

ISSUE FIVE

ECO ZINE

THE GREEN ZINE



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eco – from the Greek word *oikos*, meaning house

zine – an alternative magazine, bucking the trends in mainstream media

ecozine – a new way to learn about forest ecology

wild – living in a state of nature; roving at will; not tame; not domestic

life – the period between birth and death

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ECOZINE

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BASICS

GETTING BACK TO

BASICS

The three basic needs of wildlife are:

a place to live, food to eat,

and a mate to have offspring with.

Imagine suddenly being teleported from your house to a dense forest somewhere in the “wilds” of BC. What do you think would be the first thing you’d wished you’d had time to pack? Several bags of chips and a couple of chocolate bars? Maybe a tent, warm clothes? Although it’s always nice to have the extra luxuries, to survive in the wild, the necessities are pretty basic—a roof over your head and food on the table. Around nightfall, you’d begin to wonder whether you were alone or if there was some wild animal out there waiting patiently for a snack.

At times like this we’re not much different from the rest of the animal world. A microscopic springtail crawling in the dark, damp litter layer of the soil and a grey whale gliding through the depths of the ocean all have the same basic needs.

This issue of EcoZine is all about wildlife. Wildlife means a lot more than deer, wolves, and bears. It includes fungi, banana slugs, and tree frogs, too. All of these creatures have unique strategies for meeting their basic needs.

The three basic needs of wildlife are: a place to live, food to eat, and a mate to have offspring with. The article *Wildlife Wooing Rituals* takes a look at the variety of ways that wildlife have for attracting a mate. Here we’ll focus on “a place to live” and “food to eat.”

The place where a species lives is called **habitat**. The habitat of an animal or plant is the environment that provides its basic needs. A decaying aspen tree might be an ideal nesting or feeding habitat for a sapsucker. A patch of skunk cabbage might be an ideal habitat for a grizzly bear to feed on shoots and roots. A rock cliff might be an ideal escape route for a bighorn sheep.

From the tiny sundew plant, which traps insects with its sticky

leaves, to the wolf, which hunts moose and caribou, what wildlife eat and how they get it depends on the species. All of these behaviours make up the life strategy of a species and develop through the process of **natural selection**. As species evolve, the individuals with the most successful life strategies and the best characteristics are “selected by nature” to survive and produce offspring. This process takes thousands of years to produce the kinds of results we would notice. But it helps explain why there is so much variety out there.

When the life strategy or physical characteristics of a species changes through the process of natural selection, it is said to have **adapted**. Wolves have adapted certain physical characteristics to give them the ability to run fast on deep snow so they can hunt moose in the winter. Some lichens adapted the ability to grow in trees, while caribou adapted the ability to eat and digest those lichens. The connections between species, their life strategies, and their adaptations are endless.

Let’s look at the first basic need most humans think of—food. All wildlife need food to provide water, energy, and nutrients. Each of these plays an important role in the survival and fitness of an individual. Water helps digest food and regulate body temperature. Energy allows an individual to move around and stay warm. And nutrients such as proteins, vitamins, and carbohydrates help keep an individual healthy.

Herbivores eat plant material, and **carnivores** eat meat or other animal matter. Each of these diets has its limitations. For herbivores, there’s always plenty of food, but it’s not necessarily of the best quality. The most nutritional vegetation is often the new growth, available in the spring, and fruit or seeds, available in the fall. So in the summer and winter, herbivores can have a problem finding nutritious food that is easily digestible. For carnivores, nutrition isn’t a problem because meat has lots of protein. Their problem is



Red Squirrel

Continued on page 4



Sapsucker in aspen habitat



Bighorn sheep

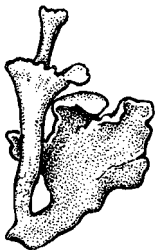
McELP

Continued from page 3

quantity. It takes a lot more energy and time to get meat than it does to wander around the forest nibbling on vegetation. **Omnivores** tackle these problems by eating both vegetation and meat. Humans, bears, and voles are omnivorous. Wolves and owls are carnivorous, as are shrews, which mostly eat insects. Deer, elk, and bighorn sheep are examples of herbivores.

Different species will eat different amounts of food or will eat it more or less often. These aspects of their life strategies depend on how their bodies and **metabolic** systems have evolved. Some species, such as the Canada goose, are able to store fat and use it as an energy reserve on long migrations. Other species, such as the water shrew, are very small, with little room for fat reserves, and need to eat very often.

Water is food, too, and is essential to the survival of all wildlife species, including humans. Water warms and cools the body and flushes out waste. Wildlife obtain water from surface sources like rivers, ponds, and snow. Most foods contain water, including succulent vegetation, meat, and fruit. Even though water is available in all these forms, it can be in short supply. In a drought year, for example, vegetation is less succulent and ponds may dry up. If the drought is coupled with higher temperatures, species have higher cooling needs. It can get to be a problem.



TREVOR GOVARD

Lichen *Bryoria nitidula*.



Moose in clearing

Through the process of natural selection, species have developed ways to use water more efficiently. Nocturnal animals such as raccoons are most active at night, when temperatures are cool and they need little water to cool their bodies after a busy night of scavenging. Some animals have adapted to use their environments to keep themselves cool or warm. These are known as **ectothermic** animals, whereas humans, mammals, and birds are **endothermic**. Reptiles like the western rattlesnake are ectothermic. Snakes often bask in the hot sun to warm their bodies and move into shade when they're too hot.

Food and water aren't the only things wildlife need from their habitat. They also need space and shelter. "Shelter" is a term humans use to describe our own needs, but isn't really accurate for species in

the wild. A better word than shelter is **cover**. Cover can include any structural feature of habitat that enhances the survival and reproduction of wildlife. A rotten log can be cover. Cliffs can be cover. Even open fields can be cover. It all depends on your point of view.

Forests and other natural habitats offer an endless combination of features that wildlife species use in many different ways and at different times of the year.

How does cover "enhance survival and reproduction?" It gives the species protection—from predators, from competitors, and from the extremes of weather. As with food, different species have adapted to use different cover types. Predators such as cougars prefer cover that allows them to hide so they can ambush their prey. Prey species like deer, on the other hand, prefer open areas where they can see all around them and have many escape options should they see a predator. But hunting and fleeing are not the only considerations in cover preferences. Deer also need forest cover to intercept snow and serve as a windbreak during the winter. Salmon need gravelly stream bottoms to lay their eggs on, and black bears on the coast need big hollow trees for hibernation.

When you start to add up all the different types of cover and habitat that each species of wildlife needs, you start to appreciate the value of a diverse landscape—that is, a landscape which offers a wide variety of cover and food sources at different times of year.

To take advantage of a diverse landscape, species have to move around. In EcoZine's interview with Tony Hamilton entitled *Bear Necessities*, you'll learn how bears use different habitats throughout the year. You can read about larger-scale movements such as the long journeys of Pacific salmon in the article *Time to Move*.

Forests and other natural habitats offer an endless combination of features that wildlife species use in many different ways and at different times of the year. Learning how and when wildlife use those factors is an important part of understanding how we humans change the landscape. And just how basic our needs for survival are. AM|EZ

EMMC (Energetic mature male cougar), 89 kilograms, reddish-brown fur, seeks female for non-monogamous relationship. Most active at night and enjoys stalking deer, can leap up to 20 metres.

wooing rituals

Sit on any downtown street corner or café for a couple of hours and you're sure to see some of the fan-fare the human species performs to attract a mate. People display their strength, exchange gifts and kind words, wear showy and revealing clothing, and try various other strategies in the hopes of standing out in a crowd. The purpose of all this fuss... to impress, flatter, or attract a member of the opposite sex. You don't have to be an anthropologist, psychologist or biologist to realize how similar animal and human behaviours are. A closer look at animal courtship rituals reveals several ways to attract a mate:

Be in the right place at the right time.

Location, location, location...where one lives or chooses to hang out ultimately determines the choices available for finding a mate. For many animals this means hanging out close to a good food source or watering hole. Male bees, wasps, and other pollen-eating insects position themselves near flowers hoping a female will soon arrive. A swamp takes on a nightclub atmosphere where you'll witness singing, elaborate outfits, outrageous dance maneuvers, and passionate perfumes filling the air. Sound, smell, and body language are all integral to attracting a mate.

Flaunt it if you've got it.

If an animal is not in a place where there are potential partners, it may have to resort to advertising. Colourful displays of plumage on a male bird are hard to ignore if you're a female of the same species. During the breeding season, a male grouse struts his stuff, fanning his tail feathers and expanding the red or yellow combs above his eyes like balloons.

Squeaky wheel gets the mate.

Other animals express their presence and desires verbally. Songbirds are a notable example. Warbler's songs are a symphony of sounds with varying individual acoustic arrangements. Outstanding male virtuosos are the first to attract a mate, and once a pair is formed the male stops singing. A bellowing bull elk can be heard for miles around during the fall **rut**.

You smell terrific. What pheromone are you wearing?

Smell can also communicate a courtship message. Humans have long been bewitched by enticing odors that may excite a potential mate. But you may want to think twice next time you slather yourself in **musk**. Musk deer also emit this chemical compound to attract a mate. The female pine bark beetle emits a **pheromone** to attract a male of the same species.

In the wild, seeking attention has its downside, too. By using smells and sounds to allure a member of the opposite sex, you run the risk of attracting others that may compete for food, or consider you food. Or perhaps they may want to woo your mate.

Whatever the tactic, animals in the wild take part in courtship rituals with the purpose of repopulating the earth. Whether you're a grouse, a slug, or a grizzly bear, the survival of a species is determined by its ability to reproduce, so finding a mate plays a crucial part in animal behavior. KC|EZ

THE MATING GAME...

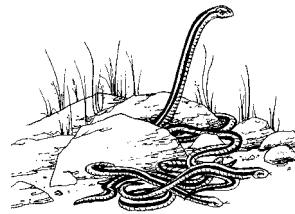


Canada Geese The Canada Goose is renowned for its greeting ceremony that can be seen and heard during the mating season. Geese pair up in the winter months and remain with each other for life. A female expresses her interest in a male by following him closely on land and water in the spring. The male reciprocates by defending the immediate area around her from other males. The greeting ceremony often occurs between mating geese after a male has aggressively encountered another male. The male and female engage in a duet of calls and a rhythmic display of movements. This may include dipping their necks in water and tossing water over their backs as they fling their head up out of the water.



Bighorn Sheep For most of the year, males and females live separately. Females remain in a large herd with their young while clusters of bachelors hang out in smaller groups away from the females. When females approach estrus, the bachelor herd moves in to

engage in battles for dominance. During the rut, two males begin what can be a lengthy battle of head-to-head combat. The clashing of horns can be heard echoing in valleys in the fall. One by one the adventurous males challenge the winner of the previous battle. After a few weeks of ritual combat, one male establishes himself as the dominant male and mates with all the eligible females in the herd. If there are competitors of comparable size and vigor, it is unlikely the dominant male will hold this title for two years in a row because of the enormous effort and energy displayed in the previous year's rut.



Common Garter Snake Snakes spend the winter in caverns that contain as many as 1,000 snakes. Males emerge first in spring and wait patiently nearby en masse for the females. The females depart one at a time to face hundreds of eager males. An enormous mating ball forms around the female, which produces a pheromone that distinguishes it from the males. A combination of strength, endurance, and maybe a bit of luck determines which males will fertilize one or more females. This sexual scramble may continue for up to three weeks as females vacate the cavern one by one.

Dear Hank,

Having a great time in Mexico!
The trip was a bit strenuous and I'm
looking forward to resting for the
winter in the Baja. I glided in
just the other day, it only took me
20 days to get here this year. I
woke early each day to catch the
sunrise and start my day soaring
in the thermals. Some days were
better than others, I tried to get
in at least 200 km per day.
By late afternoon, when the wind
died down, I looked for a place to rest
for the night. Rough weather and
strong headwinds forced me down in
the southern states and I spent 2
days in the desert, existing on
rodents. When the weather changed,
I powered straight for the coast to
revel. Here I am, after travelling close
to 4000 km, why do I do it year
after year?

I hope winter in B.C. isn't too
hard on you. Wish you were here.
accipiter striatus
(sharp-shinned hawk)

time to move

**Why do some animals travel such
great distances to reach a particular
destination every year?**

Migration is a behavioural response in animals. Whether it's to find food, mate, or give birth, animals of every shape and size perform great feats of strength and determination and require amazing navigational skills to reach their destination. Millions of birds and insects journey thousands of miles along flyways crossing continents. Other international travelers include many marine species. The grey whale spends summers in the Arctic and then makes its way to southern California and Mexico to give birth during winter months. Land mammals like elk and bear restrict their movements to local migrations, spending summers in alpine meadows and winters down in the valleys.

Continued on page 7



time to move

Continued from page 6

More often than not, a migration occurs before and after the breeding season.

Animals seem to rely on a number of external and internal stimuli to trigger their own **biological clock**. Climate influences and aids migration. The lunar and solar cycles combined with the earth's magnetic field may guide some migrant species along their journey.

Migrating on Land: Caribou

Caribou live in many parts of BC and concentrate their migratory routes around food. The caribou of Stagleap Provincial Park between Castlegar and Creston cover a small range between southeastern BC and Idaho. This is BC's most southerly caribou herd and probably the smallest, averaging 30 animals in the herd. These Mountain Caribou travel up and down mountain slopes and valley bottoms in search of preferred edibles—arboreal lichens. After the fall **rut**, they browse on the last green shrubs in old-growth cedar-hemlock stands. Later in the winter, the herd moves up the mountain on a hard snowpack to subalpine forests just below the timberline. Here they find more hanging lichen and fewer predators. With the spring melt, the caribou (mainly the bulls) slowly descend the mountain slopes to the valleys. The pregnant cows remain higher on the mountain waiting for spring to reach them. Their northern relatives, the Woodland Caribou, live in boreal forests, and have a much larger range, travelling greater distances between tundra in the summer and lichen-rich forests in winter.

Migrating in Water: Pacific Salmon

Salmon migration from ocean to coastal and inland streams and rivers is one of nature's most wondrous events. Pacific salmon are conceived and born in small channels in freshwater streams and rivers. The time spent in and near their ancestral spawning streams varies with each species. Pink salmon begin their migration to salt water en masse soon after their emergence, whereas steelhead enter salt water after spending one or two years in fresh water. Recent studies show that the time it takes to move from fresh water to salt water is usually directly related to food supply.

Pacific salmon usually migrate in a broad circular pattern. When the salmon first enter the ocean, they move north and northwest. Some travel thousands of kilometres into the ocean and may spend up to four years in the salty water before returning home to spawn as mature adults. When the time is right, salmon focus all their energy into the spawning run home. Finding their way and knowing when to return to the exact same spawning area is complex. Many factors are involved. Studies of salmon migration reveal that **celestial alignment**, **photoperiod**, magnetic and electric fields, currents, temperature, and pheromones can trigger a mass migration. KC|EZ



Salmon spawning

PATTERNS OF MIGRATION



Complete Migration Animals of the same species, often travelling in groups or pairs, cover great distances from breeding grounds (spring and summer) to winter range (fall and winter). The Swainson's Hawk travels about 8,000 km from its breeding grounds in southern Canada to its wintering range in the mountains of northern Mexico.



Partial Migration Characterized by seasonal movements away from breeding grounds by only some of the members of a species. Male and female Elk come together for the mating season, but males leave after the rut to pursue a more solitary existence.



Irruptive Migration This type of migration is less predictable than complete or partial migration but seems to be based on lack of available food. Seed-eating birds may exhaust the seed supply of a given area over time and have no choice but to find food elsewhere.

VULNERABLE

is any indigenous species that is particularly at risk because of low or declining numbers, occurrence at the fringe of its range or in restricted areas, or some other reason, but is not a threatened species.

THREATENED

is any indigenous species that is likely to become endangered in Canada if the factors affecting its vulnerability are not reversed.

ENDANGERED

is any indigenous species that is threatened with imminent extinction or extirpation throughout all or a significant portion of its range in Canada owing to human action.

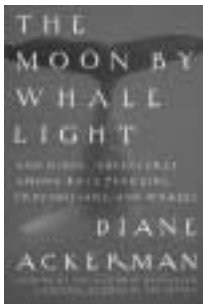
EXTIRPATED

is any indigenous species that no longer exists in the wild in Canada, but occurs elsewhere.

EXTINCT

is a species that no longer exists.

book review



TELLING TALES

The Moon by Whale Light and Other Adventures Among Bats, Penguins, Crocodylians, and Whales. 1991. Diane Ackerman. Vintage Books.

"Because I write at length about little-known animals in curious landscapes, people often ask, for example, Do you prefer whales to bats? I prefer life. Each of the animals I write about I find beguiling in and of itself; but in all honesty there is no animal that isn't fascinating if viewed up close and in detail."

The Moon by Whale Light proves just that. It is a fun and in-depth look at some of the earth's most fascinating animals and the people that study them. Explore tropical caves on the lookout for bats. Wade through shallow waters to take blood samples from alligators and fly reconnaissance in search of breeding whales.

Of course, living the nature writer's life is not without its challenges.

"Although I never take unnecessary chances, a tidy amount of risk, discomfort, pain, or physical challenge does not deter me."

"There were times handling alligators that I got banged up pretty hard. I didn't jump back fast enough when climbing off an alligator, and it swung its head around and clobbered me on the shin."

Ackerman's writing puts us right there, struck in awe at the sight of 2.5 million bats exiting the small mouth of a cave, cringing at the loud hiss of an alligator, or sighing at the grace of a whale.

"By night we patrolled the nets or photographed bats. One night I spent hours aiming photographic lights for Merlin in an abandoned barn while startled bats peed on me nonstop."

Reading Ackerman's book is kind of like reading someone's travel journal. Her tales are entertaining, up front and personal, and they give us an awe-inspiring glimpse into the lives of wildlife that most of us have never seen. AM|EZ

species@risk

...today human activities
are threatening species at
an escalated rate...

Dinosaurs, huge insects, and woolly mammoths once traversed landscapes that provided everything they needed to survive. Mass extinctions of animals such as these have occurred periodically throughout the history of our planet, perhaps due to changing climates and habitat. Over time, British Columbia has been home to a vast assortment of animal and plant species. While many species have disappeared over a geological time frame, today human activities, including urban and agricultural development, forest harvesting, livestock grazing, and environmental contamination, are

“The diversity of life forms, so numerous that we have yet to identify most of them, is the greatest wonder of this planet.”

– E.O. Wilson, Biologist

threatening species at an escalated rate. The good news is that many committed individuals—biologists, resource managers, local landowners, to name a few—are making a concerted effort to help protect the threatened and endangered components of BC’s biological diversity.

How do we know when a species is at risk? There are various degrees of “at risk” in Canada. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is a national body that assesses the overall risk to many different species of wildlife. COSEWIC classifies Canada’s species at risk into five categories: vulnerable, threatened, endangered, extirpated, and extinct.

In British Columbia, the Ministry of Environment, Lands and Parks

has developed the Red and Blue lists to track species at risk. The Red List includes species that are threatened, endangered, extirpated, or being considered for one of those categories. The Blue List includes species considered to be vulnerable in BC. As well as mammals, insects, and fish, ecosystems can be considered at risk. The Garry oak ecosystems of southern Vancouver Island and the Gulf Islands are red-listed. Urbanization, heavy settlement, and the invasion of non-native Scotch broom have reduced the number and size of Garry oak meadows to historically low levels.

Currently, approximately 13 percent of vertebrate animals and 12 percent of vascular plants in BC are red-listed, or are candidates for this designation. Because they are forest-dependent, a higher proportion of freshwater fish are red-listed than other groups of animals. For many components of BC’s biological diversity we know very little. Although sometimes small in size, lichens, fungi, insects, and spiders are also vital components of many habitats in BC.

There are likely 40,000 to 50,000 species of invertebrates in BC and many are considered at risk. It’s impossible to keep track of the number of individuals in an insect population and very difficult to identify where they are concentrated. So a habitat approach is the most practical way of tracking these species. Insects and spiders have been studied extensively in the lowlands of the Okanagan and Similkameen valleys. It’s estimated that 15,000 species of insects, spiders, and other invertebrates live there. The ground mantid, a carnivorous insect distantly related to grasshoppers, and the viceroy, a mimic of the monarch butterfly, are just two of these species that are at risk because their habitats are at risk.

Forest managers and other land users rely on the Red and Blue Lists to help them plan their activities. Knowing whether a species is at risk is an important part of land-use planning. Guidelines are being

Continued on page 10

developed to help identify critical habitats and keep potentially harmful activities away. The tailed frog is a blue-listed species which populates certain cool, swift, permanently flowing mountain streams. Forestry planning objectives for this species will be to maintain water quality and flow in perennial headwater creeks or gullies that contain tadpoles. The spotted bat is a blue-listed species which




Rob Cannings

relies on cliffs in the Okanagan-Similkameen for roosting. Park planners may use this information to designate key sites as protected areas to keep rock climbers from inadvertently disturbing valuable habitat.

To ensure that we're not always reacting to an already serious situation, proactive policies are in place to prevent species from becoming blue or red-listed. Species that are suffering in a particular region of the province but not necessarily province-wide are monitored carefully. Keeping tabs on things regionally helps ensure that species do not become vulnerable at the provincial level.

With BC's Red and Blue lists, ongoing observation and research on species at risk, and public education programs, we are working towards species conservation. In the meantime, we can keep on learning and getting involved.

BC Environment has published a comprehensive series of brochures and fact sheets called Species at Risk in British Columbia. Each brochure profiles a species at risk in BC and summarizes its biology, present status, and the factors that have caused it to be at risk. To order copies call BC Environment, Wildlife Branch, at (250) 387-9717. AM|ST|EZ

 The **American White Pelican** is red-listed and considered to be endangered in BC. Only one nesting colony remains in BC—at Stum Lake in White Pelican Provincial Park west of Williams Lake. The pelicans require shallow lakes where

fishing is easier. They like to "loaf" on small barren islands, sandbars, or logs. The pelican's endangered status inspired the designation of the area surrounding Stum Lake as a Provincial Park in 1971. Tourists who wish to see the pelicans are encouraged to visit one of

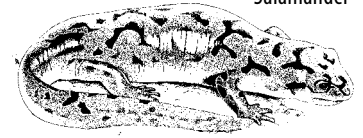


Tom Hall

the surrounding lakes where the birds forage for fish rather than Stum Lake, which they use mostly for nesting in the winter.



The **Pacific Giant Salamander** is red listed and considered to be vulnerable. The largest of BC's salamanders, this species occurs in a very small corner of the province—along the Washington border, south of Hope. Most of the Pacific Giant Salamander's range is in Washington, Oregon, and California. Salamanders eat insects and insect eggs and are found in rivers, ponds, and lakes. In BC, they're usually found in small streams, which are very sensitive to surrounding logging and development. Because its range in BC overlaps an area where forestry and urbanization are prominent, the Pacific Giant Salamander is in danger of being extirpated from BC. With careful logging practices that have minimal impact on streams, these salamanders should be able to survive here.



Pacific Giant Salamander

BCOW



The **Badger** is blue-listed and considered vulnerable in BC. They are common in the prairie provinces and are not considered to be at risk in Canada as a whole. Badger habitats are the open, dry Ponderosa pine or Douglas-fir forests in the valleys around Okanagan Lake and the Columbia River. They also prefer open grasslands with deep soil because they spend a lot of time digging burrows to hunt for food or take cover. Unfortunately, these habitats are also ideal for human settlement and agriculture, which have destroyed habitat with roads, orchards, and towns. When badgers try to co-exist with humans, landowners see their digging as a nuisance and sometimes have them killed.



A GOOD NEWS STORY

Recovery efforts for species at risk are beginning to meet with success. The sea otter was once considered extinct in Canada. The victim of ruthless exploitation by fur traders, the worldwide sea otter population was reduced from perhaps 300,000 before the mid-1700s to between 1000 and 2000 animals in 1911.

In 1929, the last specimen for Canada was obtained near Kyuquot on Vancouver Island. From 1969 to 1972, sea otters were reintroduced to a remote area on the west coast of Vancouver Island. The BC population has grown and spread to a current estimated 1600 animals. In 1996, the sea otter was down-listed from "Nationally Endangered" to "Nationally Threatened".



bear necessities



Measuring excavated bear den

Bart the trained grizzly bear usually plays a ferocious monster in the movies. But Tony Hamilton can tell—it's all an act. Real-life grizzlies, you see, are far more complicated than the Hollywood variety. *EcoZine* went after the real story in this interview with Tony about his work with bears in BC.

A biologist with the Ministry of Environment, Lands and Parks, Tony is involved with research on bears, wolves, and cougars in BC. He got started in the animal science program at the University of British Columbia where he was lucky to have two orphaned bears to work with while doing his undergraduate thesis. The bears had been captured as problem animals and donated to UBC. Tony fed them various foods and studied how the bears digested them. For his Masters degree, he looked at bears in the wild and how they changed their diet and movements with the seasons.



McELP

Tony's work these days is mostly on bears, even though other large carnivores are part of his job. "It's almost all bears...research is driven by conservation concerns and, of the large carnivores, bears are the most threatened."

"What is it about bears that makes them more threatened than wolves or cougars? Are they more sensitive to things like logging and development?"

"Yes, and grizzly bears are direct competitors with humans for space and resources. Bears need a lot of space and have very specific food requirements. Their diet of vegetation (roots, shoots, bulbs, and berries), insects, small and large mammals, carrion, and fish varies with seasonal availability. Bears need food that is high in protein, energy, and fat but low in fibre. And since they're hibernating for up to six and a half months of the year, they don't have very long to find enough food to sustain themselves through the winter. This means they need huge home ranges. A single adult male in the northern interior, for example, may use up to of 3,500 km²."

"What's a home range? Is it like a territory?"

"No. Home ranges overlap, territories usually don't. Cougars are territorial and often defend their turf from other cougars. Bears, on the other hand, share large areas of land, although they don't hang around in groups." There are approximately 10,000 to 30,000 grizzly bears in BC. Part of Tony's job is keeping that estimate up to date and keeping track of where their populations are concentrated. "In BC," Tony reports, "you can have as many as 70 or as few as five bears per 1000 km²."

Continued on page 12

BEAR FOOD



Salmonberry,
Rubus spectabilis

Mrs. J. M. Woollett



Devil's Club,
Oplopanox horridus

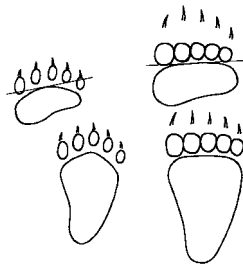
J. Pojar



Skunk Cabbage,
Lysichiton americanum

A. Inselberg

The beauty of managing for bear habitat is that it often captures the needs of other species as well.



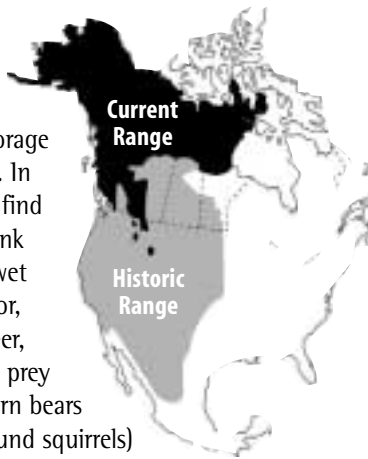
Comparison of black bear footprints (left) and grizzly bear footprints (right). Note the grizzly bear's long claws, closely spaced toes, and relatively straight toe arc.

Why is there such a big difference? Why would some parts of BC have lots of bears and other parts be bear-free? You guessed it... habitat. Grizzly bears don't have any interest in the grasslands of the Okanagan or the Garry oak tree ecosystems of the Gulf Islands. These areas don't have the habitat grizzly bears are adapted to. I asked Tony what bears look for in a home range. In other words, what is preferred bear habitat?

"Grizzly bears depend on diversity above all," answered Tony. "There's not just one type of habitat that you can describe as 'preferred.' Grizzlies require a variety of habitats throughout the year—for feeding, mating, and hibernating." To explain the bears' complex needs, Tony takes us through the year, describing what bears need along the way.

"In the spring, grizzlies descend to valley bottoms, streamside areas, or estuaries after a winter of **denning** at high elevations. They're generally trying to get down to where the snow has already melted to get newly sprouting vegetation and feed on other vegetation. Adult females who have given birth that winter, would not move down until later. As the snow melts farther up the slopes, the bears move back up to take advantage of areas like avalanche chutes where they might forage for glacier lilies and spring beauty. In the early part of the summer, you find them digging up leaf bases of skunk cabbage, a favourite of theirs, in wet forests and swamps." In the interior, early summer brings vulnerable deer, moose, and elk calves which bears prey on. In general, interior and northern bears eat more small mammals (like ground squirrels) than coastal bears.

By midsummer, the bear's main course is served—berries. "It's amazing how tight the association is between bears and berries. They eat hundreds of kilograms of berries and have to have access to them. This is true for grizzlies as well as black bears." Tony and his colleagues recently worked on a project called "Saving Berries for the Bears." The project identified ways coastal forest managers could try growing trees while ensuring that berry-producing shrubs are plentiful enough for bears.



Current and historic distribution of grizzly bears in North America

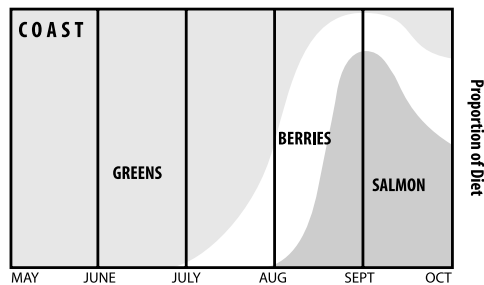
In the late summer and fall, grizzlies in coastal and some interior areas go fishing. During the annual salmon run, bears can be found snapping live salmon out of rivers early in the season and then scavenging for dead salmon toward the end of the run. Elsewhere in the interior, fall feeding moves back to foraging for greens—especially the roots of vetch plants, which are actually poisonous for humans.

As winter brings falling temperatures and shorter days, bears head back into their dens for another season of hibernation. Coastal black bears den in large old trees and stumps commonly found in old-growth forests. These structures usually serve them well in keeping them dry. A dry bear is a warm bear! Grizzlies excavate their dens and use root masses from trees or shrubs as ceilings to keep the moisture out. They usually choose sites where there is enough snow to cover their dens with a warm, insulating blanket. As well as keeping bears dry and warm through the winter, dens provide protection from predators like cougars and even other bears.

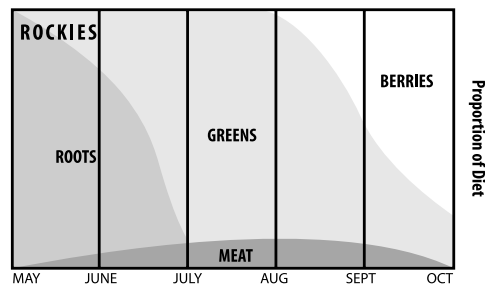
Tony uses his understanding of bear biology to help foresters keep bears in mind while planning their activities. This is the exciting part as far as Tony is concerned—getting things done on the ground to conserve bear habitat. Tony has helped develop guidelines at different scales for the conservation of bear habitat. At the most detailed level, he recommends things like keeping parts of the forest in shrub stages to encourage berry growth. "Although grizzlies might use forests for denning, young, dense forests may only offer some resources when canopies are closed and choke off the understory fruit production." At a more general level, his guidelines describe things like how much land should be "roadless" and how much forest should be of a certain age. These are "landscape level" guidelines whereas things like leaving patches of shrub are "stand level" guidelines.

The beauty of managing for bear habitat is that it often captures the needs of other species as well. Because bears need young and old forest, low-elevation and high-elevation areas, wet areas and dry areas, you end up managing for a full spectrum of habitats across the landscape. "If you're making a healthy package for bears, it's going to benefit a lot of other species as well."

I finally asked Tony if he enjoyed his work. Judging from the bear-shaped mug on his desk, I knew the answer already. "I'm happy in my job because I get a lot of support from my colleagues and I work with people from all over BC. There's no end to the variety of things bears do in different parts of the province. And I just love bears. I have several collections of bear paraphernalia including four *really good neckties.*" AM|EZ



Seasonal diets of coastal and interior grizzly bears



continued on page 13

BART FACTS

Name: Bart
Year of birth: 1977
Weight: 673 kg (1,480 lbs)
Height: 2.9 m (9.5 feet)

- Personal history: born to orphaned wild bears who were in captivity at a U.S. zoo. Adopted by animal lovers and trainers, Doug and Lynne Seus.
- Food consumption: 27 kg / day
- Training method: reward-based
- Favourite rewards: pesto, apples, carrots, Hawaiian Punch

- Films and co-stars:
 - ★ *The Edge*, Alec Baldwin and Anthony Hopkins
 - ★ *Legends of the Fall*, Brad Pitt
 - ★ *Clan of the Cave Bear*, Darryl Hannah
 - ★ *The Great Outdoors*, John Candy and Dan Ackroyd
 - ★ *White Fang*, Ethan Hawke
 - ★ *The Bear*, Youk the bear

- To find out more about Bart and what he is doing for bear habitat conservation, visit Vital Ground at www.vitalground.org.
- And a great Canadian bear site is at www.nature-net.com/bears.



UP A TREE canopy insects in ancient forests

Wildlife habitat doesn't always have to be a wide open plain or a never-ending coastline. It can be as small as a square centimetre of soil or as large as a grizzly bear's home range. For **arthropods** living in the tree canopies of BC's coastal forests, habitat is a mass of moss, lichens, and soil suspended in branches high above the ground.

Researchers of canopy arthropods spend a lot of time up a tree. They use ropes and climbing gear to get a close look at the unique habitat they call "suspended soil systems." In BC, these habitats-in-the-sky have mainly been studied in the ancient Sitka spruce forests on the west coast of Vancouver Island.

Sometimes over 60 m above ground, suspended habitats support untold numbers of species of insects and spiders. Researchers in the Carmanah Valley on Vancouver Island have found that a certain group of beetle **mites** dominate the soil suspended in the branches of Sitka spruce trees. That wouldn't be such a big deal if they were found just anywhere. But over 80 species of these Carmanah canopy mites are new to science! And mites are mighty picky. Some species are found only in a single tree or small area, and many are found nowhere else but in the ancient forest canopy.

What does this tell us about wildlife habitat in ancient Sitka spruce forests? First, that suspended soil habitats are unique to those forests. And second, that certain groups of mites are unique to different soil habitats. So we quickly start to see how precious those unique habitats are. Losing just one tree or small area could mean losing species that have not been found anywhere else. Even though

mites are minuscule and we're not sure what they do, we've got to remember to "keep all the parts."

With more research into what mites "do" and how they function in those ecosystems, we might gain a better understanding of wildlife habitat in our ancient forests. Until then, go climb a tree. AM|EZ



Suspended soil systems support species of mites found nowhere else in the world.

legend and legacy

Since the arrival of humans on earth, we have depended on other members of the animal kingdom for our own survival. Animals have also provided humans with aesthetic pleasure and spiritual strength—so varied is the human need for animals.

Our early ancestors depended solely on animals for their basic needs: food, shelter, and clothing. As time progressed, human dependency on the animal world increased. Some animals like the buffalo faced extinction because of over-hunting. The dog was probably the first animal to become domesticated, about 9,000 years ago. Their ability to sense game, warn of danger, track and kill prey, herd and protect livestock, all contributed to early human survival and eventually earned them the title, “man’s best friend.” Other animals eventually became domesticated to supply the demand for animal products and food. Farmers raised cows, sheep, goats, chickens, and pigs to meet increasing human demands.



Top: Cattle drive, Peter Tasker photo
Bottom: Dog sled team, 1899, Atlin BC Archives A-06726

Animals and humans sometimes experience a love-hate relationship. Where the boundaries of wilderness and human activity overlap, there is often conflict between species. A farmer might despise the “wild animal” that causes a threat to livestock. Wolves, bears, and cougars are just a few of the infamous characters portrayed in folklore. On

the other hand, humans express their admiration, wonder, and respect for the animal world. Sculptures, paintings, and literature over the centuries have revealed our fascination with animals. First Nations traditions created a legacy of their appreciation for the natural world through their stories, sculptures and artworks.

Bill Reid was a First Nations artist of Haida ancestry. Born in Victoria, BC, (1920–1998) he worked with various mediums, producing works in gold, silver, cedar, and bronze. Reid used traditional and European tools and techniques to create both miniature and mammoth pieces. One of his last sculptures, “Spirit of Haida Gwaii,” has profound proportions, both in concept and in size. He amasses a crew of animals with human characteristics and humans with animal characteristics from Haida mythology, casts them in bronze, and sets them off in a six-metre-long canoe. The passenger list includes some of the Haida’s most revered characters. Everyone aboard has a story. Raven takes his place in the stern as both creator and destroyer. He has one of the most powerful roles in Haida legends: he steers the boat. Huddled together in the bow is the Grizzly Bear family. Also known as transformers, the grizzlies can take on human forms. Their story is told with various twists in many cultures around the world. A human woman marries a grizzly bear and gives birth to two sons. The woman’s brothers search for their sister, and when they find her are required to kill the great bear. Their position in the boat portrays the family before the tragedy takes place. Across from the Bear Mother is Eagle who is an equal to the Raven. Eagle can also shift in and out of human form. Wolf is arched across the back of the boat biting into Eagle’s wings with his claws in Beaver’s back. In his forepaws which have a human form, he clutches a paddle. Although Wolf is not a common figure in Haida art, it represents the principal crest of the sculptor’s family. Frog is perched on a gunwale underneath Eagle and Great Bear. Frog knows more than any other creature about the elusiveness of things, the powers of sexuality, and transformation. Crouching like a stowaway beneath the body of the Raven is Mouse Woman, the smallest passenger in the canoe. She has spent time on the bottom of the sea and is the traditional guide and advisor for those traveling from human to nonhuman realms. Raven is her grandson. Dogfish Woman paddles behind Beaver. She is always portrayed alone in Haida mythology and is a major crest in Haida art. Beaver rides low in the canoe behind Bear Mother. At one time Beaver lived on the ocean floor

Continued on page 15

legend and legacy

Continued from page 14

hoarding all the fresh water and fish. He is one of Raven's uncles and represents renewable wealth. The Ancient Reluctant Conscript is a partial self-portrait of the artist... an oarsman donning a cedarbark cape and a plain, woven spruce-root hat. The Chief stoically holds his place in the midst of the other cramped passengers and in one hand holds a speaker's staff with Killer Whale gracing the top. The Chief is the largest figure in the canoe with the commanding role of speaker, exemplar, and director.

Comments from Bill Reid on where this boat may be heading:

There is certainly no lack of activity in our little boat, but is there any purpose? Is the tall figure who may or may not be the Spirit of Haida Gwaii leading us, for we are all in the same boat, to a sheltered beach beyond the rim of the world as he seems to be, or is he lost in a dream of his own dreaming? The boat moves on, forever anchored in the same place.

Many people have their own theories about the meaning of this remarkable sculpture created at the end of the 20th century and based on traditions and beliefs held since the beginning of time. The original bronze sculpture resides at the Canadian Embassy in Washington, DC. The plaster cast is on display at the Museum of Civilization in Hull, Quebec. Closer to home, a replica is on view at the Vancouver International Airport. If you want to find out more about Bill Reid or the "Spirit of Haida Gwaii," you can get more details on the Web at the Museum of Civilization <http://www.civilization.ca>. KC|EZ



Bill Reid, Artist. Plaster cast, "Spirit of Haida Gwaii". Collection Canadian Museum of Civilization. Special thanks to the Bill Reid Studio Gallery, Vancouver BC.

BC Archives-D-02331



Native myths and legends reflect First People's attempts to explain the world and their place in it.

Their beliefs involve a profound respect for all animals. Stories have been told and retold with recurring themes of creation, survival, and knowledge through animal symbols and mythology. In stories like *Wisdom Says Men and Animals Lived as Equals* or *World of Raven and his Friends*,

BC's First People describe why and how things came to be on earth.

Some believe humans can acquire power, wisdom, and courage from the animal world and regard animals as **totems**. **Totem poles** scattered along the shores of the Pacific coast reveal images of: Eagle (Thunderbird) — ruler of the skies and the elements;
Whale—spirit of the seas;
Bear—symbol of power;
Goat—symbol of nobility.

The symbolic poles were usually raised to commemorate a special event, or to represent a clan's ancestral history.

Totem poles were also erected as grave posts for high ranking persons such as a Chief or a Shaman.

hands-on habitat

Biology boring? Some students in British Columbia don't think so. Along waterways, around the school yard, and in the forest, science students and local residents are getting their hands on habitat and having some fun doing it. Building bat boxes, saving salmon, and landscaping for native plants are just a few of the projects underway in BC.

We are fortunate to live in the most biologically diverse province in Canada. But rapid growth and development and declining animal populations in some areas are causing concern. Students and local residents, both urban and rural, are taking note of their natural areas and looking at how they can keep and maintain them through habitat enhancement projects. A project may include:

- landscaping for butterflies
- counting birds of prey during fall migrations
- building platforms in wetlands for nesting birds
- cleaning up stream banks
- designing interpretive signs
- removing invasive plant species.

Wildlife in BC needs your help. Wherever you live—city or country—natural areas and wildlife species are begging for attention. You may want to get started in your own backyard by enhancing the habitat you share with other species. It may be something simple like building a bat box to provide a home for a brown bat. A great natural pest control, bats can consume up to 600 mosquitoes an hour. Eight of the sixteen species of bats in the province are listed as threatened or endangered.

Some enhancement projects may take years to complete, others can happen in a day. Overall, a project is aimed at maintaining or increasing the potential of an ecosystem and the species that make it their home. Some projects are more complex than others and often require experts and naturalists to lead the way. You may want to contact your local Fish and Wildlife Officer and naturalist club before proceeding on your own project.

Schools in BC getting down and dirty.

Surrey Traditional School, Surrey Project: Adopt a Creek

In Surrey, students are learning from local experts how to help conserve and protect salmon habitats. Students plan to inform and involve the community and to increase fish stocks in the creek. The school incorporates this project in its science program.

Cedar Hill Junior School, Victoria Project: Greening School Grounds, creating and restoring natural ecosystems on and near school grounds. See www.greengrounds.org.

Cedar Hill is one of ten schools in the Greater Victoria involved with the Greening of School Grounds. A Garry oak meadow surrounds the school grounds—Garry oak is an endangered ecosystem on Vancouver Island. Students work with a landscape architect, teachers, parents, and community members restoring and enhancing the meadows.

Norkam Secondary School, Kamloops Project: Bat Box.

A church on the Squilax Reserve was a roosting site for brown bats until it burned down last year. Students constructed bat boxes and placed them in and around the remains of the church and along the river to attract bats that were returning home to roost. The students involved in the project were part of the Resource Management Program offered at the school.

For more ideas on how you can get your hands on habitat, check out the *Naturescape* series (listed in Stuff to Read, pg. 12) This series of booklets contains ideas and instructions for caring for wildlife habitat at home. **KC|EZ**

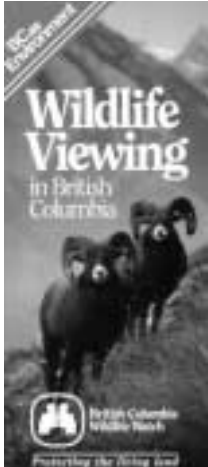


Students from Norkam School placing bat boxes



wildlife

CLOSE ENCOUNTERS



Call BC Environment at (250) 387-9767 to order a copy of the Wildlife Viewing brochure.

geese who have arrived to feed on eelgrass while making their annual migration from Mexico to Alaska.

Throughout the seasons in BC, wildlife brings people out in flocks. Each year along the Adams River north of Kamloops, thousands of people congregate on the river banks to welcome back the sockeye salmon. The river turns turbulent and crimson as anywhere from one to two million salmon return to spawn. At the same time, the banks are filled with eagles and gawking wildlife watchers.

A sloth of bears. A squabble of sea-gulls. A shimmer of hummingbirds. A business of flies. A knot of toads. A prick of porcupines. This wealth of wildlife is right in our backyard, and there are lots of ways to get a little closer.

Every April along the intertidal areas around Parksville on Vancouver Island they arrive like clockwork. Some come in small family groups, others solo. It's not the abundant food or spring weather that brings them to these places every year. Land-locked and avian species from around the world are gathering for the annual Brant Festival.

This festival attracts thousands of birdwatchers who gaze at the several thousand black brant

With such diverse climates and geographies, BC has a huge variety of habitats, from wetlands and estuaries to grasslands and rain-forests, and all of these support different mammal and bird species. With so much variety, BC is an excellent place to watch wildlife.

What you can see will depend on the time of year and how well equipped you are to get out into backcountry. But there's lots to see even if you just go as far as your local park. Here's a checklist of some animals, where to find them, and what you might need to get there. AM|ST|EZ



URBAN VIEWING

Where?

Local birdfeeders, greenspaces, urban streams and ravines, municipal parks

What do you need?

Lots of patience, a raincoat, camera, notebook

Animals to watch for:

Hummingbirds, butterflies, gulls, raccoons, skunk, pine grosbeak, cedar waxwing, finches, crickets

FRONT- AND MIDCOUNTRY VIEWING

Where?

Along coastal beaches, lakes and rivers, provincial parks, country and logging roads

What do you need?

Patience, appropriate clothing (hat, boots, a good jacket), binoculars and notebook, lunch

Animals to watch for:

Moose, seals and sea lions, eagles, gray whales, loons, kingfishers, black bear, porcupine, shorebirds, coyote

BACKCOUNTRY VIEWING

Where?

Wilderness areas, larger provincial parks

What do you need?

Kayak, skis, hiking boots or canoe, lots of patience, First aid kit, outdoor equipment, binoculars, food

Animals to watch for:

Grizzly bear, bighorn sheep, owls, bats, pica, ptarmigan, caribou.

stuff to read

On the Brink: Endangered Species in Canada. 1989. J.A. Burnett, C.T. Dauphiné Jr., S.H. McCrindle, and T. Mosquin. Western Producer Prairie Books, Saskatoon.

Conservation of Grizzly Bears in British Columbia. Background Report. 1995. B.C. Ministry of Environment, Lands and Parks.

Courtship in the Animal Kingdom. 1988. Mark Jerome Walters. Bantam Doubleday Publishing.

Sexual Selection. 1997. James L. Gould and Carol Grant Gould. Scientific American Library. WH Freeman and Company.

It's a wonderful life: The Burgess Shale and the Nature of History. 1990. Stephen J. Gould. WW Norton and Company.

Naturescape British Columbia, Stewardship Series. 1995. Habitat Conservation Trust Fund. B.C. Ministry of Environment, Lands and Parks. www.elp.gov.bc.ca/hctf

British Columbia, A Natural History. 1996. R. Cannings and S. Cannings. Douglas and McIntyre.

Farside Galleries. 1984. Gary Larson, Andrews McMeel.

Looking at Totem Poles. 1993. Hillary Stewart. Douglas and McIntyre.

Kwakiutl Legends. 1989. James Walls and Pamela Whitaker. Hancock House.

Mammals of the Canadian Wild. 1985. Adrian Forsyth. Camden House Publishing.

Pacific Salmon from Egg to Exit. 1996. Gordon Bell. Hancock House.

The Black Canoe, Bill Reid and the Spirit of Haida Gwaii. 1991. Robert Bringham and Ulli Steltzer. Douglas and McIntyre.

lingo

adaptation - evolutionary change resulting from natural selection.

arthropod - animals with jointed legs and segmented bodies; mostly insects and spiders.

biological clock - a physiological system that enables organisms to live with the rhythm of nature; also known as circadian rhythms, related to season and day-length.

carnivore - an organism that eats meat and other animal matter.

celestial alignment - arrangement of stars and planets.

den - place where bears spend the winter to stay warm and dry. Females give birth in their dens in January or February and stay in them until late spring.

ectothermic - obtaining heat from outside the body; mistakenly known as "cold-blooded."

endothermic - generating heat inside the body.

habitat - a collection of biotic and abiotic elements used and/or required by a species.

herbivore - an organism that eats foliage and other plant matter.

invertebrate - animal with no backbone; includes arthropods, worms, and shellfish.

metabolism - the combination of physical and chemical processes necessary to maintain life; includes conversion of food to energy.

mite - small, often microscopic eight-legged bug of the spider class

musk - strong smelling glandular secretion produced by some animals, and used in the perfume industry.

natural selection - the process by which individuals in a species are favoured by nature to succeed and reproduce because of traits that give them an advantage over other individuals of the same species.

omnivore - an organism that eats both plant and animal matter.

pheromone - chemical substance secreted by one organism that influences the behaviour of another.

photoperiod - the number of daylight hours in a 24-hour period.

rut - season of sexual excitement and activity among ungulates.

totem - an object that symbolizes a clan or family; often represented as an animal or plant.

totem pole - a tribal symbol displaying carved or painted totemic figures.

COUGAR SEEN SLINKING AROUND THE EMPRESS

In 1992 a wayward male cougar weighing 60 kilograms found its way into the parkade at the Empress Hotel in Victoria. Far from home, the cougar may have ventured from East Sooke about 40 kilometres west of the city. Over the years sporadic sightings of cougars have caused their fair share of commotion in and around the famous hotel in Victoria's inner harbour. Unmistakably larger than domestic felines, cougars have been sighted near the hotel and roaming through the surrounding neighborhoods. Cougars found within urban centres are tranquilized and moved to their natural habitat in the wild.

E C O | n d e x

Approximate number of insect species in BC: **35,000**

Estimated number of vascular plant species in BC: **2,073**

Percentage of vascular plant species endangered or threatened in BC: **12**

Number of mammal species in BC: **143**

Percentage of mammals endangered or threatened in BC: **10**

Number of pairs of the now extinct great auk seabird to have bred on Newfoundland's Funk Island in the eighteenth century: **100,000**

Number of grizzly bears killed each year because of their developed dependence on garbage: **50**

Number of black bears killed each year because of their developed dependence on garbage: **800**

Total number of deaths caused by bear attacks over three years (1994, 1995, 1996): **4**

Distance in kilometres travelled during complete migration of Swainson's Hawk: **8,000**

Maximum distance in kilometres travelled by northern caribou during migrations: **5,000**

Non-stop distance in kilometres travelled by hummingbirds during migrations over the Gulf of Mexico: **800**

Percentage of fish threatened or endangered in BC: **32**

Minimum length in centimetres of male rattlesnakes found successfully mating with female rattlesnakes in BC: **72**

Number of eggs laid by horseshoe crab: **80,000**

Percentage of bird species that are monogamous to some degree: **90**

Average air speed in km/hour of migrating songbirds: **32**

Average air speed in km/hour of migrating Canada geese: **50**

Length in centimetres of horns on a mature male bighorn sheep: **127**

E C O V i b e

What did you think of *EcoZine*?

Was there too much stuff?

Too little?

What was your favourite part?

What didn't you like?

Do you have any story ideas for *EcoZine*?

If you know the answers to these questions, share your wisdom! Send your comments to *EcoZine*...

Snail Mail:

EcoVibe, BC Ministry of Forests
Public Affairs Branch
Suite 300 - 1675 Douglas Street
Victoria BC V8W 3E7

or visit our Web site at:

Wild BC

<http://www.elp.gov.bc.ca/hctf/wild/resources/projectwild/activity.htm>

Ministry of Forests,
Communications Branch

<http://www.for.gov.bc.ca/pab/pab.htm>