



## A BEAR'S LIFE THROUGH THE MONTHS

January: The full moon in January is sometimes called the 'bear moon'. Black bear cubs are generally born in January. The mother bear licks them clean, keeps them warm and moves into positions to make it easier for them to nurse.

February: All bears continue to hibernate. Newborn cubs continue to grow as mother bears care for them.

March: Hibernation continues. The testosterone (sex hormone) levels of adult male black bears begin to rise.

April: The snow melts and bears leave their dens. Adult males leave their dens first while mothers with cubs are the last to leave their dens. Food is very scarce. Adult males begin to roam. Most other bears remain lethargic (sluggish), eating mainly aspen catkins and willow catkins (pussy willows). All bears lose weight at this time of year.

May: Green plants begin to grow and trees begin to sprout leaves. The bears' lethargy (sluggishness) ends. They begin to eat sprouting grass, emerging herbs and young aspen leaves. Cubs taste what their mother eats, but swallow very little of it. They still rely on their mother's milk. Mother bears that are nursing young cubs continue to lose weight. Other bears slowly begin to gain weight.

June: Green plants mature and toughen, making most of them inedible for the bears. Ant pupae become abundant and bears add them to their diet. Mating season begins and males roam widely to find females without cubs. Cubs begin eating solid food, especially ant pupae from logs their mother opens for them. Mothers stop losing weight. Other bears gain weight slowly.

July: Cherries, blueberries, serviceberries, wild sarsaparilla berries and raspberries ripen and become major foods. All bears gain weight rapidly if these berry crops are good.

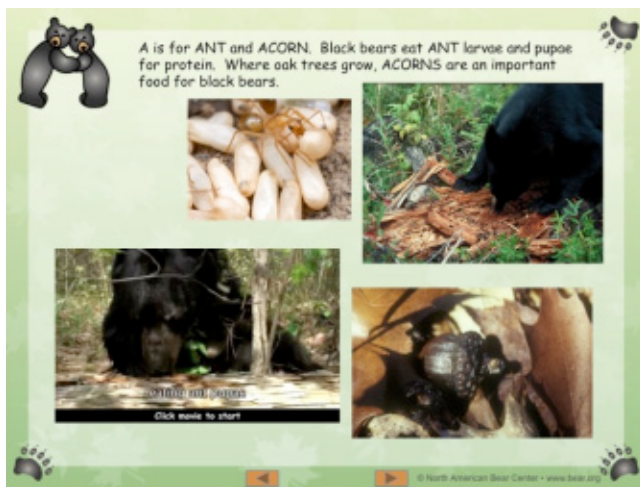
August: Viburnum berries, dogwood berries, wild plums, hawthorn berries, mountain-ash berries, and hazelnuts (their favorite) ripen. All bears continue to gain weight.

September: Acorns ripen. Berries and hazelnuts become scarce. Where acorns are abundant, bears feed and fatten on them. Other bears begin losing weight. Cubs stop nursing. Bears begin to become lethargic (sluggish) and some enter dens to begin hibernation.

October: Most bears enter their dens and begin a light hibernation. Cubs born last winter will share their mother's den.

November: Hibernation deepens. A hibernating bear's heart rate slows to as low as 8 beats per minute. Breathing becomes as slow as one breath every 45 seconds. Eggs fertilized in the late spring or early summer implant in the uterus and begin to develop.

December: Hibernation continues. Cubs will sleep through their first birthday (in January) without celebrating.



## ANT BROOD - AN IMPORTANT FOOD

Ant specialists refer to ant larvae and pupae as "brood." These digestible clumps of fat and protein are the main source of animal protein for black bears over much of temperate North America. Black bears have long, sticky tongues for probing into ant colonies.

Ant brood is a major food from late spring until mid to late summer. It is a delicacy for 4-month-old cubs eating their first solid foods. The cubs crowd in, often bawling, when mothers open ant colonies. Hungry mothers show frustration at times but almost always defer to the cubs.

Bears find brood by keying in on pheromones and other chemicals ants use for communication and defense. Researchers watched bears sniff out up to 200 colonies per day. The colonies included 20 ant species. 94 percent of the colonies were Formicine ants, many of which use formic acid and citronella for defense.

Bears attempt to eat brood cleanly without getting a lot of soil, debris, and adult ants. They do this most easily with colonies under rocks, moss, and ground litter. They flip over the rocks or other cover and get the brood with a few flicks of their sticky tongues.

Colonies in logs or stumps are more difficult. Biting into logs is the main use of the black bear's long canine teeth. Bears sniff along logs to locate the colonies and then tear in with teeth and claws as worker ants spray formic acid into the air and begin carrying off the brood. If the bears don't work fast, worker ants can scatter the brood before the bears get to it. When researchers experimentally put their faces next to the bears' faces at logs, the researchers jerked away from the acrid cloud of formic acid. They stood amazed that the bears could keep working. By the time bears reach colonies in logs and stumps, workers are carrying away some of the larvae and pupae. Bears flick these larvae and pupae into their mouths along with the attached workers. After digestion, some of the worker carcasses still hold bits of pupae in their mandibles.

Bears usually avoid anthills and ant mounds. Digging into them mixes too much soil with the brood. Sign of bears digging into ant mounds is a sign of scarce food.

If summer berry crops fail, brood can be especially important. In the hot dry summer of 2006, berries withered but ants flourished, and bears ate brood longer into the summer than usual. Despite the berry crop failure, few bears searched residential areas for garbage and birdseed.

Bears work hard for small amounts of brood. The amount eaten per colony has proved difficult to measure but is only a few grams. It is no wonder bears add little fat when berry and nut crops fail and they must rely mainly on ant colonies and vegetation.

Formic acid is probably a reason bears sometimes bite into insulated snowmobile seats, hot tub covers, and refrigerator walls. These items all produce formic acid when the formaldehyde in the insulation breaks down, making them smell like ant colonies.



## THE IMPORTANCE OF BERRIES

Berries are important foods throughout the black bear range. The most commonly eaten berries in northeastern Minnesota are sarsaparilla berries, juneberries, cherries, dogwood berries, blueberries, and raspberries. Many other berries are eaten, but they have shorter seasons, are scarce, or are less preferred. A very few berries, including common berries like baneberries and blue bead lily berries, are not eaten.

The period when berries and hazelnuts are abundant around Ely is short—mainly July and August—making that period critically important in

the black bear's annual cycle of events. Efficient feeding during that time is critically important to winter survival, growth, and reproductive success. Researchers found that bears around Ely end mating activities before the critical feeding period and focus on feeding for the remainder of the summer. In eastern states, bears continue mating activities longer into summer because the critical feeding period is not until fall when acorns, hickory nuts, bechnuts, and other foods become abundant. These foods are scarce or absent around Ely.

Black bears are efficient berry-eaters, consuming up to 30,000 berries a day in a good year. They gather berries quickly, using their sensitive, mobile lips and swallowing them whole. The berries enter a two-part stomach, which grinds the pulp off the seeds.

The seeds pass through the digestive tract unbroken and able to germinate, making black bears important seed dispersers. Each summer, they spread the seeds of their favorite berries all over their home ranges. For very large-seeded fruits like Canada plum (*Prunus nigra*), black bears are probably one of the few species that can disperse the seeds.

Bears around Ely gain weight most rapidly during July and August when berries and hazelnuts are abundant. When the berries run out in September, there is little else to eat. The bears usually enter dens in September or October. At that time, bears in the eastern deciduous forest are just beginning their fall period of rapid weight gain. The longer period of food abundance in eastern states enables bears to achieve more growth and reach maturity more quickly than bears do around Ely. Bears in eastern states typically produce their first litters at 3 or 4 years of age, while bears around Ely produce their first litters at 6.3 years of age on the average.

Berries contain anti-oxidants, and the seeds of some species contain vitamin B-17, considered an anti-cancer compound by some scientists. Although cancer occurs in captive bears, it has never been reported in wild bears.



## CLAWS FOR DIGGING

The short curved claws that adapt black bears for climbing limit their digging ability. By comparison, grizzly bears have longer straighter claws for digging as an adaptation to living in more open country where more of their food is underground.

## WHY ARE BLACK BEARS SO TIMID?

The Pleistocene Ice Age was a dangerous time for black bears across North America.

For hundreds of thousands of years—until about 10,000 years ago—North America was home to saber-toothed cats, American lions, dire wolves, and giant short-faced bears.

Black bears didn't stand a chance against any of these predators in a fight, but the black bear was the only one of them able to climb trees. Black bears stayed near trees and lived by the rule "Run first, ask questions later." They develop a mind more like that of a prey animal than a predator.

Today, the black bear's timid attitude aids survival in the face of grizzly bears, timber wolves, and people.



## WINTER DENS

Bears den in a variety of places. If you suspect something is a den, look for a bed of leaves, although not all bears make beds if they den after snow has fallen. To be sure a bear used a leafy bed, look for a depression 2-4 feet in diameter. Dampen your hand on the forest floor and rub it around on the leaves to see if any dark hair sticks to it.

Bears investigate possible den sites throughout the summer. If a bear is disturbed during the winter, it will often move directly to another den.

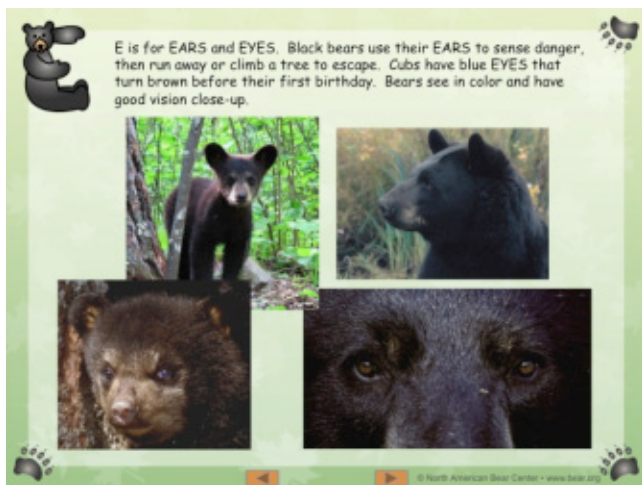
Standing hollow trees are favorite denning spots, but few trees are allowed to reach the mature stage at which the center rots and becomes hollow. Such trees can be found in portions of the Boundary Waters Canoe Area in northeastern Minnesota, especially where they were fire-scarred a half century or more ago.

Rock crevices and caves are also used as dens, and these can remain useable for centuries, but usually not by the same bear and usually not in successive years. The den that researchers found being used the most during four decades of study was used three times, each time by a different bear, and each time after an interval of six years.

Dens are also dug into hillsides or under the root system of a tree. These dens may be dug during the summer months, long before they are needed. Dug dens often collapse after use and therefore are seldom reused.

Bears also may den under the crown of downed trees or in brush piles.

Some bears just rake up a bed on the ground near a windbreak.



## **VISION**

Bears see in color and have sharp vision close-up. Their distance vision (over two hundred yards) has not been tested.

## **HEARING**

Hearing is the black bear's first line of defense against danger because they can hear in all directions (unlike smell) and they can hear farther than they can see in brushy forest. Their ears develop to full size more quickly than the rest of their body. Their hearing is over twice the sensitivity of human hearing and exceeds human frequency ranges.

## **SMELLING**

Their smelling ability is extremely good. The limits are untested. Their nasal mucosa area is about 100 times larger than in humans.



## BLACK BEAR COLOR PHASES

Black bears come in more colors than any other North American mammal. They can be black, brown, cinnamon, blond, blue-gray, or white.

East of the Great Plains, nearly all black bears are black. These were the first bears early settlers saw, hence the name. The melanin in black fur makes the fur resistant to abrasion in the brushy understory of eastern forests. In forested states that border the Great Plains, 5% to 25% are shades of brown rather than black. About 5% are brown in Minnesota. Blond or white individuals are rare in Minnesota, but a young white male was seen near Orr, MN, in

1997 and 1998.

In western states that have mountain meadows and open park-like forests, over half the black bears (*Ursus americanus cinnamomum*) are brown, cinnamon, or blond. Light colored fur reduces heat stress in open sunlight and allows the bears to feed longer in open, food-rich habitats. The lighter colored fur may also camouflage them from predators in those open areas. Ice Age predators undoubtedly used to kill black bears in open areas where the bears couldn't escape up trees. Grizzly bears still do that in some areas today.

Honey, the resident female black bear here at the North American Bear Center, is cinnamon colored. She came from captive stock of unknown origin but likely has roots in the west.

Some non-black black bears bleach in the sun. New dark brown fur can bleach to nearly blond by the time it is shed the next summer.

Two rare color phases are found in coastal British Columbia and southeastern Alaska where populations are isolated by mountains. The Kermode bear, a subspecies of black bear (*Ursus americanus kermodei*), lives on a few islands along the coast of British Columbia. Most of them are black, but in some areas up to 20% are creamy white and called Spirit Bears.

Farther north, another subspecies, the Glacier Bear (*Ursus americanus emmonsii*), lives in southeastern Alaska. Again, most are black, but a few are dark bluish gray with silver-tipped guard hairs. Mountain glaciers that isolated this subspecies during the Ice Age are now gone or greatly reduced. The subspecies is now only semi-isolated from surrounding populations. As these bears integrate with surrounding populations, dominant black genes will make the rare blue-gray color phase even more rare.



## HOW DO BLACK BEARS RESPOND TO TICKS?

The only ticks found on black bears in northeastern Minnesota are dog ticks, also known as wood ticks (*Dermacentor variabilis*), and rarely winter ticks (*D. albipictis*).

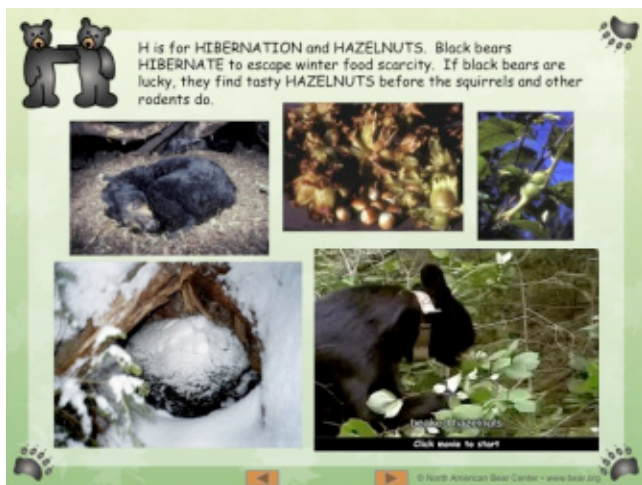
Dog ticks are found on bears from early spring to mid August. Single winter ticks have been found on a couple bears in dens. Neither of these ticks carries Lyme disease. Black bears remove dog ticks by scratching with their claws or by rubbing on objects.

Within family groups, mothers and cubs groom each other using their incisors to delicately

remove ticks and using their molars to crush engorged ticks before swallowing them.

After family breakup, tick infestations increase without family members to remove them.





## THE FIVE STAGES OF ACTIVITY AND HIBERNATION

The annual cycle of black bear activity and hibernation has five stages:

1. hibernation
2. walking hibernation
3. normal activity
4. hyperphagia
5. fall transition

The stages differ in biochemistry, physiology, appetite, and level of activity. The onset and duration of the stages are genetically programmed to fit regional norms of food availability, which differ across America.

For example, around Ely, fall food is scarce, so bears begin hibernating in September or October and remain in dens for 6 or 7 months until April. If supplemental food is provided to these bears in fall, they abandon it to begin hibernating on time, as they are genetically programmed to do. Bears around Ely usually continue hibernating through winter thaws.

The activity schedule is very different in eastern North America where acorns, hickory nuts, beech nuts, and other foods become available in fall and some foods remain available all winter. Bears there are genetically programmed to delay hibernation until late November or December and hibernate less than 5 months. Hibernation there is typically not as deep, and some bears emerge to forage during winter thaws. Food sometimes remains available throughout winter there, and some bears continue foraging throughout winter.

### Experimental studies with captive bears revealed the following:

Stage 1—Hibernation is continuous dormancy with distinct decreases in heart rate and metabolic rate. Bears use up to 4,000 kcal per day, mainly body fat, but do not eat, drink, urinate, or defecate. They can reduce oxygen consumption and metabolic rate by half and breathe only once every 45 seconds. Heart rate can drop periodically to 8-21 beats per minute, and blood flow to skeletal muscle, particularly the legs, can be reduced by 45% or more, making some bears slow to arouse and run away in winter. Blood perfusion rates of peripheral tissues can fall below levels needed for aerobic metabolism in humans.

Stage 2—Walking hibernation is the 2-3 weeks following emergence when metabolic processes adjust to normal summer levels. During walking hibernation, bears voluntarily eat and drink less than they will later during normal activity. They also excrete less urine, nitrogen, calcium, phosphorus, and magnesium.

Stage 3—Normal activity typically lasts from green-up in spring to the onset of hyperphagia in midsummer or fall, depending upon region. During this stage, bears with unlimited food eat 5,000 to 8,000 kcal per day. If they are denied water and food during this stage, they cannot duplicate hibernation responses. Instead, they become dehydrated, utilize muscle for energy, and accumulate nitrogenous wastes in the blood, which can be fatal.

Stage 4—Hyperphagia is a period of excessive eating and drinking to fatten for hibernation. Black bears with unlimited food and water ate 15,000 to 20,000 kcal per day and drank several gallons. Large amounts of water are needed to process the large amounts of food and rid the body of nitrogenous waste. Daily urine volumes for two bears were 2-4 gallons (8-16 liters). Nitrogen

losses were 2.4 to 3.7 ounces (69-104 grams) (Nelson et al. 1983). By contrast, wild bears obtain most of their water during this period from the berries they eat.

Stage 5—Fall transition is a period after hyperphagia when metabolic processes change in preparation for hibernation. Bears voluntarily eat less but continue to drink to purge body wastes. They become increasingly lethargic, resting 22 or more hours per day, often near water. Active heart rates fall from 80-100 per minute to 50-60 per minute, and sleeping heart rates fall from 66-80 per minute to less than 22 per minute.

## **HAZELNUTS - A FAVORITE FOOD**

Hazelnuts are one of the most important and preferred bear foods in northeastern Minnesota. Across North America, availability of hard mast (nuts and acorns) is a major predictor of bear growth and reproductive success.

In the eastern United States, acorns, hickory nuts, beechnuts, and hazelnuts make the eastern deciduous forest the top black bear habit of North America. Most bears there produce first litters at 3 or 4 years of age. In northeastern Minnesota, lack of hard mast is the major reason bears do not produce litters until 6.3 years of age, on the average.

Most hazelnuts in northeastern Minnesota are beaked hazelnuts (*Corylus cornuta*). In the occasional year when nuts are abundant, bears gain extra weight, nuisance activity is infrequent, fewer bears go to hunters' baits, and pregnant females go on to produce healthy surviving cubs. They begin eating the soft developing nuts in June and make them their main food in July & August when the nuts ripen.

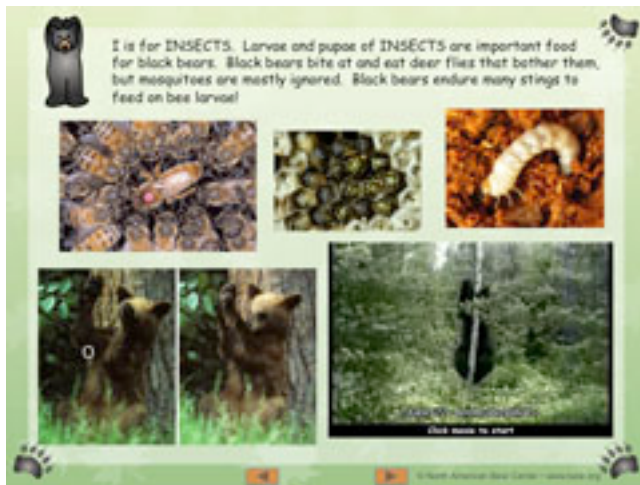
A good patch of hazelnuts can draw bears from long distances. On July 30, 1991, researchers watched Terri, a 6-year-old female with cubs, put her nose into the southeast wind and lead her cubs out of their territory on a 3-day, 41-mile trek to the best hazelnut patch the researchers ever saw. Hazel bushes loaded with nuts extended over 6 miles from Finland, MN, past Tetegouche State Park.

That was the first time Terri ventured more than a few miles outside her territory in her lifetime of being radio-tracked. At that same time, 4 other radio-collared bears moved similar distance upwind to the same patch. Terri and her cubs remained in the patch for nearly a month. Researchers watched how they extracted nuts from the bristly outer husks. They bit the husk to split it and make the nut pop free into their mouths. They gave each nut one or two chews with their broad, flat molars before swallowing it.

On September 4, at 5:30 PM, the family re-entered its territory and stepped onto a scale. Terri weighed 174 pounds—a good weight for a lactating female. The cubs were a whopping 66 and 70 pounds—the heaviest the researchers had seen.

How many hazelnuts can a bear eat in a day? Terri's sister Patch provided that data three years earlier. Patch allowed researchers to count how many nuts she ate in two 24-hour periods. She ate 4081 hazelnuts (about 12 pounds) on September 5 and 4,225 hazelnuts (about 12.5 pounds) on September 6. Where red squirrels piled nuts at bases of trees, she moved from tree to tree, sniffing each base until she hit one with a pile. Caloric intakes exceeded 12,000 calories on each of those days.

The bears' greatest competitor for hazelnuts is probably the filbert worm (*Cydia latiferreanus*). It begins life as an egg in the hazelnut flower, grows up eating the developing nut, and exits the empty shell in late summer. Bears can tell in an instant whether a nut is good or empty. When most of the remaining "nuts" are empty, the bears shift to other foods.



(note the photo with the drawn circle)

### HOW DO BLACK BEARS RESPOND TO DEER FLIES & HORSE FLIES?

This black bear is trying to slap a deer fly (in the white circle). Deer flies and horse flies bite hard. Bears shake their heads when these flies bite their faces or ears. In early summer when bears have short new fur, these flies can reach the skin and bite nearly anywhere. Black bears often try to catch them by slapping them or biting them out of the air before the flies can bite. They know they have to move fast to catch them. When a researcher offered a horse fly in his fingers, the usually slow-moving bear moved

lightning fast to get the big fly before it could get away, using its lips and tongue with precise accuracy.

### HOW DO BLACK BEARS RESPOND TO MOSQUITOES?

Black bears mostly ignore mosquitoes. They seldom bother to wipe mosquitoes off their faces. Fur usually prevents mosquitoes from reaching the skin except on the face, ears, and edges of the foot pads and toe pads. Cubs sometimes lick mosquitoes off their mothers.

### WHAT DO BEARS LIKE TO EAT IN A BEEHIVE?

Although bears prefer immature bees, they also will eat honey, depending upon the alternatives.

As good as honey sounds, it does not compare with the nutritional value of immature bees which are mostly fat and protein.

Bears endure stings to get the prized pupae, larvae, and eggs in the brood comb of a hive. Protective adult bees sting bears' faces and ears but have a hard time penetrating the fur on the rest of the body. After bears get the brood comb and perhaps some honey, they hurry away and shake bees out of their fur like they shake water.

Bears around Ely taste little honey because domestic bee hives are scarce in the forests of northeastern Minnesota and the native bumblebees and wild bees make very little honey.



## PREPARATIONS FOR BIRTH

Getting fat is the most important preparation for birth. After mating in late May or June, pregnant females focus on eating for the rest of the summer. Females that don't become fat enough by fall cannot maintain their pregnancies.

Around Ely, females that weigh 176 or more by fall maintain pregnancies, give birth in dens in mid to late January, and provide enough milk for their cubs to survive. Females that weigh less than 148 pounds in fall do not give birth. Females of intermediate weights may or may not give birth, and cubs from those females are less likely to survive.

Pregnant females make dens earlier than other bears (as early as July 19) and line them with extra bedding. Around Ely, pregnant females begin hibernation in mid September to mid-October. Black bears delay implantation. That means their fertilized eggs do not immediately implant in the uterine walls and begin development. They remain free-floating in the uterus for about 5 months until November. Then they implant and grow rapidly. When the cubs are born in January, they weigh nearly a pound each.

The age at which females begin to reproduce depends upon food. Well-nourished females maintain pregnancies when they are as young as 2½ years old, giving birth at three, but some females around Ely are unable to maintain pregnancies until they are 7½ years old. The average age when females in this area first maintain a pregnancy is 5½. Near the northern edge of the black bear range in Canada, some do not become large enough to maintain pregnancies until they are 10½, giving birth to their first litters at 11.

## CARE OF NEWBORN CUBS

Newborn cubs are smaller, relative to their mother's size, than the young of any other placental mammal. They are totally dependent on their mothers. Newborn cubs have little fur, weigh less than a pound, and can barely crawl. Three cubs is the most common litter size around Ely.

Around Ely, temperatures at the time of birth in January can be 60 degrees (F) below zero. Most dens are no warmer than the outside air because most den entrances are open. Some "dens" are simply nests on the ground surface.

The mother's metabolism is slightly reduced, but she maintains a body temperature between 94 and 98 F, compared with approximately 100 F in summer. Her body temperature in the den is high enough for full mental function. She dozes when the cubs do but responds to every cry when they are cold, hungry, or need to eliminate body wastes.

She keeps the cubs warm by hovering over them and breathing on them with her head tucked under her chest. Her arms and legs make furry walls. She helps the cubs find her six nipples. She licks them to stimulate defecation and eats the feces to recycle unabsorbed nutrients and keep the den clean.

Newborn cubs have mouths shaped for sucking, and milk is their only food. The cubs do not hibernate. They have full metabolism for maximum growth rate. They nurse frequently and for

long periods, making a motor-like hum that seems to tell mothers not to change position because everything is okay.

## **THE CUBS DEVELOP**

By the end of February, cubs are 4 to 6 weeks old and usually weigh 2-3 pounds. They have dense fur almost an inch long. They can thermo-regulate to some extent, but they still cry for help staying warm and fed. They can crawl, but they can't walk. Their eyes are opening or fully open. On warmer days, with temperatures in the 20's, the cubs often sleep partially exposed on their mother's back.

Mother loses .36 to .61 pounds a day converting fat, water, and other body stores to milk and energy. She may eat snow around the den entrance.

In March, the cubs' fur grows to over an inch. Temperatures are rising. The cubs are walking in the den on warmer days. Melting snow drips on the cubs or soaks the bedding. Mothers lick the cubs dry.

By early April, most cubs weigh 3-10 pounds, depending upon the mothers' weight and how many littermates competed for her milk. The denning period is over or almost over.

The video shows a wild black bear mother caring for her three 5-week-old cubs. They are snug in their dug den as snow gently falls outside. The mother is 6-year-old June and this is her 2nd litter. The light-faced cub is a female (Lily) and the other 2 are males (Cal and Bud). This exceptionally trusting mother allowed us to place a video camera in her den to obtain these intimate scenes of bear family life.

## **THE FAMILY EMERGES**

Bears around Ely typically leave their dens in early to mid April. In years with sparse snow, some bears leave as early as March 24. Mothers with unusually small cubs have remained at dens until mid May.

As the time for emergence approaches, bears may move in and out of their dens or may leave abruptly, especially if dens become wet from rain or melt water.

Cubs have a hard time walking through deep snow. If dens are dry, mothers around Ely typically base their activities at the dens until the snow is nearly melted and the cubs can easily follow her to a big white pine. There she rakes a bed of vegetation to insulate them from the frozen ground. Black bear cubs are natural climbers. They practice climbing from the time they leave their dens. They also play with objects, each other, and with mom when she is available.

## **CUB VOCALIZATIONS - MOTHER RESPONSES**

Because bears are intelligent animals, much of their behavior is based on learning rather than instinct, so responses may vary.

*(key to codes)*

**A-Vocalization**

**B-Situation**

**C-Mother's Response**

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### **A-Pulsating hum**

B-Nursing (or, rarely, when warm and comfortable)

C-Mother maintains position.

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### **A-Crying**

B-Underneath mother in den but can't reach nipples

C-Mother changes position.

B-Cub in den needs to defecate

C-Mother licks the cub's anus and eats the feces.

B-Cub exposed to cold in the den

C-Mother uses the paw, chin, or mouth to tuck cub beneath her.

B-Cub is cold in snow outside the den

C-Mother rolls over and lets the cub climb onto her belly and snuggle against the skin between her hind legs. She draws her legs up around the cub and covers it.

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### **A-Bawling**

B-Cub wants to nurse

C-Mother may comply or not.

B-Cub want ant colony or other food the mother has found

C-Mother usually allows the cub to eat.

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### **A-Cooing**

B-Cub separated from mother

C-Mother may come or not.

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### **A-Yelling**

B-Cub separated from mother

C-Mother grunts with concern and returns to cub.

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### **A-Screaming**

B-Cub in danger

C-Mother comes running and may bluff-charge a nearby person, attack an intruding bear, or retreat.



## HEAT LOSS IN DENS

(Note: Thermal Imaging Photo)

In 2003, the BBC phoned researchers for help with a documentary using new thermal imaging technology. The telephone conversation sounded something like:

BBC: "We're looking for someone dumb enough to try putting tiny cameras under a mother black bear with cubs in a den. Do you have such a person?"

Researcher: "Will it have educational value that we can use at the Bear Center someday?"

BBC: "Yes. One of the cameras will make the

very first thermal images of heat loss patterns in dens."

Researcher: "We have just the person."

In the first week of February, the BBC and the researcher went to the den of 3-year-old Dot. The researcher crawled into the den, showed Dot the camera, and gently eased it underneath her, revealing cubs less than 2 weeks old.

The camera was connected by cable to a monitor 30 feet away. A BBC producer watched the monitor and told the researcher where to aim the camera—up, left, hold steady, etc.

In early April, the team filmed the bears again shortly before they emerged. At one point, the researcher momentarily stepped away from the den during a blizzard and returned covered with snow. When he started to enter the den, the mother didn't recognize him and lunged. The researcher spoke and offered his hand for her to smell. The nervous mother relaxed, lay back down, and even lifted a leg as he put the camera under her again.

Narrated by David Attenborough, the documentary shows heat loss to be especially great from the eyeballs, nose, and forehead. This helps explain why bears tuck those parts under the chest when they curl up on their stomach in the hibernating position. The main area exposed is the thickly furred back.

## THE GIANT SHORT-FACED BEAR - *ARCTODUS SIMUS*

(Note: Skeleton Photo)

### *Carnivorous Diet*

Its skull and shearing type of teeth indicate a highly carnivorous way of life. Its eye sockets are set wide apart and face forward, giving it excellent vision. Its short, broad snout had a huge nasal passage, which probably means it had a keen sense of smell and could inhale great volumes of oxygen while pursuing prey. The large width of the jaws in relation to their shortness, plus the huge insertions for biting muscles, gave this bear a vise-like killing bite and the ability to crush bones to obtain marrow. Tests of bone samples show a very high ratio of nitrogen-15 to nitrogen-14, a nitrogen "signature" that indicates a true carnivore. Everything considered, paleobiologists conclude that the giant short-faced bear ate only meat.

### *Ecology*

Giant short-faced bears lived in Minnesota and the open country west of the Mississippi River and north to Yukon and Alaska. They probably scavenged and preyed upon large herbivores such as bison, muskoxen, deer, caribou, horses, and ground sloths. Their disappearance is linked to changes in habitat that led to the disappearance of some of these large herbivores at the end of the Ice Age.

### **THE LESSER SHORT-FACED BEAR**

A close relative, the lesser short-faced bear (*Arctodus pristinus*) lived near the Atlantic coast and in Mexico. This smaller bear with its longer face and smaller teeth may have been more omnivorous. It may have died out due to competition with a large Pleistocene subspecies of black bear (*Ursus americanus amplidens*) and due to brown/grizzly bears (*Ursus arctos*) invading from the west near the end of the Ice Age.

#### *Living Relative*

The only living relative of the short-faced bears is the spectacled bear (*Tremarctos ornatus*) of South America. It is omnivorous and the size of a black bear.

### **HOW BIG WAS THIS SHORT-FACED BEAR?**

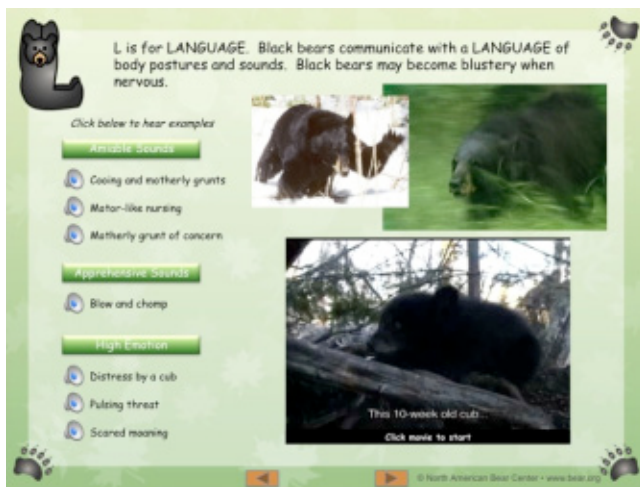
He could reach up 14½ to 15 feet.

He could reach 2 ½ to 3 feet higher with a paw than he could reach with his mouth. This skeleton measures 72 inches from the center of the shoulder blade to the tips of the toes (adding 2 inches for the missing claws). Subtracting 42 inches from the center of the shoulder blade to the tip of the nose, this bear could reach 30 inches above his up-stretched nose—to at least 14½ feet. If he rotated his shoulder upward a few inches, he could reach even higher. Ice Age campers had to hang their food higher than campers do today.

He weighed about a ton.

Archeologists estimate most giant short-faced bears, including females, to weigh 1600 to 1900 pounds. Some estimates exceed a ton. This large male specimen probably weighed close to a ton.





## VOCALIZATIONS & BODY LANGUAGE

Black bears use sounds, body language, and scent-marking to express their emotions of the moment.

*The main thing that helped me get over my fear of bears was learning their language—learning to interpret bear bluster in terms of their fear rather than my fear—learning that behaviors I thought were threatening were really expressions of their own apprehension.* - Lynn L. Rogers, Ph.D., 2007

(see sound examples in presentation)

**AMIALE SOUNDS** are grunts and tongue clicks used by mothers concerned for their cubs and by bears approaching other bears to mate or play. Cubs make a motor-like pulsing hum when they nurse or are especially comfortable.

**Cooing and motherly grunts:** This mother black bear is moving her 3-month-old cubs from their den to a white pine tree to begin life outside the natal den. The mother is grunting her concern while the cubs are voicing little squeals of mild distress.

**Motor-like nursing:** Black bear cubs make motor-like pleasure sounds as they nurse. Similar to a cat's purring, bears make this pleasure sound when they are especially comfortable, nursing, or eating a special treat. Adults make this sound with a deeper voice.

**Motherly grunt of concern:** The sounds of a young cub with its mother. The cub is making the cooing sounds and the mother grunts, which is a common sound mothers make to cubs.

**APPREHENSIVE EXPRESSIONS** are forceful expulsions of air accompanied by threatening body language and sometimes deeper throaty sounds. This explosive behavior looks and sounds very threatening but is harmless bluster from nervous bears—often mothers with cubs. Bear Center researchers have never had blustery bears approach and make contact. Out of respect, researchers avoid crowding these apprehensive bears, but they have found them easy to chase away.

**Blow and chomp:** Bears blow and clack their teeth with they are afraid. When this is done in response to being startled by a person, it appears to be a defensive threat, but they also do it when they scare themselves by almost falling from a tree.

**HIGH EMOTION.** Black bears use a human-like voice to express pleasure, pain, high anxiety, and fear.

**Distress by a cub:** This is a distress sound made by a fearful cub. This sound is commonly made when a cub is separated from its mother. This recording was made while a researcher examined a cub out in the field. The cub was soon released back to the mother.

**Pulsing threat:** A female bear is threatening a male that is competing for her food. The main sound is the pulsing threat. A higher pitched moan of fear is heard briefly from the subordinate male.

**Scared moaning:** When bears are very scared and in a subordinate role they moan. This bear was in a barrel-trap, which is a form of live trap. They also moan when they have escaped up trees or are being threatened by a nearby dominant bear.

## **THE BLACK BEARS' VOICE**

Black bears not only communicate with grunts, tongue-clicks, and blowing. They have a resonant voice. It is not the barking, growling voice of a dog and is seldom the shrill voice of a house cat. It is distinctly bear-like with a near human quality that is easy to mimic.

Children and babies sound like cubs. A screaming child sounds like a cub screaming in terror. Crying babies can fool mother bears into trying to retrieve lost cubs.

For example, on July 4, 1970, a mother bear that had just awakened after being tranquilized began looking for her cubs. The researcher's 3-week-old baby began crying. The bear immediately approached to within a few feet, saw it was not one of her cubs, and turned back. She shortly found her cubs resting in a treetop.

On March 15, 2003, a mother bear ignored people standing outside her den until a newborn baby one of them was holding began to cry. In an instant, the mother bear was up out of her den and looking at the baby from two feet away. She looked back into her den and saw her wide-eyed cubs. The concerned expression left her face, and she settled back down into the den.

On July 24, 2004, a baby cried while a parent changed its diapers at bedtime. Outside, a mother bear appeared and pressed her nose against a big picture window four feet away. She stood up with her paws against the glass, craning her neck to look and listen until the baby was quiet. She then walked off into the darkness with her cubs.

## **SOCIABLE SOUNDS**

In the wild, bears make a plaintive sound when they want to make friendly contact, take food from a bear they know, or nurse.

Mothers grunt when they approach their cubs, are concerned about them, or want them to come down from trees. When a mother returns from foraging, she looks up the tree where she left her cubs and grunts. Although cubs immediately come down in popular literature, cubs in nature have minds of their own about that. When the cubs do not come down, the mother may become agitated and give double and triple grunts, perhaps feeling a need to nurse or move to a new spot. If the cubs do not come down, she may climb up and carry one down.

Tongue-clicking usually is done when a bear approaches another bear to make friendly contact, which may include play or mating. In that context, bears also make pleasant grunts that are higher in pitch than grunts to cubs. Ted, the adult male black bear in the Bear Center pen, makes these pleasant grunts and tongue-clicks to people. If a person lets him, he then shows his friendly intentions by licking the person's mouth and gently mouthing the person's face or head.

Cubs make a motor-like hum when they nurse and occasionally when they are just comfortable and secure. Older bears sometimes make this sound in a deeper voice while eating a big piece of food (like a piece of warm fat) that they can suck or lick. Researchers observed a 3-year-old female make this sound while she was in REM sleep.

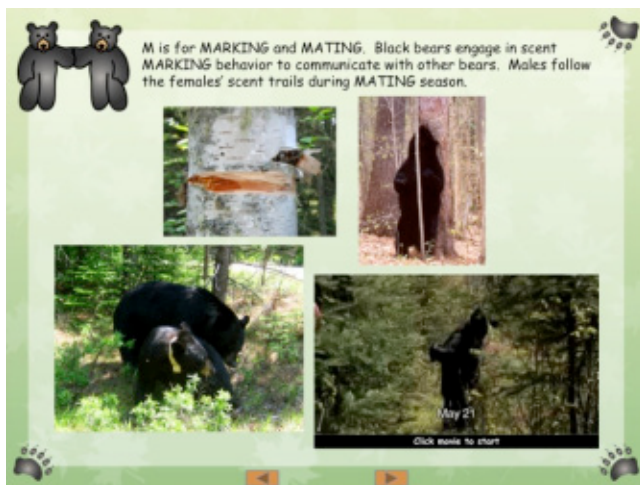
There is much to be learned about the meanings and variety of bear vocalizations.

## **IMAGES VS REALITY**

Outdoor magazine artists typically depict bears as startled, angry, charging, or attacking. All typically are shown with their lips drawn back in some unnatural expression of supposed anger. The same is true for bears depicted as entering tents and houses.

Hunters, researchers, and rural homeowners who have encountered hundreds of real bears laugh at the unreality. Bears are not like cats and dogs that bare their teeth when they feel defensive. Bears typically run away, climb for safety, or show harmless bluster with no effort to show their teeth. Instead of baring their teeth, black bears signal that they are uneasy by making the muzzle long and narrow.

Unlike cats and dogs, black bears do not bare their teeth when they feel defensive. They sometimes exhibit harmless bluster like this bear is doing. It is lunging and slamming its front feet down while blowing explosively. Its muzzle is long and narrow, showing it is upset, but it is making no effort to show its teeth. This wild bear was part of a study to learn the meanings of black bear vocalizations and body language and to learn whether blustery behavior was a prelude to an attack or simply an expression of nervousness by the bear. The study showed conclusively that blustery behavior is not a prelude to attack or a sign of aggressiveness. It simply means the bear is nervous.



## MARKING TREES AND POLES

*(note: video in lower right)*

Black bears of all ages and both sexes rub their scent on marking trees, including wooden sign posts and utility poles, but the majority of this marking is by mature males during the mating season (May and June in Minnesota). They rub their shoulders, neck and crown and may also claw and bite the tree. Claw marks are usually superficial, but incisor bites are deep enough that pieces of bark and wood are sometimes pulled out. Bites leave nearly horizontal marks that look like a dot and a dash where the upper and lower canine teeth came together.

Marking trees are generally along trails. Favorite trees have little ground vegetation to prevent a bear from approaching them, and they often lean slightly toward the trail. Look for hair caught in the bark or wood 2 to 5 feet high and look for bites 5½ to 6½ feet high.

The hair often bleaches to brown or blond after a few months but can still be distinguished as bear hair from its length and appearance. Guard hairs are typically coarse and 3-4 inches long and have a narrow base that may be wavy. Bears are shedding their winter fur when much of the marking is done in spring or early summer, so the bark may also catch underfur, which is thin, wavy and shorter.

Utility poles are favorite marking 'trees.' These are typically in ideal locations along travel corridors, but preservatives might be a factor, too. An easy way to tell if bears live in an area is to check the utility poles, especially those on upland ridges where bears are likely to cross a road. Bite marks on utility poles are generally at the same height as on trees, but bears sometimes bite low on poles.

## STRADDLE TREES & BUSHES

One way bears leave scent is by straddling saplings and bushes as they walk, urinating on the vegetation as it passes beneath them. This is done by bears of both sexes throughout the spring-summer-fall but is done most frequently by mature males in May and June.

If saplings are in leaf when straddled, the leaves may be creased or torn. Leaf creases turn brown and are evidence the trail was used after spring green-up. Trees along regular travel corridors may be repeatedly straddled and marked in this way. Branches of these straddle trees may be twisted and torn by the repeated straddling, and hairs are often caught in the breaks. Bears frequently mark straddled trees by 'painting' them with urine as they pass over.

## COURTSHIP AND MATING

Black bears in northeastern Minnesota mate between mid May and late June. Males have mating ranges 10-15 miles in diameter. Each mating range contains 7-15 female territories. Some territories contain both mothers and daughters of breeding age. Some of the females are accompanied by cubs and are not be available to mate until the next year. Males avoid those territories. Females accompanied by yearlings separate from them as they undergo hormone changes and become ready to mate.

### Extra-territorial Travels by Estrous Females

Once breakup has occurred, females traverse their territory at 3 times their normal rate laying down a scent trail. Females also may make excursions outside their territory. This serves to advertise their status, draw in potential mates, re-establish their territorial rights, and allows them to determine the availability of surrounding territory. Males follow her scent trail.

Both males and females increase their movements during mating season. Females continue to forage during this time and generally can maintain their weight. However, males forage very little during mating season and lose approximately 20% of their fall weight during the 7-8 weeks of mating season. This loss is on top of the 20% of fall weight lost over-winter. This means a mature male weighing 500 lbs in the fall would leave the den in early spring weighing 400 lbs and would weight 300 lbs at the end of mating season—and regain those 200 lbs in 3 months to weigh 500 lbs by fall.

### Courtship

Large males chase younger males away, but mature, evenly-matched, males fight for dominance and mating rights. Old males carry numerous scars on their heads and necks from mating battles.

Males follow females to assess their receptiveness, regularly sniffing areas where the female has sat and the female herself when possible. Couples often play and rest together during courtship. Males may follow individual females and guard them against rivals for up to 9 days before the female becomes receptive and mating occurs. Soon after mating, the male moves on to find another mate. Both sexes are promiscuous.



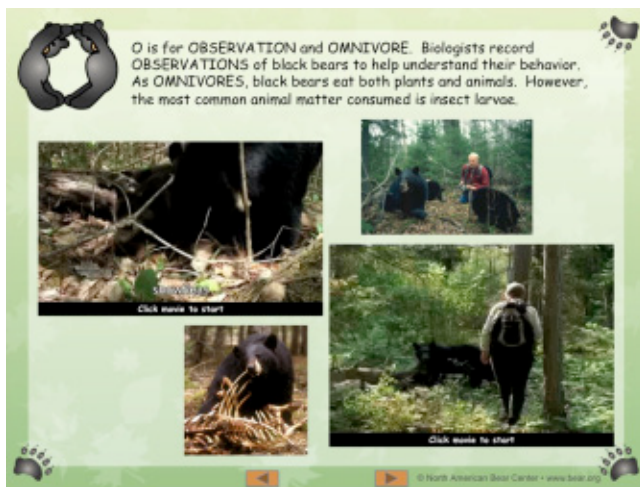
## NURSING OF CUBS

The mother bear keeps newborn cubs warm by hovering over them and breathing on them with her head tucked under her chest. Her arms and legs make furry walls. She helps the cubs find her six nipples. She licks them to stimulate defecation and eats the feces to recycle unabsorbed nutrients and keep the den clean.

Newborn cubs have mouths shaped for sucking, and milk is their only food. The cubs do not hibernate. They have full metabolism for maximum growth rate. They nurse frequently and for long periods, making a motor-like hum that seems to tell mothers not to change position

because everything is okay.

After the family emerges from the den and the cubs mature, they increase their intake of solid foods they nurse less frequently, but nursing continues throughout the summer if mother is well-fed and can produce milk.



## PREFERRED FOODS

Nuts, acorns, fruit, insects, succulent greens. Meat and less succulent greens are eaten when preferred foods are scarce. A scarcity of preferred foods can result in failed reproduction, stunted growth, failure to add optimal amounts of fat, and death of young bears, especially cubs.

## OBSERVATION

The black bear videos on [www.bear.org](http://www.bear.org) are provided by the Wildlife Research Institute of Ely, Minnesota and reveal the day-to-day lives of wild black bears in northeastern Minnesota.

None of the videos use animal actors or bears baited into view. They are the result of learning that close-up observations of wild bears are possible and then thousands of hours obtaining the information and videos shown here. Researchers routinely accompanied bears for 24 hours at a time through heat, cold, rain, swamps, and bugs. As the videos show, the bears mostly ignored cameras and observers and went about foraging, napping, playing, nursing their cubs, and battling over mates. These observations give us a better picture of how bears live than we have ever had.

A goal of the research is a better understanding of how bears live and what they need to survive in their increasingly urbanized environment. Another goal is to share that knowledge with the public. The research bears enable people to learn about bear life through TV programs, the internet, classrooms, and traveling exhibits that altogether reach over a hundred million people each year.

## ANIMAL PROTEIN

Insects and animal matter are less than 10% of the annual black bear diet around Ely and across most of North America.

Across America, exceptions occur along the Pacific coast where spawning salmon are available in some seasons and in northern Labrador where lemmings were 34 percent of the diet one year.

Around Ely, researchers found that bears get most of their animal protein from ant brood, hornet larvae, tent caterpillars, march fly larvae, grubs (especially June beetle grubs), and snow fleas (*Collembola*). Bears occasionally found bird nests (mostly ground nests) and readily ate the eggs and featherless hatchlings, but they generally rejected older, feathered hatchlings. They also rejected snakes, turtles, frogs, toads, and salamanders.

Most bears around Ely eat no fish unless they live near a stream where white suckers (*Catostomus commersoni*) spawn in spring. They usually pass up non-spawning fish, especially if berries and nuts are available. However, when preferred foods are scarce, campers can attest that bears will eat fish remains.

What bears eat depends upon what else is available—or is not available.

Meat is a very small part of the diet around Ely except in late May and early June when fawns are born. Researchers who walk with bears in late May and June watch bears catch up to 4 fawns. The bears don't seem to actively hunt fawns. Instead, they search for ant colonies at that time of year. But if a bear happens upon a fawn, it stops searching for ant pupae, sniffs out the fawn, and

pounces on it. The first thing they ingest is the high-fat milk in the stomach. Newborn fawns make captures easy by lying still. However, once they reach about 10 days of age they change escape tactics. When bears approach, they get up and run and easily escape. Black bears lack the agility of dogs and cats to catch dodging animals. The bears soon ignore the scent of fawns until the next spring when a new batch of catchable fawns is born.





## WHY DO BEARS PLAY?

The cubs playing in the video (lower right) are Pete and George, offspring of June, a wild bear that allows researchers to follow her as she forages and cares for her cubs. Pete is always playful and is the cub seen here that initiates play with his brother.

Filmed: 6/02/05

Some bear cubs play long and hard. Others play much less. Each has its own personality. Well-fed cubs play more than malnourished ones.

Unlike children, bears play without vocalizing. Cub play often looks like fighting but fighting is

noisy. Play is quiet, and play-bites are gentle. Movie producers often make play look like fighting by adding growling sounds of lions or dogs, or fighting sounds of bears.

Few animals play more than bear cubs do, but why they play remains a mystery. Scientists have suggested that young animals might play to:

- stimulate development of the brain
- increase cardiovascular fitness
- "burn off" excess energy
- explore surroundings
- practice fighting, mating, or hunting skills animals will need as adults
- help learn to recognize kin, evaluate risk, or cope with stressful situations
- provide a safe way for young animals to test their abilities, the abilities of playmates, and the degree of cooperation/competition with them
- help strengthen social bonds, reduce aggression, enhance alliances, increase tolerance, and improve group cohesion
- release endorphins and other "feel good" chemicals.

These all sound like good ideas, but none has been proven. There is no consensus on why young animals risk injury and burn up energy in carefree activities simply to have "fun." Play is most elaborate and prolonged in young mammals whose behavior as adults is based in large part on learning—animals like bears, dogs, cats, and primates.

Researchers who walk with black bear families noticed that play often begins when a family reaches a puddle, an open field, or a soft pile of wood chips.

Bears play much less after they reach 1½ years of age and leave the security of their mothers. Some siblings who played a lot when they were together as a family sometimes never play with each other again.

Three circumstances lead to play in older bears—courtship, having cubs to play with, and very abundant food.

Where food is so abundant bears don't have to spend all their time looking for and competing for it, they often join up to roam and wrestle. Most often, these play partners are unrelated adolescent males. The largest group of play partners reported to date was a group of four yearlings (3 males and a female) that frequently traveled and played together in late July and August in an area of very abundant food. All were from different litters. Occasionally, they were joined by the female's brother and by a 2-year-old male. Females seldom play with each other. Instead, they tend to be territorial competitors, even where food is abundant.

Play partners split up when food becomes scarce, but they remember each other and sometimes track each other down for brief meetings. When conditions are right again, they sometimes join up and roam together again.

June and her cubs Pete and George appear in the above video (upper left) as well. George was collared to help monitor the timing of family breakup.

A springy tamarack sapling is also an invitation to play. Bears recognize these supple trees from a distance and run and jump on them. They climb up, ride the tops down, get off, and climb them again. They walk the bent-over trees like tightropes, and play king of the mountain with their mother and siblings. Bears eat nothing from these trees, they just seem to enjoy them.



## QUIET BEARS

Bears' soft foot pads and soft coats let them move quietly despite their weight. They can be very elusive unless they choose to show themselves. Over much of their range, they live among people, often unseen.

Bears walk on the soles of their soft feet, so they often do not leave distinct tracks unless they walk through soft mud or snow.

Bears have 5 toes on each foot. Their large toe is on the outside of the foot and the small inner toe does not always register.

Footpads are bigger at the outer edges. Front tracks are wider than rear tracks. The small round heel pad of the front foot seldom registers. The rear track is longer because the whole foot, including the heel, registers. They tend to toe-in, especially with their front feet.



## MONITORING WILDLIFE ACTIVITY WITH RADIO AND GPS COLLARS

### *Radio collars*

A traditional radio-collar transmits a signal that can be picked up by a receiver to determine the animal's location and track its movements. This is called telemetry. When the animal is within range the receiver beeps. Using telemetry, researchers map an animal's location and movements from the ground or from an airplane.

The radio-collar's signal shows researchers which direction the animal is but not how far away it is located. Once a direction is determined, a

compass reading is taken and recorded on a map. A line is drawn on the map from the spot where the researcher is standing in the direction of the animal. Then the researcher must move quickly to another location, listen again for the signal, and repeat the mapping. The spot where the two lines meet on the map shows the approximate location of the animal. This is known as triangulation. Additional readings increase accuracy.

### *Global Positioning System / Satellite collars*

Satellites are used to electronically track research animals wearing Global Positioning System (GPS) collars. Information can either be stored in the collar or transmitted to the researchers via the Internet.



Bears often follow deer trails and forest roads, but some trails are used mainly by bears. These consist of a series of depressions created by multiple bears placing their feet in the same footsteps year after year.

Bear trails can be seen where bears approach favorite marking trees. These trails are often especially distinctive because bears frequently stomp-walk as they approach such trees. Stomp-walking is a form of scent-marking in which bears stomp, twist, and slide each footstep.

## **MARKING TREES AND POLES**

Black bears of all ages and both sexes rub their scent on marking trees, including wooden sign posts and utility poles, but the majority of this marking is by mature males during the mating season (May and June in Minnesota). They rub their shoulders, neck and crown and may also claw and bite the tree. Claw marks are usually superficial, but incisor bites are deep enough that pieces of bark and wood are sometimes pulled out. Bites leave nearly horizontal marks that look like a dot and a dash where the upper and lower canine teeth came together.

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## IDEAL HABITAT

Black bears like large forests with a variety of fruits and nuts. Many kinds of berries and ants are especially productive in sunny openings. Lowlands and wetlands add succulent vegetation. Pools and streams help bears cool off. Mothers with cubs prefer large trees (over 20 inches in diameter) with furrowed bark (like white pines or hemlocks) for bedding sites and refuge.

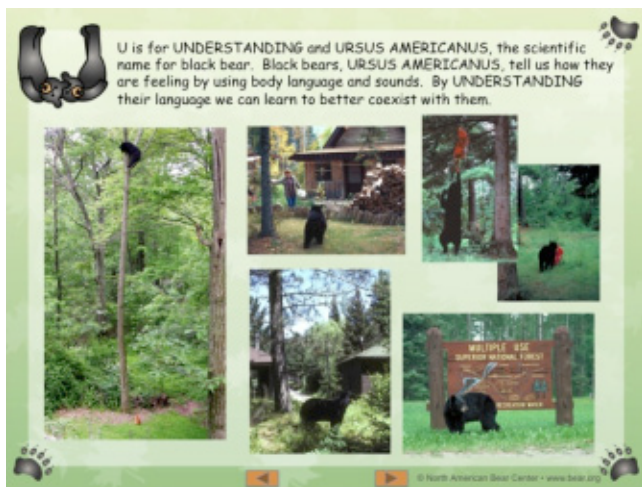
## THE REFUGE TREE

When a mother black bear leads her cubs away from a den, her usual destination is a big tree

where the cubs can take refuge from danger. Around Ely, that tree is typically a white pine over 21 inches in diameter. A mother may pass by thousands of other trees to reach a big white pine where she will rake a bed at the base for herself and the cubs. She seems to know where each big white pine is in her territory. Big white pines have strong, rough bark cubs can safely climb. Their needles give shade, and the branches are strong enough to hold whole families if need be.

Mothers leave their cubs at these "baby-sitter" trees and forage nearby, occasionally up to two miles away. The cubs sleep hidden in the crowns or play around the base, ready to climb at any hint of danger. If disturbed, they may remain quiet up the tree or yell in distress, bringing mothers running, grunting with concern.

Around Ely, mothers with cubs continue to seek out the safety of big white pines throughout spring and summer, making 92 percent of their beds at the bases of them. Other bears give more consideration to comfort, shade, and water than to the security of white pines.



(Note: Photo of bear with backpack)

Campers often tie their food packs to long ropes and sling the food packs over high branches so the food packs are hanging below the branches. The other ends of the ropes are tied to the ground or tree trunks. To get the food, some bears shake each rope like they would shake the stems of bushes and then chew the correct rope like they would chew the base of a branch. When the rope breaks, the food pack falls.

Many campers no longer hang their food. They protect it in lightweight bear-proof containers that make the food virtually inaccessible for bears but easily accessible for campers.

## UNDERSTANDING THE FACTS

**Folklore:** Perhaps no other animals have so excited the human imagination as bears. References to bears are found in ancient and modern literature, folk songs, legends, mythology, children stories, and cartoons. Bears are among the first animals that children learn to recognize. Bear folklore is confusing because it is based on caricatures, with Teddy Bears and the kindly Smoky on one hand and ferocious magazine cover drawings on the other. Dominant themes of our folklore are fear of the unknown and man against nature, and bears have traditionally been portrayed as the villains to support those themes, unfairly demonizing them to the public. A problem for black bears is that literature about bears often does not separate black bears from grizzly bears.

**General Description:** The black bear is approximately 4 to 7 feet from nose to tail, and two to three feet high at the withers. It has small eyes, rounded ears, a long snout, a large body, a short tail, and shaggy hair. It differs from grizzly bears in being smaller with a smaller shoulder hump, a furred rear instep, a less concave facial profile, smaller claws that are more tightly curved, and longer, smoother, and more tapered ears.

**Classification of *Ursus americanus*, the American black bear:** Kingdom: Animal, Phylum: Chordata, Class: Mammalia, Subclass: Theria, Infraclass: Eutheria, Order: Carnivora, Suborder: Fissipedia, Family: Ursidae, Subfamily: Ursinae (all bears except the giant panda and the spectacled bears), Genus: Ursus, Subgenus: Euarctos, Species: americanus.

**Names:** Some black bear subspecies go by different names, like Kermode bear, Cinnamon bear, or Glacier bear, but they are all black bears. We prefer calling male and female bears simply males and females, but many people call them boars and sows, like pigs. Although pigs and black bears are both omnivores, they are not related. A group of bears is sometimes called a sloth of bears after the Middle English slowthe, meaning slow. The term is inaccurate because bears are not slow (see below), and few people use the term anymore.

**Range:** The American black bear is found only in North America. The population is estimated at 750,000. They live in forests as far south as Florida and northern Mexico and as far north as forests grow in Alaska and Canada. In northern Labrador, where grizzly bears no longer live, black bears range out onto open tundra where there are no trees to escape into. People are becoming more tolerant of black bears as we learn more about them. Many people are enjoying having bears live close to them where the bears were once feared and killed.



Color: Body fur usually black or brown but occasionally blonde, or rarely white as in the Kermode subspecies of coastal British Columbia. Brown muzzle. White chest patch is uncommon in most populations. Eyes brown (blue at birth). Skin light gray.

Adult Weights: Wild male black bears of breeding age usually weigh between 125 and 500 pounds, depending upon age, season, and food. Very well fed bears can be heavier. The record is 880 pounds in Craven County, North Carolina, and a close second from northeastern Minnesota weighed 876 pounds on September 5, 1994. Wild females usually weigh between 90 and 300 pounds with the heaviest known female weighing 520 pounds in northeastern Minnesota on August 30, 1993. Black bears in captivity may exceed these records.

Adult Length: 50 to 80 inches long, nose to tail, with males being larger than females.

Mating Season: Usually from late May to early July. In the eastern deciduous forest, mating season can extend into August.

Implantation: Delayed until November.

Birth: January or early February.

Number of Cubs: The number of cubs in a litter is usually 2 in the western United States and 3 in the eastern United States. First litters are often only 1 or 2. Litters of 6 have been reported in several eastern states.

Birth Weight: Cubs weigh 1/2 to 1 pound at birth.

Fall Weight of Cubs: By their first fall, cubs may weigh as little as 15 pounds or more than 165 pounds, depending on food supply.

Parental Care: Cubs usually stay with their mother for 17 months (rarely 29 months). One to six days before the mothers are ready to mate in late May or June, they force their yearlings to stop traveling with them.

Age at Production of First Cubs: 2 to 11 years, depending upon food supply. Typically 3 to 7 years.

Interval Between Litters: Typically 2 years, but it can be 3 or 4 years if food is so scarce that they have to abort their blastocysts, embryos, or fetuses. If a litter is born but dies before the mating season, the mother will mate again and produce cubs in consecutive years.

Sex Ratio: Nearly 50:50 at birth. Males are killed by people at a higher rate, though, so the sex ratio among mature bears is often one male per 2-5 females.

Vision: Bears see in color and have good vision close-up. Their distance vision (over two hundred yards) has not been tested.

Hearing: Exceeds human frequency ranges and probably twice the sensitivity.

Smelling: Their smelling ability is extremely good. The limits are untested. Their nasal mucosa area is about 100 times larger than in humans.

Intelligence: Large brain compared to body size. One of the more intelligent mammals.

Navigation ability superior to humans. Excellent long-term memory. Can generalize to the simple concept level.

Sounds: Usually silent (except in movies in which sounds are dubbed in). A variety of grunts in amiable situations. Loud blowing noises when frightened. Clack teeth when frightened. They use a resonant, humanlike "voice" to express a range of emotions from pleasure to fear. Does not threaten by growling (except in movies). In story-telling, any sound a bear makes is called a growl.

Swimming Ability: Good. Speed and distance limits are untested. Can swim at least a mile and a half in fresh water. One swam more than 9 miles in the Gulf of Mexico. Can swim to island campsites.

Running Speed: Lean bears can exceed 30 mph. Can run uphill, downhill, or on level ground. Fat bears in winter coats overheat and tire quickly.

Daily Activity Period: Most bears become active a half-hour before sunrise, take a nap or two during the day, and bed down for the night an hour or two after sunset. However, some bears are active at night to avoid people or bears.

Preferred Foods: Nuts, acorns, fruit, insects, succulent greens. Meat and less succulent greens are eaten when preferred foods are scarce. A scarcity of preferred foods can result in failed reproduction, stunted growth, failure to add optimal amounts of fat, and death of young bears, especially cubs.

Do bears hibernate? When hibernation was defined simply in terms of temperature reduction, bears were not considered hibernators. New knowledge of hibernation processes has led biologists to redefine mammalian hibernation as simply a specialized, seasonal reduction of metabolism concurrent with the environmental pressures of scarce food and low ambient temperatures. Black bears are now considered highly efficient hibernators. They sleep for months without eating, drinking, urinating, or defecating. Hibernators with lower body temperatures, such as chipmunks, woodchucks, and ground squirrels, cannot do this. These smaller mammals must awaken every few days, raise their temperatures to over 94 degrees, move around in their burrows, and urinate. Some of them must also eat and defecate during arousals. Black bears have far more insulative pelts and have lower surface to mass ratios than the smaller hibernators. As a result, bears' body heat is lost very slowly, enabling them to cut their metabolic rate in half and still make it through winter, maintaining temperatures above 88 degrees--within 12 degrees of their normal summer temperature. (Excerpted from "A Bear In Its Lair" by Lynn Rogers, Natural History Magazine, October 1981). Mothers wake up to give birth, typically in mid to late January, and take excellent care of the cubs in the den, licking them clean and responding to every cry for warmth and milk.

Length of Hibernation: The length and depth of hibernation is genetically programmed to match the regional norms of food availability. Hibernation is deeper and can last over 7 months in the northern portion of the black bear range where abundant, high quality food is available only from May through August. There, some bears hibernate so deeply, especially the leaner bears after a summer of unusually scarce food, that a person can jostle them for several minutes before they wake up. However, in southern states where food is available year-round, some do not hibernate at all, and those that do are easily aroused. Lean females cannot bring their fetuses to full term and do not give birth.

Potential Longevity (lifespan): Black bears can live 21-33 years or more if they are not killed.

Causes of Death: Very few adult bears outside of national parks die of natural causes. Nearly all adult bears die from human-related causes. Most are eventually shot. A few are killed by vehicles. The average age of death in hunted populations is three to five years of age. Bears less than 17 months old sometimes die from starvation, predation, falls from trees, and other accidental causes. Very few die of disease.

Core Home Range Diameter: Typically: Yearlings: 1-2 miles. Adult females: 2-6 miles. Adult males: 8-15 miles. Excursions to 126 miles recorded.

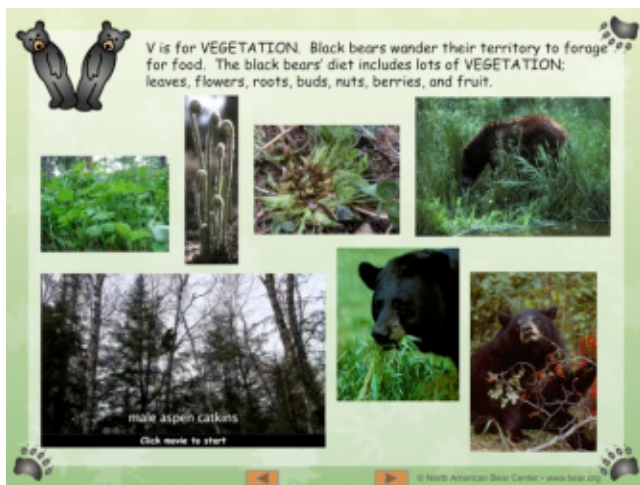
Ideal Habitat: Black bears like large forests with many different kinds of fruits and nuts. Small sunny openings within the forest provide many kinds of food for the bears. Lowlands and wetlands provide tender and juicy vegetation. Streams and woodland pools provide water for drinking and cooling. Mothers with cubs like large trees (over 20 inches in diameter) with furrowed bark (like white pines or hemlocks) for bedding sites. These trees are safest for small cubs to climb.

Living with Bears: Many people are moving into black bear habitat. The bears' future depends on how well we understand and tolerate them.

Long-Term Problem: Magazines and movies have given black bears an unrealistically ferocious image, causing people to fear them excessively and kill them unnecessarily. There are many misconceptions about black bears.

Greatest misconception: The greatest misconception about black bears is that they are likely to attack people in defense of cubs. They are highly unlikely to do this. Black bear researchers often capture screaming cubs in the presence of bluff-charging mothers with no attacks.

Defense of cubs is a grizzly bear trait. About 70 percent of human deaths from grizzly bears are from mothers defending cubs, but black bear mothers have not been known to kill anyone in defense of cubs.



## VEGETATION - THE DIETARY MAINSTAY

Vegetation is the primary bear food in northeastern Minnesota when all seasons are considered.

In April, flower parts of aspen, willow, maple, ash, and hazel are the main foods.

In May, plants, grass, and leaves appear. For 2-3 weeks high quality food is everywhere. The young vegetation is highly digestible because many of the nutrients are in a fluid form.

Important foods in May include grass (especially blue-joint grass in ash swamps), aspen leaves,

large-leafed aster leaves, interrupted fern stems, peavine leaves, skunk cabbage, dandelion leaves and flowers, clover, red maple seeds, and wild calla leaves. As some of these species mature, they become fibrous and less digestible as their nutrients become incorporated into cell walls as cellulose, which is no more digestible to bears than it is to humans.

Some plants remain digestible enough to be eaten throughout the summer. Most are less preferred than berries and hazelnuts, but they can sustain bears in years when berries and hazelnuts are scarce. Important summer vegetation includes wild calla, legumes, jewelweed, and wild lettuce.

Other plants and grasses are eaten less often. The fleshy roots of coralroot orchid and water-parsnip are eaten occasionally. All parts of cattail are eaten occasionally

## ADAPTATIONS FOR OBTAINING FOOD

- A keen sense of smell
- Strong curved claws for climbing trees and ripping logs
- Strength for turning over rocks and logs to get colonial insects and strength for bending branches to reach buds, catkins, leaves, and fruit
- A vomeronasal organ in the roof of the mouth for enhancing taste and smell
- A long, sticky, agile tongue for reaching into ant colonies and separating preferred and less preferred foods. For example, a black bear can ingest a mouthful of mixed nuts, distinguish less preferred varieties and drop them out the side of the mouth.
- Color vision to aid in finding berries
- A tapetum lucidum to aid night vision. The tapetum is the membrane behind the retina that gives them 'eye shine.' It reflects light back over the retina for extra bright images in low light.
- Sensitive, mobile lips for picking berries
- Canine teeth for ripping open logs, capturing young prey, and pulling apart carrion
- Incisors for nipping young green plants and grass
- Broad, flat molars and premolars for crushing acorns, nuts, and vegetation
- Reduced 1st, 2nd, and 3rd premolars, creating a diastema (space) for stripping leaves off branches that are pulled sideways through the mouth
- A 2-part stomach that includes an expandable fundic region to hold large volume and a muscular gizzard-like pyloric region for grinding the pulp off small fruits. This enables black bears to quickly ingest berries without chewing and rely on their stomach to mash them up.
- A long memory of places that provided food
- The ability to form a mental map of how to get to distant feeding areas and return home
- Detailed close-up vision to coordinate the use of a single claw for delicate tasks



## WEIGHT

Typical weights:

Males of breeding age: 125-500 lbs or more  
 Females of breeding age: 90-300 lbs or more

Records:

Male: 880 lbs (399 kgs), Craven Co., NC, 1998  
 or or 902 lbs (410 kg) field-dressed, Quebec, 1976

Female: 520 lbs (236 kgs), St. Louis Co., MN, Aug 30, 1993

Captive bears may exceed these weights.

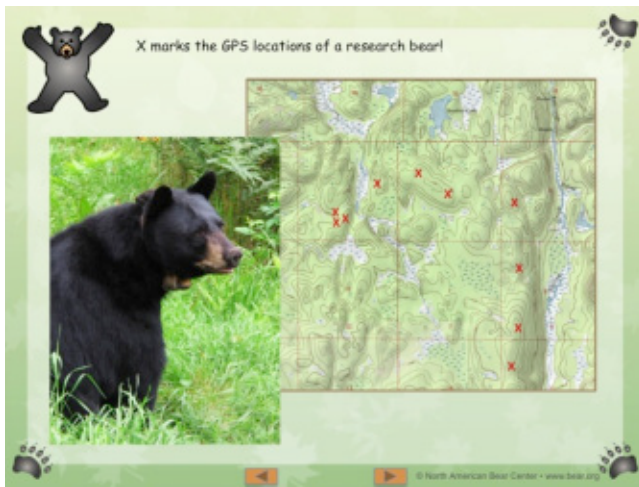
Weight depends upon age, sex, season, food, and genetics. Males reach full size by 12 years of age. Females approach their smaller full size at 6.

Weight loss: Males that weigh 500 pounds in fall can lose 100 pounds over winter and another 100 pounds during spring mating season. Mature females can lose about the same percentage over winter and spring if they give birth and nurse newborn cubs.

Weight gain: The period of weight gain in the Northwoods is short-mainly summer. In parts of North America that have acorns, hickory nuts, and other fall foods, weight gain can extend through fall.

Supplemental food: Unusually heavy black bears usually have access to supplemental food. Researchers weighed such a bear near Orr, Minnesota, in 1994. Duffy, age 12, weighed 584 pounds on July 31 and 876 pounds on September 5, gaining 8.1 pounds a day those 36 days. On September 9, he went off to make a den. On July 4, 1995, he weighed only 465 pounds after losing 411 pounds (47 percent) during hibernation and mating.

As a side note on this unusually big bear, he had a gentle personality. He trusted people where he was accustomed to seeing them, and he allowed researchers to walk with him, but he remained wary of unexpected people. He survived far past the average age of 2 at which male bears are shot in Minnesota. A hunter shot him at the age of 16  $\frac{3}{4}$  in the area where he was used to seeing people.



## ADVANCES IN LOCATING WILDLIFE

Satellites are increasingly used to electronically track research animals wearing Global Positioning System (GPS) collars. Information can either be stored in the collar or transmitted to the researchers via the Internet.

These advances have revolutionized data collection and allowed researchers to obtain more data and more precise data on wildlife locations. This provides scientists with an increased understanding of wildlife population dynamics and provides wildlife managers with better data to manage far-ranging species.



## FAMILY BREAKUP

Black bear mothers give birth in January and stay with their cubs for 16-17 months.

Family bonds remain strong right up to the day of family breakup. In the days before family breakup, they play together, groom each other, sleep together, and suckle. Like human youngsters, yearling bears sleep very soundly, trusting their safety to the alertness of their mother.

Family breakup happens suddenly during mating season in May or June when the mother is nearly ready to mate.

The sudden presence of a male can precipitate family breakup. At first, the mother is torn between her yearlings and the persistent male, but within a day after family breakup, she will chase her yearlings away whenever she encounters them.

Littermates also separate from each other. Each settles in a separate area within its mother's territory. The mother then avoids those areas, giving the yearlings nearly exclusive feeding rights.

Without their mothers, the yearlings are initially skittish, spending long periods up trees. They become covered with ticks. By the end of the summer, they develop into confident little bears.

Most sons voluntarily leave within a couple years after family breakup. Most daughters eventually establish territories in or near their mother's territory.

Photo – upper left: A week before family breakup, a yearling male (left) sleeps snuggled with his 5-year-old mother, not realizing the traumatic change that is about to happen in his life. — May 18, 2006, Ely, MN



## **ZOOLOGY**

Zoology is the branch of biology that deals with animals and animal life, including the study of the structure, physiology, development, and classification of animals.

## **WHY ZOOS?**

Zoos provide an environment for recreation and discovery while inspiring an appreciation of wildlife. Zoos give visitors a sense of awareness and concern for the intricate beauty and fragility of our planet. Many zoos also support programs that preserve biodiversity, conserve natural habitat, and collaborate with endangered species programs.





**VIDEOS USED IN THIS PRESENTATION CAN BE FOUND AT THESE LINKS:**  
*(as of 02/2011, links are subject to change)*

- A – Eating Ant Pupae - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- B – Eating Berries - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- C – Mother and Cub Climbing - <http://www.youtube.com/watch?v=JIcKGrf6MCU>
- D – Den Dig - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- F – Kermode Bears - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- G – Grooming - <http://www.youtube.com/watch?v=-UUyo8u30Cw>
- H – Eating Hazelnuts - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- I – Eating Tent Caterpillars - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- J – Caring for Cubs in Den - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- L – Nervous Behavior - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- M – Marking Behavior - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- N – Mother and Cubs in Den - <http://www.youtube.com/watch?v=D0mhgwRWnWQ>
- N – Nursing Cubs - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- O – Eating Animal Matter - <http://www.youtube.com/watch?v=yuDSrdkCcSQ>
- O – Taking the Videos - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- P – Bear Cubs Playing - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- P – Tamarack Play - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>
- Q – Footpads - <http://www.youtube.com/watch?v=4IRHAYScgZU>
- T – Cub Climbing High - <http://www.youtube.com/watch?v=r5QLtVxlrMo>
- V – Eating Vegetation - <http://www.bear.org/website/live-cameras/videos/bear-videos.html>