails created by voles and shrews are the first areas to green up in our lawns having been aerated and fertilized by their passage.

The small predatory ermine enters subnivean tunnels created by voles and shrews and once inside hunts them. A host of larger predators like martens, foxes, coyotes and owls depend on voles, shrews, and an occasional ermine for winter food. These hunters use keen hearing and smell to locate their small prey and pounce through the snow to capture it.

Resident birds also use subnivean spaces for pro-

tection against cold. Redpolls and chickadees congregate in pairs and groups beneath the snow maintaining precious body heat. Larger birds including ptarmigan and grouse will submerge their bodies in snow to insulate themselves while resting. They often keep their heads above the snow to watch and listen for predators like hawks and owls.

One of the most remarkable subnivean creatures in Alaska is the 4.5 ft., 200 pound ringed seal of the Arctic Ocean. Ringed seals build subnivean lairs in snowdrifts to insulate themselves from extreme cold. As snowdrifts form in winter, ringed seals hollow out lairs in the snow adjacent to their breathing holes. Air temperatures in these chambers range between 20 and 40°F. while outside temperatures may be as frigid as –60°F.

There may be several dens in a single drift. Pregnant females construct the most elaborate lairs with multiple chambers. In April, they give birth to their pups and nurse them inside these hideaways. Young pups mimic their mothers by digging snow tunnels expanding their elaborate subnivean world.

Polar bears use their excellent sense of smell to sniff out pups in snow chambers. They dig furiously for seal pups hoping to catch them before they can escape through snow tunnels to the ocean under the ice. Arctic foxes follow polar bears feeding on whatever scraps the bear leaves behind. Occasionally, in soft snow conditions, arctic foxes have successfully invaded dens and taken pups on their own.

Humans may have been originally inspired to build igloos and snow shelters by observing the lifestyles of our subnivean animal kindred. Next time you are out in the snow, take time to observe subtle subnivean activity. Look for small holes in the snow, tiny tracks, and raised snow tunnels. Who knows what you may learn from the subnivean that could help you in a winter survival situation?

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