

High up in the mountains, where the treeline of subalpine fir and Engelmann spruce begins to peter out and the alpine meadows start to form, there is a well-trodden path that follows the green swath of a snow avalanche tract.

On a warm summer's morning the first creatures on the path are a grizzly bear sow and her two cubs. They have been searching for alpine flowers and any hoary marmots that they could dig out of their burrows with their long claws.

The cubs frolic and play all the way down the path, but always under the watchful eye of their mother. One "huff" will bring them scampering back to safety if the sow spots a nasty and hungry old male. He would not hesitate to make a meal of one of her cubs.

A few of the young marmots follow the bears down the path seeking other marmot colonies where they can breed. They are careful to get under the cover of the forest when a golden eagle sweeps by or a wolf appears over the ridge.

Coming up the path is a family of mountain goats. They are returning from a salt lick down at the bottom of the valley to their homes up in the cliffs above the meadow. Rocky mountain bighorn sheep watch cautiously from above. They wait until the grizzlies have moved on to descend into the meadow to graze.

Pikas squeak defiantly at the bears, and then scurry down to the treeline to feast on the black huckleberries and black gooseberries. They know to avoid the false azalea or fool's huckleberry that looks tasty but has no real fruit. A flock of Bohemian waxwings flies up the path in search of berries, landing on an old spruce that still stands in spite of a series of avalanches.

By midmorning, the grizzlies have descended one thousand metres to the old-growth subalpine fir forest. There, they rest in a nest made in a hollow among the gnarled roots of an old tree. Oak ferns surround the den and camouflage it from hikers who have paused to rest just a few feet from the den.

The fir tree that the hikers sit under has hosted many generations of human visitors. Aboriginal people called these firs "medicine trees." They used the pitch to ease the distress of colds and tuberculosis. After lunch, the hikers are careful to clear away even the smallest crumbs. They know that bears who develop a taste for human food end up in trouble with humans and often have to be destroyed. A Clark's nutcracker finishes the job of clearing up.

A bee narrowly misses a swat from the hikers as it zooms in to investigate the strong smell of some twayblades nearby. Suddenly, like a cannon, this orchid-like plant shoots out a glob of pollen, making a direct hit on the bee. As it flies to another plant, it transfers the pollen, pollinating the flower.

Summer and autumn, spent in the high country, have been a learning period for the pair of grizzly cubs. Their mother has taught them where to hunt for food, how to stay out of danger, and now, in September, much larger and wiser, they are heading down to the rivers to feast on spawning salmon. As they descend from the high mountain meadows, they feed in the shadow of many different kinds of forests. Rain forests of hemlock alternate with Engelmann spruce. For days





the bears gorge themselves on berries that grow in profusion under the spruce. In a newly burned area, they eat the new shoots of young trees. Sometimes they head for glacial-cold creeks, and fish for small trout or frogs.

At the spawning rivers, the bears fatten up on fish. Above them, the olive-sided flycatchers feast on the insects that swarm over the water. The flycatchers' songs of quick three beeps ring out as they go. When the insects begin to die out, the flycatchers start to leave. That is a sign for the bears to head back up to the hills for their dens. Where and how to make a cozy little den is something else the cubs have to learn.

The mother bear waits for the first heavy snowfall before she enters her den for her long winter sleep. The snow will bury her tracks, and keep the location of her den a secret. Over the winter, the snow blankets the den and the path. Few creatures use the path in the winter. Many, like the elk and caribou, head for the southern interior where there is less snow. Others rely on the lichen falling from the old spruces for their winter nutrients. The bears just sleep the winter away, secure in their dens deep in the hillside.







A flock of Boreal Chickadees swirls into an aspen grove like a handful of leaves in an autumn gust. Their little brown caps, white cheeks and black bibs mark them as chickadees but they are the quietest of all the chickadees'.

They call out with a nasal-sounding 'tseek-a-dayday'. Named after Boreas, Greek god of the north wind, both the forest and the chickadees are adapted to the harsh north wind that blows through the year.

The chickadees work together through the aspen, gleaning the tree for seeds and insects. Extra seeds are stored under the bark of branches for winter fuel. The chickadees are selective about which branch to use. The branch must be high enough that the winter snow cover doesn't bury it, but not so high that it is exposed to the raging winter blizzards. While they work, the golden leaves of the trembling aspen continue to fly off on the wind. Each tree is connected to the same network of roots, so the whole grove is really one single plant with many suckers which shed their leaves at the same time.

After the flock has worked through one grove they swirl away to the next, a group of stunted old white spruce trees with stiff bottlebrush branches. A Boreal Owl sits silently in his daytime roost on the highest tree. The chickadees mob the owl and harass him with their calls. The owl opens one eye and ignores the noise. Then a passing raven hears the chickadees and flies over to investigate. The swoosh of her wings and her raucous croak alarm the owl. He silently flies off before the raven calls in the rest of her family.

The spruce stand now feels secure for the chickadees to forage in. They are joined by a flock of crossbills who have perfected the art of extracting seeds from spruce cones with their bizarre crossed beaks. In one deft move, the crossbill inserts the tip of its top bill

between the scales of the spruce cone, pinches the tips together and pries the cone apart. Then with a quick stab of the tongue, he extracts the seed from the base of the scale. If the conditions are right, what the crossbills miss, the chickadees pick up, and what the chickadees miss, the red-backed voles and deer mice pick up from below. What they miss takes root and a new spruce tree grows.

Next stop for the chickadees is a boggy area where the black spruce grow. The stumpy crow's-nest crowns of the spruce provide a good spot to find spiders and insects lingering before the winter. In the bog below, insect-eating plants compete for the last insects. With their peculiar sticky leaves, little sundews and butterworts trap flies, then consume them.

Another bog dweller with unusual leaves is Labrador tea. Thick hairy leaves that can withstand the cold and drying effect of the wind make an aromatic tea. In the bog, sphagnum mosses can hold up to ten times their weight in water. The moss made great diapers.

The chickadees are off into the air again, flying over a mosaic of forest and wetlands. By autumn, the many water and shore birds that nest in the northern wetlands have flown south or to the sea. Ermine and the snowshoe hare change from brown to white anticipating the winter snows. Woodland caribou move from open ground to the shelter of mature spruce forests. Lynx move with the hares, and hibernating animals burrow into their holes in the cavities of tree trunks and roots.

Winter, which comes quickly and fiercely, lasts from



September to June. This is the time when more people come into the boreal forest as they can move easily over the ground when it is frozen. Curious by nature, the chickadees might move to investigate a trapper, a timber cruiser or mineral exploration team passing through. If there is nothing to eat, then the flock will all at once burst into the air and fly to another stand where a store of food is cached.

Spring and the long days of summer arrive eventually. The chickadees can start foraging again on the fresh fruits of the boreal forest.







A warm autumn sun filters down through the leaves of the bigleaf maple, shining golden against the dark green of the Douglas-firs. Leaves fall like big yellow dishtowels onto the forest floor. Maple seeds gently rotate down like helicopters.

They will take root wherever sunlight reaches the forest floor, some in areas that have been burned by wildfires and others in areas cut by forest workers. Many seeds will be picked up by mice for food. Seeds that land in the forest streams will sometimes take root at the water's edge or grow in the shore of the sea where they have been carried by the stream.

Wherever the maples hang over the water, they'll provide welcome shade and protection for frogs, newts and young salmon. Where they hang over the earth, they provide important shade and protection for young western redcedars. Mosses and lichens hang on the oldest maples like curtains, creating their own forests in the air.

One of the mosses, called plume moss, is curled inwards because it is dry. As soon as the autumn rains come, the plumes will unfurl to catch the drops. Out of the moss grows the licorice fern. It really does taste like licorice, and is chewed by some aboriginal people to cure their sore throats.

Deeper in the forest there is one small patch of oldgrowth Douglas-fir trees. Left by the early loggers because they were not straight, these gnarled and ancient trees are up to a thousand years old. Their deeply-grooved bark has protected them from many natural fires. The black bark tells the story of each fire through the centuries. Look in the nooks and crannies of the bark of the tree. You'll see lots of little places for small animals to live.

Red squirrels nest in the Douglas-fir tree tops and gather the cones. They leave tidy piles of chewed cones and scales on the forest floor as they search out the tiny seeds. Great Horned Owls roost up in the branches, waiting for night to hunt squirrels, voles and mice. The only sign of the night's hunting will be a regurgitated pellet of the fur, bones and claws of an owl's midnight meal at the foot of the tree.

Bats tuck themselves into the crevices of the bark. A banana slug slides its way round the base of the tree searching for tasty decaying matter. As the vacuum cleaners of the forest floor, slugs will consume several times their own body weight in the course of a day. Hiding in wait for the slug is an elegant, striped garter snake.

Come springtime, the garter snake quietly weaves in and out of a quilt of flowering plants at the foot of the bigleaf maple. The bright colours of yellow wood violets, showy white spikes of vanilla leaf flowers, and rosy broadleaved starflowers send an invitation to insects who pollinate the flowers during their visits.

The western trillium beckons with white flowers which produce the oily seeds that thatch ants love. Carried by the ants to their big thatched nests of needles and twigs below the Douglas-firs, some seeds are discarded along the way. Next spring they will take root and grow.

By summer, the ants are investigating the sunnier patches of the forest where berries grow. These



are berry paradises. Thimbleberries, salal berries, elderberries, black raspberries, wild strawberries, red huckleberries, Oregon grapes, trailing blackberries, and gooseberries all grow on and between old stumps in the forest.

Waxwings and thrushes, fruit-eating birds, are usually the first comers to a berry feast. Flies and moths quickly follow to feast on the sticky fruit. Flycatchers, warblers and bats leave the deep forest to feed their babies with the flies. Falcons hunt the small birds to feed their young. All the scat and discarded fruit fall to the ground and get turned into rich soil by the fungi, insects and slugs waiting below.

Pushing up through the thicket of berry bushes is another young maple tree. It draws the nutrients from the soil and starts the cycle over again.







Snuffling, gruffing, snorting, grunting and ooffing, a shuffling porcupine waddles home through the autumn pine needle litter of a lodgepole pine forest. Just looking at its short, clumsy little legs, you'd never think it could climb trees.

But look way up, and you'll see it hunched up like a black ball in the witches' broom in the crook of a tree. It easily climbed the tree because of its sharp claws and its stiff tail with special quills.

A witches' broom is a tangle of branches that the pine tree sends out when it is attacked by the parasitic mistletoe plant. Both the tangles of sharp twigs and the porcupine's sharp quills discourage hungry bears or cougars from making an easy daytime meal of a sleepy porcupine.

From the safety of a juniper shrub at the foot of the tree, a deer mouse pauses, fearful that the shuffling noises of the porcupine may come from a cougar or a lynx. Seeing the porcupine, the mouse moves on to feast on a juniper berry dropped by a hermit thrush. This tiny bird looks like it's wearing a white pair of eyeglasses.

Suddenly, a shadow darkens the juniper. A deer mouse scuttles under the step moss that grows in clumps over the forest floor. As a northern goshawk swoops down, the hermit thrush joins the mouse under cover.

Up in the pines, the drum of a hairy woodpecker announces the break of dawn. Looking for insects like the mountain pine beetle, the woodpecker drills into the inner bark. Little brown creepers and redbreasted nuthatches move like escalators up and down the trunk. The creepers always move up, and the nuthatches move down, finding different food supplies as they go.

A strong smell of fermenting wood wafts through the forest on dry winds of the hot day. Foresters getting a whiff of that smell know that the sleeping porcupine is digesting the inner bark it stripped from a pine tree under the cover of darkness. In fact, the tree may be so damaged it will die. As a wildlife tree, it then becomes a home for woodpeckers which keep insects in check. From the foresters' point of view, it is better to have the porcupines eat some of the pines than have insects eat all of them.

Aboriginal people also knew that the strong, fermenting smell signaled the presence of a sleeping porcupine and the quills they prized for decoration. Hauling an angry, sleepy porcupine out of a tree could be a very prickly hunting adventure, however, for these hunters, the juicy inner bark of the pine tree was also one of their own main food sources. Its tall, straight trunk also became the framework for teepees and lodge poles.

In snowy November, the fermenting smell from a female porcupine is irresistible to a male porcupine looking for a mate. His groans, grunts and highpitched cries during the mating season echo through the cold winter forest. Together they engage in a slow - moving dance before mating.

In the spring, the spotted sandpipers return to the wetlands to breed. At the same time, in a hollow amongst tree roots, a single baby porcupine is born. Probably it will witness a fire in its lifetime of ten years.





Sometimes, in the heat of the summer, the buildup of dead branches, needles, pitch and bark fuels fires that sweep through an area. To a baby porcupine, these fires are as natural a part of life as the scolding of the sandpipers and mountain chickadees if he comes too close to their nests.

The ground fires traditionally burn quickly until they meet a wetland, open grassland or a previously burned area. The heat releases seeds from pine cones. Spruce grouse love the buds of young trees which will sprout from these seeds.

After the fire, when the ground has cooled and darkness falls, the young porcupine crawls down from its safe nest up in the tree, and looks for a juicy pine to chew on.







With a rustle and a gentle chirrup, a western toad as big as the palm of your hand comes out of its hiding place beneath the birch trees. The toad is on the move in the sub-boreal forest. He needs to find a mate in a swamp or a lake. Now that the sun has set, it is dinnertime. A meal of insects will suit him just fine.

The western toad, like all toads, has a very special way of defending itself. Covered in warts that ooze a foultasting fluid to any would-be predator, the toad feels confident about setting out. If you pick him up, and he's really scared, as a last defense he will try to shock you by peeing in your hand.

Along his route to the water, the toad hops from thicket to thicket of birch and willow trees. High up in a paper birch, a small vireo is busily constructing a nest. An olive-coloured bird with eye markings like spectacles, the vireo knocks a tangle of birch flowers, called a catkin off a birch tree. Startled when the catkin drops near it, the toad digs for cover with his hind feet.

With shimmering pale green leaves, long dangling catkins and papery thin white bark, the birch tree was an important tree for the forest dwellers. Deer, moose and beaver browse on its leaves. Aboriginal people built canoes, baskets and cradles from the waterproof bark, used the sap as a cold medicine and enjoyed hot, long-lasting fires from its wood.

Finally the toad arrives at the edge of a marsh. Nearby, a moose wades in to begin to feed. It is evening. Moose and toads often share the same territory.

Throughout the next few days, the toad calls out, with other males, in a high-pitched warble, trying to attract a mate. Eventually the females arrive and they mate. The males clasp the females in their arms

to fertilize the eggs. This is known as amplexus. The females lay ribbons of eggs as long as the moose. These eventually hatch out into tadpoles that feed voraciously on algae in the marsh. By the time they have grown into adults, they are ready to begin their own migration. Winter is on its way. It's time for the toad to find a place to burrow away from the cold.

Some of the young toads will cross meadows of sedges and grasses to the small isolated stands of subalpine firs. Up in the narrow crown of the fir, a marten, relative of the weasel family, sits and waits for a red squirrel or vole to appear. The thick coat of the marten allows it to survive the harsh winter, hibernating in a hole in the tree. The toad finds a well-insulated burrow beneath the tree. Snow is its best insulation.

Some toads will move into the dense stands of hybrid white spruce that stretch over much of the region. Frequent visitors to the prickly spruce forests include wolves and lynx in search of snowshoe hares. Longlegged moose push through the snow, feeding on this year's growth of the spruce. Spruce grouse and threetoed woodpeckers drum their rhythms even in the cold of winter.

Aboriginal people who lived in the spruce forests relied on all parts of the tree. They wove roots into baskets, used bark for wound dressings, and boiled needles for a cough remedy. Forestry companies now





log the spruce for lumber and pulp used for making paper products.

Today the toads have another enemy, one that isn't put off by warts. Because they absorb moisture and air through their skin, they are very sensitive to toxins in the water and ultraviolet rays from the sun. Whether the next generations of toads continue their mating migrations will depend a lot on whether we can protect the ozone layer and reduce pollution. Our efforts will mean a lot to the toad.





The sun sets. Shadows creep in and out among the trees. The forest seems silent and empty. Then there's a sudden movement from beneath the edge of a loose slab of bark on an old and fire-scarred ponderosa pine. A hoary bat stretches out its wings and takes flight.

The sun sets. Shadows creep in and out among the trees. The forest seems silent and empty. Then there's a sudden movement from beneath the edge of a loose slab of bark on an old and fire-scarred ponderosa pine. A hoary bat stretches out its wings and takes flight.

With a wing span as big as a ruler, it soars, and swoops and glides over the tree tops, grasslands and small wetlands that dot the landscape, gobbling almost 600 insects in its first hour of nighttime hunting. Navigating by echolocation, it emits constant high frequency squeaks that "echo" off the trees, and off the small insects it then intercepts at close range.

Sharing the night sky are other bats, and birds of the goatsucker family. No, they don't suck goats, but with their huge mouths they suck up insects, thousands of them! When dawn comes, the goatsuckers, including nighthawks and common poorwills, and the bats find resting places on lichencovered bark where they are well camouflaged.

The sun wakes up the yellow pine chipmunk and the pygmy nuthatches. They leave their own night roosts in the pines to go after the seeds of the large cones. They are constantly on the alert for the divebombing of a goshawk who would really like to make a meal out of them.

The northern flicker and white-headed woodpecker are looking for insects and cone seeds on the pine. If their sharp bills pierce the thick fire-resistant bark, a

peculiar smell fills the air. You stop and sniff. "It smells like vanilla," you think.

Aboriginal people thought the pitch of the pine tree made great chewing gum, and collected its bark for hot, sweetsmelling fires. Woodworkers using the light wood of the pine for furniture building and woodworking know that vanilla smell very well.

While the woodpeckers explore the pine, a miniature world of insects, particularly beetles, scrambles for safety. With a little luck, a beetle grub or larva will escape the probing beak of the bird, and will be able to stay curled up in the tree until the conditions are right for it to come out. Sometimes that can be a long time. There is a story about one sleepy little grub that stayed for 75 years in a church pew made from a pine tree before emerging as a beetle!

Beetles are such successful inhabitants of the pines that they sometimes seriously damage and even kill large numbers of trees. Bats and birds help to keep them under control.

All through the summer, the hoary bat continues to feast. This is the season for fire. A lightning storm triggers a quick blaze that rushes through the forest, burning up dead branches and cones. Some of the thin-barked trees are killed, but since the fire stays close to the ground, the fire-resistant bark of pine and Douglas fir trees protects them from serious harm. The tightly-compacted shells of cones pop open in



the heat, and spill their seeds onto the earth. A new generation of trees will grow from the seeds that germinate after the fire.

Preventing the fires is not always a good idea. Without the fires, other trees grow in the shade of the pines and begin to replace them. This changes the habitat for other species of plants and animals.

For the hoary bat, the end of summer means the end of its food supply. The flying insects die after laying their eggs, and the little bat begins its long flight south for the winter. Rufous and black-chinned hummingbirds, who have been feeding on the nectar of wild roses, pussytoes, and sunflowers, have already taken off for their long migration to the tropics.

Aboriginal people traditionally spent their autumn gathering the seeds of these sunflowers. They would grind the seeds of the balsamroot flowers for flour, and make dandruff shampoo from brown-eyed Susans that dot the open spaces of the forest. These hardy flowers with their hairy leaves and stems are as well-adapted as the brown, furry bat for the extreme heat, drought and cold of the pine forest.

Flying a steady tempo, the hoary bat crosses the thousands of miles to the southerly part of this desert plateau of the continent. Down below, the spadefoot toad, the western rattlesnake, the prickly pear cactus and the ponderosa pine wait for the cold storms of winter. By October, the bat is roosting in a favourite tree in Central America. In the spring, it will return for another season of aerial acrobatics in the forests of the Southern Interior.





Wafting on a spring breeze through a forest swamp, the heavy smell of a skunk cabbage fills the cool, moist air. Cloaked in a bright yellow hood, and protected by the shade of a western redcedar tree, it seems to glow in the dark and lives up to its other name—the swamp lantern.

Its perfumed flowers attract a parade of curious animals while the foliage exudes a strong odor that make beetles think it's a rotting carcass. While they crawl all over it they pollinate its flowers.

A mother black bear and her newborn cubs follow the smell to their favourite skunk cabbage patch. After a long winter sleep, the mother needs the protein she gets from juicy underground stalks. While she grubs in the skunk cabbage patch, her cubs play around a redcedar tree, and splash through the waters of the stream nearby. They'll be drinking mother's milk for a while, but they won't forget where to find this food source when they, too, need a healthy spring meal as they grow older.

By late spring, the bright yellow hoods of the skunk cabbage have withered away, and its huge and waxy green leaves stand over the swamp waters like shields. In the shade of the leaves, larvae of frogs and salamanders begin to grow to adulthood.

Some aboriginal parents bring their children to the swamps to harvest the waxy cabbage leaves line their beautiful cedar bark baskets. While the children would pick cabbage leaves, the parents would strip bark from the cedar tree. The parents call the redcedar the "tree of life." They made dugout canoes, house planks and posts, totems and mortuary poles, boxes, baskets, clothing, mats, spears, fishing floats, and whistles from its bark or its wood.

Nearby, a rufous hummingbird takes a break from collecting shredded bark, lichen and spider's silk for its nest to confront an intruder in its salmonberry patch. For dinner, it sucks the nectar from the vivid pink blossoms. L ater in the spri n g, the bright red berries of these bushes become food for bears, humans and a beautiful songbird called the Swainson's thrush or "salmonberry bird."

Up on a branch in the middle of an ancient Sitka spruce, a marbled murrelet zooms in at 100 km an hour from a night of fishing at sea to feed its single chick. The parents share the duties of babysitting the chick and flying to the ocean to catch small fish.

In the summertime, the swamp begins to dry up and the skunk cabbage leaves begin to collapse under their own weight. Midges and mosquito larvae hatch in huge numbers. During the twilight, they swarm up over the creek and into the upper canopy of the forest. From under the bark of huge Sitka spruce trees, bats emerge from their roost and use their mouths and wings to get insects to their mouths. A single bat devours thousands of insects before it returns in the dawn for its daytime snooze.

The bears and the hummingbirds have moved upstream to feast on the blossoms and berries of flowers and bushes of the mountain slopes. In particular, the bears like the berries of the devil's club, a thick and thorny plant that was also an important





medicine chest for aboriginal people.

By the end of the summer, the water level in the stream near the skunk cabbage patch is low. Salmon who have returned from the sea wait for the first rains of autumn to swell the mouths of rivers and cool their waters so they can swim up the stream and spawn. Bear, marten and raccoons pass the time while they wait for their coming fish feast by grubbing out the ends of nurse logs full of beetle grubs and ants.

The nurse log supports a big community of living things: new seedlings, small plants, ferns, mosses, lichens, mushrooms, beetles, spiders and other minibeasties. Underneath the moss hides a tiny Clouded Salamander.

Digging down into the forest soil, a deer mouse discovers tasty mushrooms and nibbles the mushroom, swallowing the spores before scampering back to its nest. Crossing a small clearing from a windblown tree, it poops and allows the spores of the fungus to return to the soil to nourish a new generation of trees.

When the winter rains come, the swamp fills up with water. The decayed leaves of the skunk cabbage add their nutrients to the soils of the forest. Spawning salmon lay their eggs, die and provide food for many other forest animals. Skunk cabbage shoots lie dormant underground waiting for spring and a new growing season.

