Frequently Asked Questions

Black Bear Biology

BLACK BEAR BIOLOGY, STATUS AND MANAGEMENT IN NORTH AMERICA

HOW MANY KINDS OF BEARS ARE THERE AND WHERE ARE THEY FOUND?

The bear family or "Ursidae" contains 8 species of bears. These include the: (1) American black bear (*Ursus americanus*), found in Alaska, Canada, forested areas of the lower United States, and in northern Mexico; (2) brown bear (*Ursus arctos*) (the grizzly and Alaskan brown bears are usually considered to be subspecies of the brown bear), found in northwestern North America, northern Eurasia, and scattered areas of southern Eurasia from the Alps west to the Himalayas; (3) polar bear (*Ursus maritimus*), found in Arctic and Subarctic areas of Canada, Alaska, Russia, and Greenland; (4) Asiatic black bear (*Ursus thibetanus*), found from Iran east through India to Vietnam and north through China to Japan; (5) sun bear (*Helarctos malayanus*), in Indonesia and mainland Southeast Asia; (6) sloth bear (*Melursus ursinus*), in Nepal, India and Sri Lanka; (7) spectacled bear (*Tremarctos ornatus*), in the Andes Mountains from Venezuela to Bolivia; and (8) the giant panda (*Ailuropoda melanoleuca*), in central and western China. Although some books classify the giant panda with the raccoons, or in its own family, the best evidence now indicates that it is a very specialized bear.

References: MacDonald 1984, Wilson and Reeder 1993

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ARE BEARS ENDANGERED?

Most bears are in trouble in parts of their range. The American black bear was stable or increasing in 33 of 35 states surveyed in 1993. The remaining 6 bear species appear to be in decline over most or all of their range. Human activities are affecting bear habitat for all species–especially those in tropic regions–through commercial and residential development, agriculture, timber harvesting, and oil and gas exploration and development. Direct human threats to bears include the killing of bears through unregulated hunting, protection of property, vandalism, or through commercial exploitation for folk medicine or the pet trade.

The U.S. Fish and Wildlife Service lists the following bears as Endangered (E) or Threatened (T):

- E Giant Panda (*Ailuropoda melanoleuca*) (China)
- E Brown Bear (*Ursus arctos arctos*) (Italy)
- E Mexican Brown Bear (*Ursus arctos nelsoni*) (Mexico) (probably Extinct)
- E Tibetan Brown Bear (*Ursus arctos pruinosus*) (Tibet)
- E Baluchistan Bear (*Ursus thibetanus gedrosianus*) (Iran, Pakistan)
- T Louisiana Black Bear (*Ursus americanus luteolus*) (LA, parts of MS and TX)
- T Brown (Grizzly) Bear (*Ursus arctos horribilis*) (lower 48 USA)

The International Union for the Conservation of Nature (I.U.C.N.), which has several risk categories, lists the following bears on their most recent Red List of species in need of conservation:

- Baluchistan Bear (*Ursus thibetanus gedrosianus*) (Critically Endangered)
- Sun Bear (*Helarctos malayanus*) (Data Deficient)
- Giant Panda (*Ailuropoda melanoleuca*) (Endangered)
- Mexican Brown Bear (*Ursus arctos nelsoni*) (probably Extinct)
- Polar Bear (*Ursus maritimus*) (Low Risk)
- Sloth Bear (*Melursus ursinus*) (Vulnerable)
- Spectacled Bear (*Tremarctos ornatus*) (Vulnerable)
- Asiatic Black Bear (*Ursus thibetanus*) (except Baluchistan Bear) (Vulnerable)

References: Amstrup 2003, Servheen et al. 1999

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ARE THERE DIFFERENT VARIETIES OR SUBSPECIES OF BLACK BEAR?

Sixteen subspecies of black bear are currently listed in the scientific literature. The one found in New England is the first-described or “nominate” subspecies, *Ursus americanus americanus*. However, it is probable that several–if not most–of these alleged subspecies are invalid. It was once a common practice to “describe” new species or subspecies of animals based on minor physical differences among a small sample of animals. For example, some 87 “species” and “subspecies” of North American grizzly/brown bears have been named in the older literature. In reality, only 2 of these may be valid taxonomic entities.

References: Merriam 1918, Hall 1981, Lariviere 2001

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ARE BLACK BEARS AND CINNAMON BEARS THE SAME KIND OF ANIMAL?

Black bears are typically black overall, with brown muzzles, perhaps brown spots over the eyes, and sometimes a white V or patch on the chest. However, one of the named subspecies of black bear is the so-called "cinnamon" bear (*Ursus americanus cinnamonum*) described in 1854 by J.J. Audubon and J. Bachman from a specimen taken in Colorado. In reality, brown, cinnamon, and blonde "black bears" occur widely west of the Rocky Mountains. These color phases are nearly identical to those in domestic dogs and appear to be inherited. Brown-phase animals are rare or absent in moist areas of North America but common in arid regions. For example, in Minnesota, 94% of black bears are black, but only 9% in Yosemite National Park. This probably represents natural selection, as influenced by vegetation and habitat type. Bears in dense boreal or mountainous forests or temperate rain forests are predominantly black, while those in more diverse habitats have a greater percentage of alternative colorations. Habitat is likely the dominating factor influencing color phases in black bears.

The unique Kermode ("spirit") bear of coastal British Columbia is a "white" (cream-colored) phase of the black bear (*U. a. kermodei*). Few *kermodei* are actually white; ranging from 3 to 12% of the populations on Gribbell, Roderick, and Princess Royal islands and the adjacent mainland. White bears have pigmented eyes and skin and are not albinos. White-phase Kermodes were probably established and maintained by genetic isolation, reduced population size, and possibly selective pressure and non-random mating.

Black and grizzly/brown bears may sometimes be confused in the field, particularly since some "black bears" are brown and some grizzlies nearly black. The identification series of the Montana Department of Fish, Wildlife and Parks is a useful aid to distinguishing the 2 species.

References: Clarke 2002, Herrero 2002, Kolenosky and Strathearn 1987a, Marshall and Ritland 2002, Powell et al. 1997, Rogers 1980, Rounds 1987

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WHERE ARE BLACK BEARS FOUND IN NORTH AMERICA? WHAT IS THEIR STATUS?

Prior to European colonization, black bears were found throughout North America except the barrens and tundras of Canada and the arid desert regions of the southwestern USA. The animal still occupies 85% of its historical range in Canada. Its range in the USA has shrunken since 1500 but a resurgence in populations is evident in many states. There are an estimated 767,000 to 914,000 black bears in North America. The most substantial populations are in Alaska, the Pacific Northwest, Rocky Mountains, northern Great Lakes area, and northern New England. Densities vary widely, from 3 per 100 mi^2 at Susitna, Alaska, to 50 per 100 mi^2 in Shenandoah National Park, Virginia. Densities on Stockton Island, Wisconsin, may exceed 210 bears per 100mi^2. Twenty-seven

states have substantial populations and a hunting season, 14 have few or no bears (no hunting), and 2 have good-sized populations but no hunting. The animal is State Threatened in 3 states, State Endangered in 2, and Federally Threatened in one. Black bears are common and hunted in every Canadian province except Prince Edward Island, where they do not occur. The black bear is Endangered under Mexican law and the hunting season was closed in 1985. However, uncontrolled poaching occurs there.

References: Anderson and Fleming 1995, Carney 1985, Garshelis 1994, Hristienko 2003, Kolenosky and Strathearn 1987a, McLean and Pelton 1994, Pelton and Van Manen 1994, Scheick 2002, Servheen et al. 1999, Lariviere 2001

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ARE BLACK BEARS NATIVE TO MASSACHUSETTS? WHERE ARE BLACK BEARS FOUND IN THE STATE NOW?

Black bears are native to Massachusetts and were widespread throughout the state at the time of European settlement. Bears had probably disappeared from Barnstable, Dukes, and Nantucket counties by then, although there are archaeological records from Cape Cod and Martha's Vineyard. The explorers Pring and Brereton reported "bears" from the Cape Cod area in the early 1600s, although it is uncertain if the references are to live animals or to bear pelts in the possession of Indians.

Bears were still common in the state through the mid-1700s, but began diminishing in the eastern counties by the time of the American Revolution. In the early 1800s, bears were common only in the mountainous northwestern regions and by 1860 they were rare or absent in most of Massachusetts. The black bear remained a marginal species in the state until well into the 1950s.

A gradual resurgence was noticed in the 1960s and *MassWildlife* began a bear project in 1970, followed by the onset of field studies in 1980. A coarse estimate of 80 to 100 bears in 1976 was probably low. More refined estimates, based on data from the field studies, showed the population increasing from 450 to 500 in 1984, to 700 to 750 in 1987, to 975 to 1175 in 1992. In 1998, there were an estimated 1750 to 1800 bears in Massachusetts, with the population growing at about 8% annually.

At present (2003), bears are found almost everywhere west of the Connecticut River, at a density of about 1 bear per square mile of forest and a likely population of 2000 animals. Bears are moderately common in central Massachusetts (between the Connecticut River and the eastern boundary of Worcester County) but are only occasionally found in the northeastern counties. Black bears are absent from southeastern Massachusetts.

References: Cardoza 1976, Cardoza et al. 1990, Cardoza 1997, Elowe 1984, Foster et al. 2002, Fuller 1993

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HOW CAN YOU TELL THE DIFFERENCE BETWEEN MALE AND FEMALE BLACK BEARS?

Male and female black bears cannot always be distinguished with certainty, unless accompanied by cubs. However, males are typically larger than females. In studies in Idaho and Pennsylvania, adult males weighed nearly twice as much as adult females. In areas of good nutrition, females reach adult weight at 3½ years, but males may continue to grow until 8½ or older. In New York, 2½-year-old males were similar in size to 8½-year-old females. Adult males also have substantially larger skulls than do females. In Alaska, 5-year or older females had skulls 8 to11% smaller than males of comparable age. Adult males have more heavily muscled heads, necks, and shoulders than do females. If adult bears stand erect facing the viewer, it is often possible to see the male's penis or the female's nipples. Males are often called "boars" and females "sows".

References: Alt 1980, Beecham and Rohlman 1994, Landriault et al. 2000, Rausch 1961, Sauer 1975

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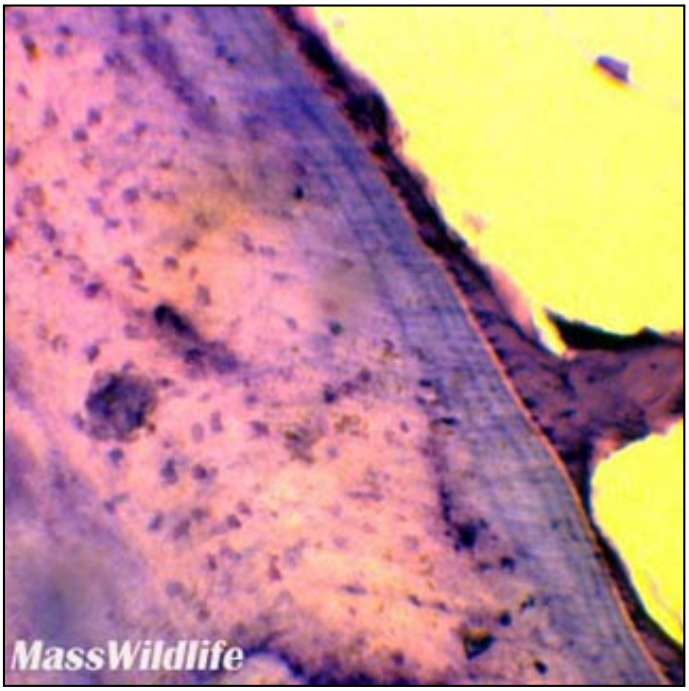
HOW DO YOU TELL THE AGE OF BLACK BEARS? HOW LONG DO BLACK BEARS LIVE?

Other than cubs (<1 year old) or yearlings (between 1 and 2 yrs old) accompanied by their mother, black bears can be reliably aged only by slicing and staining thin cross-sections of a tooth and then examining the annuli (annual rings of cementum) through a microscope. These annuli are similar to the growth rings on a tree stump. The tooth typically used for this process is the first premolar, which is very small in size and can be easily and harmlessly removed from a live bear under sedation.



The "average" age of bears in a given area is difficult to specify, since many tallies are derived from hunter harvest, which can be biased towards the more inexperienced or more vulnerable animals. Although a population should have representatives of all age classes, a mere tabulation of age ratios from a sample of that population conveys little or no information on demographics or rate of increase. Additional information is needed to adequately assess the response of a population to change. In one New Hampshire study, the average ages of live-captured bears were greater than those of hunter-killed animals, while female bears were less abundant in the captured sample than in hunter harvest. It was unknown which result was more representative of the actual population.

Black bears can be long-lived, although animals over 30 years of age are rare. Wild bears have reached 32½ in New York, 33½ in British Columbia, and 35½ in Michigan. The oldest bears recorded in Massachusetts were a 25½-yr-old male and a 26½-yr-old female.

References: Caughley 1974, Gilbert et al. 1978, Kane and Litvaitis 1992, Sauer 1975, Smith 1995, Stoneberg and Jonkel 1966, Willey 1974

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WHAT ARE THE SIZES AND WEIGHTS OF BLACK BEARS?

Black bear life history summaries have variously reported weights ranging from 88 to 400 lbs. for adult females, and 132 to 617 lbs. for adult males. Lengths have been reported as 51 to 75 inches for adult males and 43 to 67 in. for adult females and shoulder heights at 31 in. for females and 40 in. for males. A tabulation of average and range of lengths and weights from 10 states is shown in the accompanying table. Comparisons should be made with caution. Weights and lengths may vary depending on geography,

season of the year, age of the animal, whether the animal was live or field-dressed, and the particular technique or skill of the persons taking the measurements.

SIZE AND WEIGHT OF ADULT AMERICAN BLACK BEARS*

Location	Average Length Male	Range Length Male	Average Length Female	Range Length Female	Average Weight Male	Range Weight Male	Average Weight Female	Range Weight Female
California		64-73		53-66		170-280		59-203
Florida					305		189	
Idaho (4 sites)	56-61		51-54		250-280		123-141	
Massachusetts	57		51		229		139	
Montana					211		125	
New Jersey					396		185	
Pennsylvania	73	64-83	61	56-68	402	210-584	203	132-356
Vermont		45-58		42-52				
Washington					221		142	
Wisconsin					162		125	

* Size in inches and weight in pounds.

There is an anecdotal report of a 900 lb. black bear killed in Arizona in December 1921; however, this is probably an estimate. The current “world record” black bear was taken by a hunter in North Carolina in November 1998. The 10¾-year-old male weighed 880 lbs. An 856½ lb. male, 7 ft. 9 in. long, was killed by an automobile in Manitoba in August 2001. This bear lost an estimated 30 lbs. of body fluids between time of death and weighing, so it probably would have been a record if promptly weighed. Some Minnesota and Wisconsin bears also have exceeded 800 lbs. The heaviest female black bear was recorded in Minnesota in 1993, and weighed 520 lbs. The heaviest Massachusetts bear was taken in the November 1980 hunting season in Berkshire County. It weighed 467 lbs. field-dressed (>525 lbs. live weight).

References: Alt 1980, Carr 2002, Beecham and Rohlman 1994, Eason et al. 1996, Elowe 1984, Fair and Rogers 1990, Harlow 1961, Hristienko 2001, Jones 1999, Jonkel 1974, Jonkel and Cowan 1971, Kohn 1982, Kolenosky and Strathearn 1987a, Pelton 1982, Poelker and Hartwell 1973, Seton 1929, Sitton 1982, Willey 1978

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DO BLACK BEARS HAVE POOR VISION? DO THEY HAVE GOOD SENSES OF SMELL AND HEARING?

Black bears probably do have poor vision when compared to humans. However, black bears have color vision and excellent near vision and pattern discrimination. These abilities undoubtedly help the animal forage for small, scattered food items. The bears probably focus on acorns and other food items both by sight and smell. In experiments, black bears have retained memory of specific shapes and patterns for up to 8 months. This ability undoubtedly helps them remember specific food sources over time.

Smell is undoubtedly the most important of the bear’s senses. Bears use olfaction both to discern distant odors and to identify objects at close range. Although not tested in the experimental sense, bears can probably identify carcasses from several miles

distance. Black bears may stand briefly on their hind legs, possibly to see over vegetation, but also to better scent the person or item that they are sensing. Cubs frequently sniff, lick, and mouth a wide range of plants and other potential food items and may learn these food items by sniffing the mouth and breath of their mother.

Although experiments have not been done, it is likely that black bears have a good sense of hearing. In an Alberta observation, 2 grizzlies heard a elk calf bleating from 1600 feet away and then located and killed the calf. Black bears may well have similar auditory capabilities.

References: Bacon and Burghardt 1976a, Bacon and Burghardt 1976b, Fair and Rogers 1990, Herrero 2002, Kilham and Gray 2002, Kolenosky and Strathearn 1987a

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WHAT KINDS OF SOUNDS DOES A BLACK BEAR MAKE?

The degree and nature of bear vocalizations depends on the species. Black bears are presumed to be more vocal than brown bears because black bears are a forest species and cannot see long distances. Other forest-dwelling bears, such as spectacled and sloth bears, are also quite vocal. Black bears communicate using a variety of sounds, as well as gestures, stances, and signs or marks. Behaviorists using human-habituated black bears are now learning more about these sounds and the ways in which bears communicate. Cubs “purr”, coo, moan, and mew. A bawling and wailing sound or gulps may indicate distress or nervousness. A variety of other bawls, woofs, moans, grunts, bellows, or other sounds may be emitted by bears of various ages and dispositions. Mechanical sounds such as huffing, blowing, snorting, chomping, foot stamping, and “jaw-popping” are commonly produced in response to threats or other stimuli. Despite the popular literature, black bears rarely growl, although some snared or trapped bears may do so.

A common folk belief in New England and northern New York is that black bears “hoot”, “holler” or “wail” at night during the fall months. This sound is alleged to be a mating cry, despite the fact that bears breed in summer. There is no scientific basis for attributing these peculiar sounds to black bears. The sounds–if any–are undoubtedly made by other animals, possibly by porcupines.

References: Herrero 1978, Jordan 1976, Kilham and Gray 2002, Kolenosky and Strathearn 1987a, Matson 1967, Rogers and Wilker 1990, Stirling and Derocher 1990, Willey 1978

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ARE BLACK BEARS GOOD CLIMBERS? ARE THEY GOOD SWIMMERS? HOW FAST CAN THEY RUN?

Black bears undoubtedly evolved as forest animals and are rarely found far from trees. They are excellent climbers and easily ascend trees by hooking or gripping them with their short, narrow claws. Cubs are capable of climbing as soon as they exit their natal den and readily climb in response to intrusion by strange bears or humans. The sow does not need to signal the cubs to climb, although she may readily do so. Cubs can easily climb to 100 feet or more. Black bears of all ages retain the climbing ability, although some old, large males may be reluctant to do so. The bears climb not only to escape a threat but also to rest, sleep, play, nurse, obtain food, or attain shelter.

Black bears are also good swimmers and do not hesitate to enter water, whether to cross a waterway or to bathe or wallow. Two bears translocated to a small island in Newfoundland swam at least 0.6 mile through salt water to return to the capture site. Bears have also been seen swimming in Yellowstone Lake, Wyoming, “miles from shore”. In Massachusetts, bears regularly swim across the Connecticut River.

Although black bears sometimes appear to be clumsy and to waddle or amble along, they are capable of fast speed for short distances. Bears have been clocked at speeds of up to 35 mph.

References: Bray and Barnes 1967, Elowe 1984, Herrero 1972, Herrero 1983, Hill 1942, Kolenosky and Strathearn 1987a, Payne 1975, Schullery 1986

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WHAT DO BEAR TRACKS LOOK LIKE? WHAT ARE THE FIELD SIGNS WHICH SHOW THAT BLACK BEARS ARE IN AN AREA?

Black bears have 5 toes on each foot. Their “big toe” is on the outer side, not the inner side as on human feet. The little toe does not always show in tracks. Claw marks may register ahead of the toes and are not always evident. The large rear heel pad shows up in tracks more often than the smaller front one does. Track patterns may vary; in a typical walking pattern the hind foot will overstep the forefoot. Bear scat may be evident where bears are feeding. The composition and consistency of the scat varies depending on the food items.

Black bears often make well-worn trails and use the same crossings at roads, paths, or entering fields. The animals will often step in the tracks of the bear that preceded them. Bear trails may be apparent where the animals enter concentrated food sources, such as corn fields, dumps, or landfills. In historic times, some trails extended for miles and were used by generations of bears.

Black bear “mark trees”, “sign posts”, or “scratching posts” are common features in bear habitat. The bears will stand erect against or straddle a tree and scent-mark, lick, rub, bite, or scratch it. While several theories have been advanced, it is likely that tree-marking serves to communicate among bears, perhaps conveying identity, status, and sex, as well as to attract females and to assert control over feeding areas. In the Great Smoky Mountains, 8 coniferous and 26 hardwood species were marked. In the Northeast, yellow and white birch, aspen, balsam fir, red pine, and white cedar are commonly marked, among others.Bears respond not only to the bear scent on the tree mark, but also to the aromatic chemicals released from the scratched or bitten tree. Bear claw marks may also be visible, perhaps for decades, on beech, aspen, or apple trees climbed for food. Bears may also scratch, bite, and rub utility poles.

So-called “bear nests” are often seen in the Northeast, typically in beech, and are created by feeding bears which pull in and break branches to obtain nuts. Apple trees may sustain severe damage to their branches by bears clambering about to obtain fruit.

Black bears may construct day beds or “ground nests” at the base of tall, straight trees. Nests may be simple raked piles of debris or elaborate piles of grass and boughs. In Pennsylvania, one bear built 8 such nests in 2 days.

Other types of bear sign may include torn-apart logs and stumps, flipped-over rocks, dug-open anthills, muddy wallows in wet areas, or claw marks on back-country cabin doors. In agricultural or residential areas or in campgrounds, bear damage to crops, apiaries, or trash receptacles may obvious.

References: Bray and Barnes 1967, Burst and Pelton 1983, Davenport 1953, Fair and Rogers 1990, Herrero 1983, Kilham and Gray 2002, Murie 1975, Rezendes 1992, Schorger 1949, Spencer 1955, Willey 1978

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DO BLACK BEARS LIVE BY THEMSELVES OR IN GROUPS?

In general, bears are the most solitary of all carnivores. Black bears are not exclusively loners, however. The bond between mother and cubs and among siblings is particularly strong until she again comes into heat and the yearling bears disperse. Some newly independent yearlings may remain together briefly. Black bears will also tolerate each other’s presence at concentrated food sources such as open dumps, corn fields, or berry patches. In New Jersey, 13 bears were observed simultaneously at a backyard feeding site. Black bears are keenly aware of other bears nearby and communicate by sound, scent, or by marking trees. These actions may conceivably convey sex, reproductive status, hierarchy, identity, and other information, even though the animals are not in immediate contact. Overlapping home ranges are common in areas of abundant foods but bears may be territorial in areas where foods are scarce. Denning may restrict the development of social behavior by limiting the bears’ active period.

References: Gittleman 1989, Herrero 1983, Kilham and Gray 2002, Kolenosky and Strathearn 1987a, Rogers 1987a, Stirling and Derocher 1990, Fimbel et al. 1991

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WHAT IS THE BREEDING AGE OF BLACK BEARS?

The age of first reproduction in female black bears is related to food supply, and hence body size and condition. When foods are abundant, the bears become sexually mature at 2 years and produce their first litter at age 3. However, when nutritionally stressed, females may delay cub production until 5 or even 7 years. In Massachusetts, females typically give birth at 3, although a few delay until 4 years of age. Occasional females in Maryland, New Jersey, and Pennsylvania have bred at 1 year and produced first litters at 2, while in parts of Alaska, Minnesota, and Montana sows sometimes first give birth at 6 to 7 years. Males are capable of breeding at 3 years but may not do so due to competition with larger dominant males.

References: Alt 1980, Bittner 1998, Elowe 1984, Elowe 1987, Fuller 1993, Garshelis 1994, Garshelis et al. 1998, Jonkel and Cowan 1971, Miller 1994, Powell et al. 1997, Rogers 1987a

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WHEN DO BLACK BEARS MATE?

Female black bears typically come into heat in early June and remain in heat until mated or until the ovaries regress. Peak breeding occurs from mid-June to mid-July, but has ranged from late May to late August in Ontario and early June to early September in Tennessee. The female's receptive period depends on the length between onset of estrus and mating and averaged 10 days in captive bears. Males travel widely during the mating season and probably locate the females by scent. Male-female associations may last for a few hours to 2-5 days. Both sexes are promiscuous and the longer associations probably represent more than 1 male breeding the female. Black bears may be induced ovulators and cubs from the same litter may possibly have different fathers.

Once having bred, female black bears typically give birth every other year. Lactation probably inhibits estrus during the summer when she has dependent cubs. However, if the sow loses her litter prior to the summer mating period, she may mate again and produce another litter in the subsequent year. Females who lose their young after the mating period then skip a year in the breeding cycle. Some bears have bred while raising cubs, but this is atypical.

In some areas, such as Maine and New York, bears may exhibit reproductive synchrony. In one Maine study area, 95% of litters were produced in odd-numbered years following abundant beechnut crops. This synchrony was believed to derive from alternating cycles in beech production in areas lacking alternate fall foods.

References: Barber and Lindzey 1986, Eiler et al. 1989, Erickson and Nellor 1964, Free and McCaffrey 1972, Garshelis 1994, Johnson and Black 1994, Kolenosky 1990, LeCount 1983, McLaughlin et al. 1994, Powell et al. 1997, Seguin 1992

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HOW LONG IS A BLACK BEAR'S GESTATION PERIOD?

Black bears, like brown and Asiatic black bears and many other carnivores, have a prolonged gestation period resulting from an arrest in embryonic development or "delayed implantation". After mating, the fertilized egg develops into a minute ball of cells or "blastocyst", at which time development stops and the blastocyst remains unattached in the uterus. If the female attains a minimum weight in the fall, usually about 150 lbs. (but perhaps less in the southern states), the blastocyst implants in the uterine wall in late November and embryonic growth proceeds until birth of the small, feeble cubs about 45 to 55 days later. If the female fails to accumulate sufficient fat reserves, the blastocyst fails to implant and pregnancy is terminated.

Delayed implantation has been assumed to convey a selective advantage by allowing the young to be born as early as possible in spring, to avoid mating at an unfavorable time of year, or to ensure synchrony of one or more reproductive processes. The applicability of these hypotheses to black bear is uncertain. Overall, gestation is commonly reported to be 7 to 7½ months, but was estimated at 6½ months in Pennsylvania and was observed to be 182 to 236 days (6-7¾ months) in captive North Carolina bears.

References: Alt 1983, Ammons 1974, Bunnell and Tait 1981, Kolenosky and Strathearn 1987a, Mead 1989, Ramsay and Dunbrack 1986, Wimsatt 1963

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WHEN ARE THE CUBS BORN?

Black bear cubs are born between early December and early February; however, actual birth events are rarely observed in the wild. In one Pennsylvania study, 32 litters were born between January 3 to 24, averaging January 15. Newborn cubs are blind, hairless, and weigh about 7 to 10 ounces. They locate their mother's nipples and suckle immediately after birth. Sows usually have 6 functional mammaries. As the cubs grow, they become increasingly active within the den. By mid-March, they may venture a short distance outside and then return. The shortened gestation period and subsequent birth of very small young allows bears to shift from transplacental to mammary nourishment of the young. This is undoubtedly a response to physiological constraints associated with supporting fetal growth while hibernating and avoiding food intake.

References: Alt 1983, Kolenosky and Strathearn 1987a, Powell et al. 1997, Ramsay and Dunbrack 1986

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HOW MANY CUBS DOES A BLACK BEAR HAVE?

Litter size ranges from 1 to 4 young, averaging from 1.4 in Arkansas to 3.0 in Pennsylvania. First litters may be small, sometimes a single cub. Two or 3 cubs are typical thereafter. Five-cub litters are uncommon; extraordinary litters of 6 cubs have been reported in Manitoba and Pennsylvania. Average litter sizes in 2 Massachusetts study areas were 2.0 and 3.0. Two 5-cub litters have been reported in Massachusetts, once in the den and another in the field. Field observations are probably valid, as natural adoption of cubs is rare.

The sex ratio at birth is usually 1:1. However, the sex of cubs is related to the mother's weight and to litter size. The number of males is usually higher with heavier mothers, but lower as litter size increases. In one Minnesota study, 82% of single litters were male, while only 52% of 3-cub litters were males. One exceptional Massachusetts sow, 13 yrs old and 175 lbs., produced a litter of 5 male cubs.

During the denning period, sows may produce more than 50 lbs. of milk, metabolized from body fat. This milk is rich in fat and protein and nearly twice as high in kilocalories (per 100 ml) than either human or cow milk. Cubs may weigh up to 9 pounds by den emergence. Massachusetts cubs normally reach 13 to 20 lbs. by early July.

References: Alt 1980, Alt 1984b, Clark 1991, Elowe 1987, Hock and Larson 1966, Kolenosky and Strathearn 1987a, McDonald and Fuller 1998, Noyce and Garshelis 1994, Rowan 1947

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WHEN DO THE CUBS BECOME INDEPENDENT OF THEIR MOTHER?

Young black bears remain with their mother until about 16 to 17 months of age. Family breakup (typically in June) is probably initiated by the mother when she comes into estrus. She probably uses threats or aggression to compel the young to disperse. However, the female often tolerates the presence of her independent offspring within her home range and will avoid the area used by her daughters. Mothers recognize their own daughters and respond to them on that basis. Male yearlings typically disperse from their natal area after a year or so.

Orphaned cubs may be self-sufficient as early as 5½ months, even when handicapped by injury and when captured and released in an unfamiliar area. Both sexes seem to survive equally well. However, in Ontario, only 30% of cubs orphaned during spring survived.

References: Erickson 1959, Fair and Rogers 1990, Kolenosky and

Strathearn 1987a, Powell et al. 1997, Rogers 1987a

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DO CUBS HAVE HIGH ANNUAL MORTALITY?

Cub survival is influenced by food abundance and quality, physical condition of the mother, social factors, litter size, experience of the mother, cub birth weight, and estimation technique. Mothers who are nutritionally stressed, or first-time breeders, are more likely to lose cubs than are well-fed mothers. In Massachusetts, litter order was the principal factor in determining minimum first-year survival. Ten of 12 known first litters had 0% cub survival to 1 year, while 49% of second and later litters had 100% survival through the first year. Since most first litters were born to 3-year-old sows, it is likely that the mother failed to attain the minimum weight necessary to successfully raise cubs.

Annual cub survival throughout North America has varied from 27% on Long Island, Washington, to 90% at Dry Creek, Arkansas. In one Massachusetts study, 65% of female cubs (but only 10% of males) survived until adulthood. A later study in the same area estimated 63% annual survival (sexes combined). These rates are somewhat low compared to studies in Minnesota, Pennsylvania, and Wisconsin and may relate to spring and summer food conditions. Most cub mortality occurs between 2 and 5 months of age. Cannibalism, abandonment, predation, accident, illegal kill, and disease are sources of cub mortality.

References: Bunnell and Tait 1981, Clark 1991, Elowe 1987, Elowe and Dodge 1989, Garshelis 1994, Kolenosky 1990, Lindzey et al. 1986, McDonald 1998, Rogers 1976

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DO BLACK BEARS HIBERNATE IN THE WINTER?

Several terms have been used for winter dormancy in black bears, including “hibernation”, “winter sleep”, “torpor”, or “carnivorean lethargy”. The confusion arises because biologists may use the same term in different ways. “Hibernation” has sometimes been defined based upon body temperature and the animal’s ability to react to external stimuli. Ground squirrels and other so-called “true hibernators” have hibernating body temperatures approaching 32º F. The animals take many minutes to rouse but waken periodically to feed and excrete. Bears show several differences from these species, including a near-continuous dormant period of up to several months, a lesser drop in body temperature, rapid arousal, lack of excretion, and normal bone activity. Most bears awake from hibernation with only a loss in body fat. Some biologists have broadly proposed that hibernation in mammals represents a specialized seasonal reduction in metabolism, resulting from decreases in food availability and ambient temperature. However, it is likely that there are several ways in which mammals conserve energy during periods of food shortage, of which “hibernation” is only one.

The physiology of hibernation in bears has implications for human medicine, particularly regarding osteoporosis, uremic poisoning, muscle atrophication, and nerve cell degeneration. Continued cooperation between wildlife biologists and human physiologists will benefit both.

Legends of several Native American tribes allege that black bears suck their paws in the den to sustain themselves during hibernation. William Wood (*New England's Prospect*, 1634) reported "In the winter, [bears] take themselves to the clefts of rocks... to shelter them from the cold; and food being scant in those cold and hard times, they live only by sleeping and sucking their paws, which keepeth them as fat as they are in Summer." Black bears, at least in northern latitudes, do shed their foot pads during late winter and the animals may sometimes lick their feet and consume portions of the shed pads. The regrown pads may be tender and a bear's feet may bleed slightly when the animal first exits the den.

References: Fair and Rogers 1990, Floyd et al. 1990, Folk et al. 1976, Hellgren 1998, Johnson et al. 1978, Moen 1978, Rogers 1974, Watts et al. 1981, Wood 1977

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WHAT KIND OF A DEN DOES A BLACK BEAR USE?

Black bears occur throughout a wide range of habitats and climatic conditions in North America. Denning (and hibernation) is probably a behavioral response which allows the bears to survive unfavorable winter weather and a periodic lack or scarcity of food. A reasonable hypothesis thus proposes that black bears select dens to facilitate energy conservation, and hence survival of the bears and their young. Some initial data suggest this to be false; however, there is not enough information to draw a firm conclusion. Survival risks to denned bears may be related to factors other than poorly insulated dens.

Bears will utilize many materials or sites to create a den, including open nests, brush piles, fallen trees, rock piles, excavations, hollow trees, and human structures. Bears will often, but not always, make nests of grasses, twigs, or other material within the den. Regional variations are apparent and have been presumed to relate to energy needs (but see above). The sex and age of the bear may determine which type of den is chosen. In Idaho (71%) and Alberta (95%), most dens are excavated while tree dens predominate in Virginia (68%) and Tennessee (92%). Rock dens (64%) are typical in New Mexico. A variety of den sites are used in Massachusetts, North Carolina and Pennsylvania.

Reuse of den sites occurs, but is relatively low, ranging from 18% in Alaska to 5% in Massachusetts and Pennsylvania. Den sites are probably not limiting in most areas.

References: Alt 1984b, Alt 1984c, Beecham and Rohlman 1994, Carney 1985, Elowe 1984, Godfrey et al. 2000, Klenzendorf et al. 2002, Kolenosky and Strathearn 1987b, Linnell et al. 2000, McDonald and Fuller 1998, Pelton et al. 1980, Powell et al. 1997, Tietje and Ruff 1980

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WHEN DO BLACK BEARS ENTER AND LEAVE THEIR DEN?

Denning and hibernation among black bears varies with latitude, from 5 to 7 months in northern Canada and Alaska to a week or so in northern Mexico. In areas with mild climates, bears may den for 3 to 4 months. However, some bears–particularly males–may remain active all or most of the winter, especially in mild or snow-free years. In one Massachusetts study, bears denned for about 4 months in 1980-81 and about 5 months in 1981-82.

Several studies have concluded that den entry is dependent on fall food supply. Bears remain active longer when food is abundant, but enter the den earlier when food is scarce and fruitless searching results in a negative energy balance. However, gravid females may den as soon as they have accrued sufficient fat reserves for reproduction. The cumulative effects of increasing precipitation and lower temperatures may also play a role in the onset of denning. In Ontario, den entry dates ranged between September 20 to November 29 over a 5-year period, while in Tennessee 83% of bears entered between December 25 and January 7. In Massachusetts, den entry varied between November 8 and December 3 over a 3-year period. Maine bears showed an alternating pattern, denning in October when beechnuts were scarce and in November when they were abundant.

Den entry by sex and age class is variable throughout North America. In Maine and Ontario, pregnant females denned before females with yearlings while the opposite was true in New York. Males generally entered dens last. In one Massachusetts study, the sequence was barren females, pregnant females, males, and females with yearlings, all of which denned within 8 to 10 days of each other.

Males are typically the first to emerge from the den and females with newborn cubs the last. Males emerged in late March in New York, with sow-cub groupings in mid-April. In boreal areas in Montana and Ontario, some females with cubs remained denned until early May. Den emergence is probably timed to coincide with snow melt (as in Maine) and with the availability of spring foods. In Massachusetts, bears emerged during the first week of April in a warm spring, but between April 19 and May 1 after a late spring snowfall. In Minnesota, temperatures of 50º F or more for 2 to 4 days stimulated den emergence.

References: Elowe 1984, Johnson and Pelton 1983, Jonkel and Cowan 1971, Kolenosky and Strathearn 1987b, O'Pezio et al. 1983a, Pelton et al. 1980, Rogers 1976, Rogers 1987a, Schooley et al. 1994, Smith et al. 1994

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WHAT DO BLACK BEARS EAT? WHAT ARE THE SEASONALLY PREFERRED FOODS?

Black bears may be the least carnivorous of the “carnivores” of North America. They consume a wide variety of seasonally abundant herbs, forbs, fruits, berries, nuts, and other plant parts and products. The specific plants may differ among the many ecoregions of North America. However, certain trends are evident. Spring foods are predominantly grasses, sedges, shoots and other high-protein lush green vegetation. Deer and other carcasses may be scavenged, as well as leftover nuts. Skunk cabbage is important in Massachusetts and squaw root in the southern Appalachians. During summer, bears shift to energy-rich “soft mast” foods such as huckleberries, blackberries, raspberries, grapes, and cherries. Protein-rich insects such as ants, wasps, and beetle larvae are commonly taken. Crayfish, frogs, birds’ eggs, mice, red squirrels, woodchucks, snowshoe hare, and other animal food are occasionally eaten. Then, in autumn (where available), “hard mast” items including acorns, hickory nuts, beechnuts, hazelnuts, pine nuts, and similar foods are taken. Corn is also eaten where available. Bears can make tremendous weight gains in fall, as much as 3 to 4 lbs. per day. However, in northern areas, where hard mast is lacking, bears must rely only on berry crops for weight gain and den after those are exhausted. Bears, particularly adult males, and particularly when foods are scarce, may travel up to 125 miles outside their home range in late summer and early fall to a concentrated food source before returning home to den. Many historical accounts from Louisiana, Minnesota, New England, Ontario, Wisconsin, and elsewhere mention these “migrations” or “forays”, which often followed well-defined trails beaten down over time.

In spring and early summer, poplar catkins, leaves, and lush grasses are common foods. Bears lack a caecum and do not have any known ability to digest cellulose so the nutritional value of such foods is not apparent. However, researcher-habituated bears have been seen to relish deer scat and feed on the intestines of winter-killed deer. Perhaps by this means bears may acquire cellulose-digesting organisms which allow the bears to digest foods they could not otherwise utilize.

Several workers have suggested that the period between den emergence and the availability of summer-ripening fruits and berries is a “negative foraging period” during which bears gather enough food to sustain life, but not to gain weight. However, recent studies in Minnesota challenge this assumption. Young bears can and do gain weight from spring foods. However, lactating females may indeed lose weight due to the high energy demands of milk production. Breeding-age males may also lose weight due to changes in physiology and behavior.

Bears which feed in garbage dumps, campgrounds, or at bait stations may grow faster, attain greater weights, and have greater fertility than their wild counterparts. In the Great Smoky Mountains National Park, both male (224 lbs.) and female (132 lbs.) “panhandler” bears using high-energy human foods were heavier on average than wild bears of the same sex (163 and 110 lbs). Additionally, 56% of panhandler females were lactating, as opposed to 33% of wild sows. Similarly, in Michigan, “dump bears” tended to be heavier than those captured elsewhere, while garbage-fed females averaged 3.1 cubs per litter as compared to 2.0 elsewhere. One 9-yr-old male in northern Minnesota, fed daily at a bait station, grew from 410 to 620 lbs. over a 51-day period.

References: Beecham and Rohlman 1994, Bray and Barnes 1967, Cardoza 1976, Chi et al. 1998, Costello 1992, Eagle and Pelton 1983, Fair and Rogers 1990, Herrero 2002, Kilham and Gray 2002, Kolenosky and Strathearn 1987a, McDonald and Fuller 1994, McLean and Pelton 1990, Noyce 1994, Noyce and Garshelis 1994, Powell et al. 1997, Rogers et al. 1976, Rogers 1976, Rogers and Wilker 1990, Schorger 1949, Seibert 1991, Spencer 1955, Tisch 1961, Warburton 1982

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DO BLACK BEARS PREY ON OTHER ANIMALS?

While insects comprise an important part of a black bear’s diet, particularly in summer, vertebrate prey is less commonly taken. Black bears will scavenge carcasses of winter-killed deer or other hoofed animals in spring after den emergence. However, most living prey animals are too swift or elusive to be caught by black bears on a regular basis. An exception occurs during a brief period in spring when newborn moose, deer, or caribou young are vulnerable. Black bears were presumed to be the largest source of moose calf mortality when black bear numbers were 10 times greater than brown bears and when black bear densities were greater than 520 per 1000 mi^2. Predation nearly ceased by the time the calves are 2 months old. However, cow moose will aggressively defend their young against bear attack, and bears may be injured or killed when attempting to prey on moose calves. In Newfoundland, black bears accounted for 35% of caribou calf mortalities, 62% of which occurred within 4 weeks of birth. Black bear have also preyed on mule or white-tailed deer fawns in some areas. A New York study suggested that bear predation on newborn fawns could be a significant factor affecting annual recruitment. Bear predation also accounted for 49% of 21 radio-collared fawn mortalities in northeastern Minnesota. However, a mortality study in western Massachusetts found no instances of black bear predation on white-tailed deer fawns. Predation may be a learned response by black bears and further research is needed. Predation on adult cervids is usually rare; however, in Labrador and Newfoundland, very large males may prey on adult caribou. Livestock predation sometimes occurs.

Black bears will readily eat fish, but usually find them difficult to catch except at runs during spawning season when large numbers

of breeding salmon and chars congregate in space and time. Black bears will also scavenge along the shoreline on both the Atlantic and Pacific coasts to find edible food items.

References: Ballard 1992, Ballard 1994, Decker 1991, Kunkel and Mech 1994, Matthews and Porter 1988, Obbard et al. 2000, Ozoga and Verme 1982

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WHAT KINDS OF PARASITES AFFECT THE BLACK BEAR?

Black bears have been reported to host more than 30 external and internal parasites, including coccidian protozoans, flukes, tapeworms, intestinal roundworms, lungworms, filarial worms, lice, fleas, ticks, and mites. Roundworms (*Toxascaris sp.*) were the most common endoparasite in New York, occurring in 31% of bears sampled. In the Great Smoky Mountains National Park, 90% of bears were infected with the larval form of *Dirofilaria ursi*, a roundworm related to the dog heartworm. In New York, 46% of bears harbored this parasite.

Trichinellosis, or muscleworm infection, is a parasitic infection of humans (and domestic animals) resulting from the invasion of muscle tissue by the larval stage of the roundworm *Trichinella spiralis*. Severe muscle pain, fever, edema, localized hemorrhaging, and neurologic problems may result from this disease. Infection results from the consumption of undercooked meat–such as pork–containing encysted larvae. Trichinellosis has also occurred from eating undercooked bear meat. Larval *Trichinella* were found in 0% of bears sampled in Vermont, 1% in Labrador, 2% in Pennsylvania, 6% in New York, 13% in Idaho, and 22% in Alaska. Although it is commonly believed that bears acquired the parasite from eating garbage, a greater number of infected bears occur in remote areas than those with high human densities. Bears probably acquire the parasite by cannibalizing carcasses of other bears. It has been hypothesized that trichinellosis contributes to antagonistic or erratic behavior in bears. However, there is no conclusive evidence to support this hypothesis.

The protozoan parasite *Toxoplasma gondii* infects a wide ranges of birds and mammals. This parasite is transmissible to humans and may cause serious or fatal illness in persons with compromised immune systems. Congenital infections may produce birth defects. Wildlife can serve as the intermediate reservoir host for this parasite and cysts can survive for years in muscle tissue. Consumption of infected meat can produce infection in humans. In Pennsylvania, 80% of sampled bears showed antibodies for *Toxoplasma*. Persons consuming bear meat should cook the meat to an internal temperature of at least 66º C (150º F) for 3 minutes, which is sufficient to kill both *Toxoplasma* and *Trichinella*.

There may be individual and regional variation in the susceptibility of black bears to ectoparasites. Ticks were the most common ectoparasite in Idaho. Most bears were lightly infested (<25 ticks). However, in Montana, 100% of 117 bears examined in May and June were infested with ticks (*Dermacentor andersoni*). Subadult black bears were often in poorer condition than adults and probably more susceptible to parasites. Mange mites (*Ursicoptes americanus*) were found on 4% of bears sampled in Idaho. Since 1993, about 45 cases of nearly hairless bears (infested with the mite *Demodex ursi*) have been found on the western edge of Ocala National Forest in Florida.

References: Babbott and Day 1968, Briscoe et al. 1993, Butler and Khan 1992, Forrester et al. 1993, Goad 2003, Jonkel and Cowan 1971, King et al. 1960, Rausch et al. 1956, Rogers and Rogers 1976, Schad et al. 1986, Worley et al. 1983, Yunker et al. 1980

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WHAT KINDS OF DISEASES AFFLICT THE BLACK BEAR?

Wildlife diseases do not appear to play a major role in morbidity and mortality of black bear populations. However, routine

surveillance is lacking. Bears in Idaho showed antibodies for tularemia (19%), Q-fever (6%), brucellosis (5%), leptospirosis (1%), and other pathogens but none showed serious clinical signs of the diseases. In the Great Smoky Mountains National Park, bears showed antibodies for *Leptospira sp*. (22%), but tested negative for brucellosis and canine distemper. Bears sometimes show evidence of periodontal disease and dental caries ("cavities").

Black bears rarely contract rabies. Large amounts of virus are necessary to infect the animal and infected individuals show little or no virus in their saliva. Only 10 rabid bears were reported in North America through 1983. Since the onset of raccoon-strain rabies in the Northeast, 1 rabid bear has been reported in New York and none in Massachusetts. Captive or pet bears may be a greater risk. In Iowa, a captive cub at a petting zoo developed acute neurologic signs and died. Initially diagnosed with rabies (but later proved to be false-positive), the animal exposed an estimated 350 persons from 10 states. The initial expense to contact these people and give them post-exposure treatment was substantial.

References: Binninger et al. 1980, Cook and Pelton 1978, Gleason et al. 1999, Rogers 1983

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WHAT ANIMALS PREY ON BLACK BEARS?

Black bears have retained the forest-dwelling habits of their ancestral bear progenitors, unlike grizzly/brown bears which adapted to utilize open plains as well as forests. Black bears likely were not large enough to defend themselves against larger, now-extinct bears, cats, and wolves and used trees as escape habitat when threatened.

Since the extinction of the Pleistocene megafauna, few animals are capable of attacking and killing adult black bears. Grizzlies, other black bears, and occasionally wolves are the only modern non-human predators which can accomplish this. While there are frequent anecdotal or second-hand reports of grizzlies killing black bears, actual accounts are few. In one Alberta instance, a grizzly with 2 yearlings attacked a sow black bear with 2 cubs, successfully killing the cubs. In the Yellowstone ecosystem, radiotracking and field sign indicated probable predation of a female black bear by an adult male grizzly. Encounters not leading to mortality may be common, but are seldom reported. It is likely that both species have developed a system of mutual avoidance to maintain interspecies spacing and thus diminish conflicts. In Alaska, black bears commonly flee when they become aware of the proximity of a brown bear.

Wolves may also occasionally prey upon bears. Although a bear may be able to defend against a single wolf, packs may be successful predators. A pack of 9 wolves killed a denned adult female and her newborn cubs in Minnesota. Wolves also killed an immature black bear in Ontario and an adult female in Alberta. Wolf predation does not appear to be limiting to black bears in forested habitats.

Popular accounts sometimes claim that mountain lions prey on black bears. While possible, evidence is sparse. In Arizona, a mountain lion was responsible for 1 (12%) of 8 identified cub mortalities. A study in Wyoming found that black bears displaced mountain lions from 50% of the lion-killed carcasses they visited but physical contact was not documented.

Both mountain lions and wolves occurred in Massachusetts in colonial times but do not occur here now. Coyotes (which do occur in Massachusetts) have killed yearling bears in western North America and could easily kill undefended cubs caught on the ground.

Intraspecific competition among black bears is relatively common. Resident adult males may aggressively prevent immigration into their ranges, thereby reducing competition for mates and food. The number of immigrants are killed versus those expelled is uncertain. This intraspecific competition is also a likely cause of the lack of sociality among bears. There are several records of black bears killing trapped individuals of that species, but other reports are rare. Between 1974 and 1994, only about 2 bears (>1-yr-old) per year in North America were reported killed by other bears.

Direct killing or cannibalism of immature bears or cubs by other bears has been alleged to be a factor in population regulation of black bears. Male bears could benefit from killing the cubs of another by eliminating the offspring of another while favoring the dispersal of their own genes. However, these speculations have not been adequately tested in bears and the relationship between the adult males and the cubs they kill cannot easily be determined. Cub killing may be common but under-reported as cubs are not commonly radiotagged in field studies. Cannibalism accounted for 50% of all known cub deaths in an Arizona study (although the sample size was small).

References: Barber and Lindzey 1986, Garshelis 1994, Herrero 1978, Horejsi et al. 1984, Kemp 1972, LeCount 1987, Martinka 1976, Mattson et al. 1992, Miller 1985, Murphy et al. 1995, Rogers and Mech 1981, Rogers 1983, Ross et al. 1988, Stirling and Derocher 1990, Young and Ruff 1982

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DO POACHERS KILL BLACK BEARS TO SELL THEIR GALL BLADDERS OR OTHER BODY PARTS?

Bear body parts are commonly used in traditional Chinese and Korean medicine. Bear gall, containing the active ingredient ursodeoxycholic acid, is highly coveted as a “cold” medicine used to treat fever, lower body temperature, and reduce inflamed tissues. Other bear parts including bone, fat, brain, blood, and lungs are used to treat arthritis, skin disorders and hearing loss, and to increase strength and sexual potency. Bear paws, meat, and fat are also eaten and considered delicacies. Teeth, claws, and skulls are sold to tourists as curios or souvenirs or made into artifacts or jewelry. Asian bears–including the Asiatic black bear, sloth bear, and sun bear–were once the sole sources of such potions, medications, and other products.

As Asian bear populations diminished–either through illegal killing, lack of legal protection, or loss of habitat–some oriental consumers turned to imports from North American bears to satisfy their needs. In 1992, the American black bear was listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), not because of the status of the bear, but because of its similarity to endangered bear species listed on Appendix I of CITES. All species of bear are now listed on either Appendix I or II. Listing under Appendix II requires the signatory countries to monitor commercial trade in bears and bear parts and to issue permits for such exports. Such lawful export is apparently minimal. Gall prices as high as $64,000 have sometimes been quoted but are misleading and are

back-calculated from the price per gram on the street market. In 1995, black bear gall prices paid to North American hunters ranged from $20 to $250.

Due to trade restrictions and dealer scams, the actual trade in galls now consists largely of pig and cow galls from slaughterhouses. On the illegal market in Asia, only 49% of galls tested were actually from bears. Authentic bear galls comprised only 35% of the legal trade in Hong Kong and 63% in Taiwan.

In 1996, 35 states and 9 provinces prohibited the sale of bear galls taken within their jurisdiction. Six other states prohibited sale from within their states but allowed sale of parts lawfully taken elsewhere. A lesser number of states and provinces prohibited sale of other bear parts, including paws, teeth, and hides. Only 1 state (WI) indicated that trade was affecting the illegal harvest of bears. The same state also indicated that trade was negatively affecting their bear population. Arguments that the North American trade in bear parts has generated an illegal harvest twice the legal one cannot be sustained. Internet commerce may facilitate some illegal sales of galls.

Massachusetts does not allow the sale of any bear parts, whether gall, paws, teeth, or hides; however, a hunter lawfully taking a bear may retain such parts for personal use.

Attempts to decrease supply and demand for bear parts may be neither practical nor appropriate in conserving American black bear populations. The long-term viability of American bear populations can be assured only by changing public attitudes so that bears and bear habitats are valued.

References: Cooper 1996, Garshelis 1997, Gaski 1997, Mills and Servheen 1991, Williamson 2002

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DO PEOPLE HUNT BLACK BEARS? HOW DOES HUNTING AFFECT BLACK BEAR POPULATIONS?

Black bears are considered a “game” animal or “furbearer” and are hunted during regulated seasons in 27 states and 12 Canadian provinces. Season length, timing, bag limits, methods of take, reporting and tagging requirements, and other provisions vary. There are several books–of varying quality–describing bear hunting experiences and techniques.

Massachusetts has a split season with 17 days in September and 18 days in November. Bait, hounds, and hunting during deer shotgun season are prohibited. The bag limit is 1 bear annually. Hunters require a permit in addition to their basic license and must present the animal to a check station no later than 48 hours after taking the animal.

Some studies or models have suggested that sport hunting limits bear populations in areas that are heavily hunted. Bears are often reported to have an inherently low reproductive rate and hence sensitivity to hunting. However, studies in California indicated that sport hunting took about 8% of the population (10% from all causes), had little negative effect on the population and was probably compensatory. In Montana, population modeling suggested a maximum sustainable mortality of 12%. Another deterministic model of bear mortality indicated a maximum sustainable harvest of 16% for black bears >1 yr. and 14% for bears of all ages. Another study suggested that harvests are probably additive to natural mortality when populations are reduced below 25% of carrying capacity. Massachusetts has used a harvest goal not exceeding 5% of the population (10% from all causes) since 1982 and is sustaining an annual population growth of 7 to 8%.

Male bears are often more vulnerable than females and younger animals more vulnerable than older ones. In Massachusetts (1998 to 2002), the harvest sex ratio was 250M:208F (120M:100F). Bears < 2 yrs. old (1998 to 2001) averaged 44% (38-54%) of total harvest.

Bears can undoubtedly sustain heavy hunting pressure in some areas and circumstances without depressing the population or being a population sink. A heavily hunted area in northeastern Minnesota sustained high harvest and high nuisance complaints, and had a stable or increasing population, yet lacked an influx of young males. Pennsylvania sustains a highly productive population and has a harvest objective of 20%. However, the suggestion that increased mortality of older males may be offset by increased survivability of younger bears cannot be sustained. There is no evidence of a density-dependence relationship between hunting pressure and cub survivorship.

Harvest levels and composition may be related to methodology. In New Hampshire, bait hunters harvested the youngest bears and houndsmen the oldest. Hunters stalking bears showed the least selectivity (passing up shots) and houndsmen the greatest. Harvests by bait hunters and still hunters were biased towards males. However, hunter selectivity may vary with the perceived abundance of bears, season length and timing, food availability, and available methodology. In Massachusetts, natural food availability is more important than either hunter participation or hunting method in determining bear harvests.

References: Bunnell and Tait 1980, Burton et al. 1994, Fraser et al. 1982, Kasworm and Thier 1994, Kolenosky 1986, Kolenosky and Strathearn 1987a, Kontio et al. 1998, Lindzey et al. 1976, Lindzey 1981, Litvaitis and Kane 1994, McCaffrey et al. 1976, McDonald et al. 1994, McIlroy 1972, Miller 1990a, Miller 1990b, Scheick 2002, Taylor 1994, Ternent 2001

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ARE BLACK BEARS ACTIVE DURING DAY OR NIGHT?

Black bears are typically diurnal or crepuscular, although this may vary with season, available foods, social interactions, presence

of cubs, temperature, weather patterns, or extent of human disturbance. In the Great Smoky Mountains National Park, bears were distinctly crepuscular in spring and more diurnal in summer when berries were abundant. In fall, the animals were active both day and night, probably due to increased feeding prior to denning. In Idaho, bears also showed an increase in nocturnal activity in autumn. Female bears in Quebec were primarily diurnal both during late summer and autumn and were most active when berries or beechnuts were ripening.

Black bears may be nocturnal in some parks and campgrounds where human food sources are readily available and human activity disrupts the bears' normal routine. Human activity is also believed to cause nocturnal behavior among bears in a small fragmented habitat in western Florida.

In Massachusetts, bears are typically diurnal in spring, and both diurnal and crepuscular in summer, with activity peaks just after dawn and before dusk. Males show limited nocturnal activity during the breeding season. Activity during fall is similar to that in spring, with nocturnal activity nearly nil.

References: Amstrup and Beecham 1976, Ayres et al. 1986, Elowe 1984, Garshelis and Pelton 1980, Garshelis et al. 1983, Graber 1981, Kolenosky and Strathearn 1987a, Lariviere et al. 1994, Orlando and Maehr 2003, Rogers 1987a

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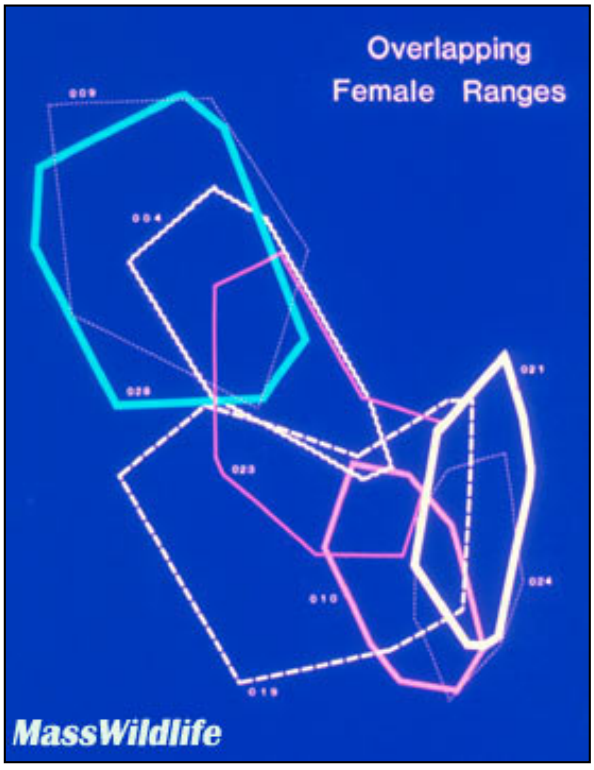
WHAT IS THE HOME RANGE OF A BLACK BEAR? DO BLACK BEARS DEFEND THEIR HOME RANGE AGAINST OTHER BEARS?

"Home range" has traditionally (and broadly) been defined as that area used by an individual animal during its normal activities of food gathering, mating, and caring for the young. Home ranges may change during the life of the animal or by season, and may be used in different ways for different behaviors. "Territory" is that part of the home range that is defended against intruders or competitors. "Defense" may include warning behavior through scent, vocalizations, or marks, as well as physical confrontation.

Female black bears (but not males) in boreal habitats in Alberta, Minnesota, and Washington showed little or no home range overlap, which suggests territoriality. Occasional aggressive behavior towards unrelated females may also occur. However, in more temperate areas with diverse resources, including Arkansas, Massachusetts, North Carolina, and Tennessee, adult females display considerable overlap in home range but mutually avoid each other.



Black bears use an area based primarily on the distribution and abundance of foods. However, other resources such as water, den sites, and escape habitat also play a role, as well as social factors, population density, competitors, and human artifacts. Climate,

vegetation, and forest management practices undoubtedly affect the quality, quantity, and availability of the bears' resource needs. These needs are probably the primary determinants for home-range size among female black bears, but home-range size for males may also be driven by the density, spacing , and home-range characteristics of breeding females. Bears appear to have both psychic and physical bonds to their home range and may be stressed when in unfamiliar terrain.

The sizes of black bear home ranges vary greatly across North America. These differences are related not only to habitat characteristics and bear densities but also to the range estimation technique. Average sizes for adult females have varied from 1.8 mi^2 in Washington and 2.6 mi^2 in Minnesota, to 15.8 mi^2 in Pennsylvania and 66.6 mi^2 in west-central New Mexico. Adult males typically have home ranges several times larger than those of females. In Council, Idaho, male home ranges averaged 56 mi^2 and in Pennsylvania 66.8 mi^2. In New Mexico, male ranges averaged 143 to 148 mi^2 while in Ontario some large males covered an area >580 mi^2 over several years. In western Massachusetts, home ranges for females >2 yrs. varied from 8.9 to 10.0 mi^2. Adult males averaged 123 mi^2.

References: Alt et al. 1980, Beecham and Rohlman 1994, Beeman and Pelton 1976, Burt 1943, Costello et al. 2001, Elowe 1984, Fuller 1993, Garshelis and Pelton 1981, Koehler and Pierce 2003, Kolenosky and Strathearn 1987a, Mace and Waller 1997, Poelker and Hartwell 1973, Powell et al. 1997, Powell 2000, Rogers 1987a, Smith and Pelton 1990, Young and Ruff 1982

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HOW FAR DO BLACK BEARS TRAVEL? WILL THEY RETURN HOME IF TAKEN TO ANOTHER LOCATION?

The daily movements of black bears change both seasonally and annually in response to changes in food abundance and distribution. Habitat, weather, sex, age, social interactions and human activity may also influence movements. Typically, males travel more than females, young bears more than adults, and females with cubs travel short distances, especially in spring. In a Tennessee study, females averaged 0.4 to 0.8 (males 0.6 to 0.9) miles per day in spring and summer, while in fall females traveled 0.5 to 1.0 (males 0.4 to 1.0) miles per day. In Idaho, net daily movements for both sexes averaged 0.8 miles. Dispersing 2-yr-old males generally travel <93 miles; those in Massachusetts typically disperse 12 to 62 miles.

Black bears have a well-developed homing instinct and are capable of returning to their home range from long distances. In New York, 22 (42%) of 52 nuisance bears transported 9 to 67 miles returned to the origin. Returns dropped when bears were moved >40 miles but 1 male returned from 56 miles away. In Pennsylvania, 20 (48%) of 42 translocated nuisance bears returned from distances <40 miles. In British Columbia, 68% of nuisance bears returned when moved up to 50 miles. Translocation studies in 11 states and provinces suggest that adult bears must be moved >40 miles to ensure <50% return. In Virginia, studies suggested that translocations <50 miles were ineffective. Young males appear to show less site fidelity and may be translocated shorter distances. The basic mechanisms involved in homing and orientation are unknown but do not involve random movements or an expanding search pattern. Homeward orientation does not require familiarity with the release site and may function at distances up to 168 miles.

Bears may also display long-distance movements without returning to their home range. An 11-yr-old male bear translocated 55 miles in Florida moved a minimum of 315 miles to Louisiana in 35 days. A relocated Tennessee bear moved about 295 miles. A female bear–repeatedly translocated within Massachusetts–then moved into Vermont and later about 89 miles to Connecticut over a 20-month period. These occasional long-distance movements may explain the persistence of some isolated bear populations.

Nuisance black bears were translocated >185 miles within Virginia to reestablish a viable population in underutilized habitat. Nineteen (44%) of 43 radiomarked bears died post-transfer. Reintroductions or translocations which result in the death of a substantial segment of the released animals pose research and ethical challenges which must be addressed.

References: Alt et al. 1977, Amstrup and Beecham 1976, Beeman and Pelton 1976, Comly-Gericke and Vaughan 1997, Elowe 1984, Fies et al. 1987, Garshelis et al. 1983, Rogers 1986, Rogers 1987b, Rutherglen and Herbison 1977, Sauer et al. 1969, Stratman et al. 2001

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WHAT KINDS OF HABITATS DO BLACK BEARS LIVE IN?

The black bear evolved as a forest animal and its life history is driven by the resources and constraints inherent in forested habitats. Typical black bear habitat consists of mixed forest interspersed with clearings and patches of early successional trees and shrubs. Physical and vegetative differences among the regions of North America influence black bear populations and habitat use in accordance with the availability of food, escape cover, and denning sites.

Bears are able to exploit diverse habitats because of their ability to den during periods of food scarcity. Foods are influenced by climatic, edaphic, and topographic characteristics which affect the quality, quantity, and distribution of foods, hence bear productivity. Mountainous areas may be favored due to the diversity of habitats resulting from altitudinal changes; however, eastern deciduous forests with their abundance of hard mast sustain the most productive bear populations.

Water is an essential component of bear range and must be easily accessed and available throughout the non-denning period. Bears drink frequently when feeding on nuts, vegetation, or similar relatively dry foods. Wetlands provide seasonally important foods as well as cool areas to relieve heat stress.

Habitat types in western Massachusetts include wetlands, abandoned fields, hardwood forest, softwood forest, mixed forest, mountain laurel thickets, logged areas, and corn fields. Overall, bears showed a strong preference for wetlands in spring, and also for hardwoods and mixed stands which produced good mast crops the previous fall. Wetlands continued in importance in summer, but bears shifted to abandoned fields and successional areas as berries ripened. Mixed forests were important when soft mast was abundant. Corn fields were heavily used in late summer, especially when mast was scarce. Hardwoods and mixed woods were favored when hard mast was abundant. Similarly, spring habitats in New Hampshire included forested wetlands, riparian areas, and forest lowlands, while regenerating stands, power lines, and edge areas were important in summer. Beech stands were favored in autumn.

References: Elowe 1984, Herrero 1978, Hugie 1979, Kelleyhouse 1980, Kolenosky and Strathearn 1987a, Meddleton and Litvaitis 1990, Pelton 1982, Powell et al. 1997, Rogers and Allen 1987

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HOW DO HABITAT CHANGES AFFECT THE BLACK BEAR?

Habitat changes are positive if they accrue positive benefits to the bears' life needs, they are negative otherwise. In reality, this is an oversimplification. Changes in habitat often involve a suite of impacts which may vary with time of day, season, year, geography and topography, climatic changes, bear numbers and distribution, human populations and activity, and other factors. Nature is inconstant; habitat changes do occur in pristine environments but may be more abrupt, dramatic and wide-ranging in human-influenced ones.

Habitat fragmentation causes large-scale changes in physiography as well as inducing biogeographic changes in fauna and flora. This fragmentation generally produces islands of remnant habitat within a human-altered landscape. The changes may alter patterns of wind, water, and nutrient flow which then affect the composition and persistence of biotic communities as well as species. Fragmentation may also facilitate invasions by exotics, isolate populations and alter gene flow, increase local extinctions, increase exposure to human-associated mortality sources, and promote competition for scarce resources within remnant populations. A species' response to fragmentation can be predicted by its body size, longevity, fecundity, trophic level, dietary habits, natural abundance in primary habitat, and abundance in surrounding habitats. Black bears have comparatively low fecundity and occur in low densities, increasing the possibility of susceptibility to local extinctions or slow recovery from population declines.

Timber harvest can alter bear habitat in several ways. Clear-cutting may remove essential food producers–such as beech or oak–and the road networks necessary for timber transport increase the vulnerability of bears to hunters or poachers. If a bear population is below carrying capacity, these secondary effects may be more deleterious than the initial habitat loss. In New Hampshire, harvests were negatively associated with human population density, town roads, gated roads, and developed land, but positively associated with national forest roads and developed land. On the other hand, the short-term pulse of low-growth successional fruit-bearing shrubs may benefit bears, but then alter size, productivity and behavior of the bear population when these ephemeral habitats vanish.

Overall, human alterations to once-pristine bear habitat degrade or alter food biomass available to bears, and induce changes in bear tolerance to humans, and that of humans to bears. Large-scale changes may result from changes in landscape mosaics, alteration of climatic cycles, rises in pollutant levels, draining of wetlands and waterways, proliferation of anthropogenic food sources, and introductions of pathogens which cause food resources to shrink or vanish. These widespread and drastic effects will challenge the ability of humans to sustain viable bear populations. A combination of increasing natural resource issues and diminishing resources has fostered a shift from single-species management to "ecosystem" management whereby lands are managed for native biological diversity ("biodiversity"). This concept is appealing and indeed essential. However, an overall approach which focuses on processes rather than species, and species diversity rather than a single species, can hinder the conservation of bears if bear-specific needs are not met. Preservation and management of large tracts of forest habitat can benefit both bears and a wide range of other species. Long-term studies and intensive hypothesis testing will be important in evaluating ecosystem management concepts and their ability to effect bear conservation.

Habitat use-availability studies are often applied to habitat management. However–even if habitat selections have been accurately measured–there may not be a direct relationship between the animal's choice of habitat and that habitat's contribution to individual fitness and hence population growth. Demographic response studies–although often difficult–are the only correct means of evaulating the relative importance and suitability of habitats in supporting animal populations.

References: Brody and Stone 1987, DeGraaf and Healy 1993, Garshelis 2000, Grumbine 1994, Grumbine 1997, Hellgren and Maehr 1992, Knight 1996, Laurance 1991, Lindzey et al. 1986, Mattson 1990, Rogers and Allen 1987, Rossell and Litvaitis 1994, Saunders et al. 1991, Schoen 1990, Simberloff 1999

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HOW DO ROADS AFFECT BLACK BEARS?

Roads may have a significant effect on bears by fragmenting, altering, or removing habitat, changing movement patterns, or producing mortality through road kill or increased vulnerability to hunting and poaching. Black bears may readily cross limited access roads and trails in response to the availability of seasonally abundant foods. Bears may also use lightly traveled roads as travel pathways. The degree of avoidance of roads depends on traffic volume, noise level, amount of roadside concealment cover, sex of the bear, season of year, and time of day. Black bears readily cross roads with traffic volumes <100 vehicles/day, but avoid roads with volumes >10,000 vehicles/day. Based on studies in 3 states, bears avoided a roadside buffer zone averaging 1640 feet. Including this buffer zone, the habitat loss from 4-lane state and interstate highways varies from 212 to 222 acres per mile.

Road mortality typically kills more male bears than females and is highest in spring and early summer when males disperse, and in fall during peak foraging. In North Carolina, males <4 yrs. old comprised 70% of road kills. However, particularly in southern states, female mortality may approach that of males during the fall foraging period. Road kills may be substantially under-reported in some areas and management strategies should take this into account. Strategies for reducing road mortality may include driver education, warning signs, and construction of highway underpasses.

Increased road access may also increase the vulnerability of bears to hunters. In western North Carolina, 73% of legal harvest comes from within 1 mile of roads driveable by 4x4 vehicle. When hounds are a lawful hunting technique, roads increase bear vulnerability by facilitating searches for bear crossings and allowing more efficient response to bears treed by hounds. Poachers may also use newly-created logging roads or trails to quickly access remote habitat previously accessible only by foot travel.

References: Beringer et al. 1990, Brody and Pelton 1989, Brody and Stone 1987, Carr and Pelton 1984, Clark 1991, Elowe et al. 1991, Fraser 1979, Kasworm and Manley 1990, Orlando and Maehr 2003, Powell et al. 1997, Rogers and Allen 1987, Warburton et al. 1993, Wooding and Brady 1987, Wooding and Maddrey 1994, Young and Beecham 1986

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HOW DO RESEARCHERS CATCH A BLACK BEAR ALIVE AND WHY?

Biologists capture black bears to research their life history, population dynamics, and habitat requirements; to translocate and restore bears to vacant habitat; and to relocate nuisance bears or “condition” them using aversive techniques. Much of our knowledge about black bears comes from scientific studies of bears which have been captured, marked, released, and radio-tracked over time. Long-term studies are essential for investigating animals with long generation times. Short studies can be misleading for long-lived animals, random environmental variables may not be encountered, and decision-making models may be modified and refined over time. Some bear studies have been going on for over 30 years.

Knowledge of the animals' life history, habitat requirements, and interactions with people are essential in conserving and managing black bear populations in the face of an ever-changing and increasingly perturbed environment. Nevertheless, any studies which involve capture, handling, and marking of an animal must be soundly designed, humane, and of benefit to the species or a population. Biologists and managers cannot ignore the necessity of ethics in wildlife conservation and management. Formal protocols which specify the appropriate techniques and procedures are integral to any well-designed field study.

Three methods are typically used to capture free-ranging black bears, including culvert or barrel traps, foot snares, and treeing with trained hounds. Each method has its benefits and liabilities. Researchers must be well-trained and familiar with the equipment and procedures and the habitat, terrain, and circumstances where the study is be done, and sensitive to the well-being of their study animal.

Live traps constructed from sections of drainage culvert are often used for the capture of lack bears. Bears up to 600 lbs. have been caught in these traps. However, these traps are cumbersome, difficult to transport, and costly. Some bears may be reluctant to enter the traps. Traps should be set in shady areas so the bear does not overheat and must be monitored regularly to prevent harassment by humans or dogs. Similar but lighter traps constructed of two 55-gallon drums welded together are also effective.

Spring-activated "Aldrich" foot snares, or cable traps, were developed in the early 1960s in Washington State as a lightweight, portable, and humane alternative to large steel-jaw bear traps for damage control. These snares were subsequently adapted for the capture of brown and black bears. Snares are easily concealed and can be set in cubby, dirt hole, or trail sets, either baited or unbaited. Careful site selection and loop placement can maximize the chances of a successful capture. Springs, swivels, and cable locks are used to minimize the chance of injury to captured animals. Snares should be set only in areas where captured bears are not subject to harassment and should be checked frequently. Aldrich snares are considered to be "leghold traps" under Massachusetts law and have not been lawful since 1996, even for bona-fide research.

Trained bear hounds have been used in several states. Dogs are used to locate bears by striking bear scent while driving logging roads, at telemetry locations, or a bait stations. Dogs are then released to trail and tree the bear. Researchers must then either follow the hounds on foot or track them with telemetry. Chasing with hounds can be effective in taking family groups, since culvert traps or foot snares rarely take more than a single animal. Hounding is also effective in selectively recapturing radio-collared animals. Chasing should not be conducted in hot, humid weather or in early spring when the bears' foot pads have not hardened. Nets should be used to break the bear's fall when darted in a tree.

In most instances, live-captured black bears must be restrained in order to ear-tag, radio-collar, weigh, or examine them, or to take biological samples. Chemical immobilization is typically the most appropriate and effective means for doing so. It is not always the best method and may be harmful to the animals when used inappropriately or improperly. The animals are not necessarily "tranquilized" and their physical and emotional safety, as well as that of the researchers and the public must be considered. Once the decision is made to chemically restrain an animal, it is the duty of the researcher to use all relevant measures for the responsible treatment of the animal. Researchers must receive appropriate training in the use of darting equipment and must comply with the pertinent state and federal laws for using controlled substances.

References: Allen 1984, American Society of Mammalogists 1987, Bekoff and Jamieson 1996, Black 1958, Erickson 1957, Filion and Hamr 2002, Flower 1975, Fowler 1995, Friend et al. 1994, Johnson and Pelton 1980b, Kohn 1982, Kreeger 1999, LeCount 1986, Leopold et al. 1996, Massopust and Anderson 1984, Miller et al. 1973, Nielsen 1999, Pelton and Van Manen 1996, Poelker and Hartwell 1973, Troyer et al. 1962, Willey 1983

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HOW DO YOU COUNT BLACK BEARS IN THE WILD?

A commonly asked question regarding wildlife is “how many are there”? This is simple to ask, but complex to answer. First, we need to define what is meant by “how many”. We normally use the term “population”. This means a group of animals occupying a particular geographical area at a particular time, and which is isolated from other groups of the same species. This may be very broad, such as the North American continent, or very small, such as a tiny island. Except on small areas, or where the animal itself may be very rare (e.g., the number of whooping cranes in North America), there isn’t an easy–or even possible–way to get an exact count of most populations. The animals may be too wide-ranging, secretive, difficult to capture (or harmed in the process), costly to survey, or vary in numbers quickly to make such a count practical. Such an exact count is called a “census”. An “estimate” or “population estimate” is an approximation of the true population size based on some sampling method. A “survey” samples a portion of the individuals in a given population, and an “index” is a measurable factor or count of some segment of the population (e.g., the number of cooing doves in spring) which can be related to population size in some manner, and which changes predictably with population size. An index may be direct (e.g., the number of deer seen per road mile), or indirect (e.g., the number of coyote dens per square mile). However, most population indices are now considered suspect as a basis for making inferences about a population without an empirical measure of the sampled population segment (“detection probablility”).

Population size does play an important role in wildlife management. For scarce animals, it may be desirable to increase their numbers, while with some abundant species a reduction in population size may be warranted. For animals that are hunted or trapped, a goal may be to maintain a specific population level which can sustain a certain level of harvest or to keep overpopulation from producing habitat degradation. However, there may not always be a need for an exact population size (i.e., a “number”). A single count at a given point in time and space doesn’t tell much about the overall status and viability of a population. It may be more useful to get a series of counts over a period of time, or in different habitats and at different seasons. Or, it may be most useful to determine the “trend” of a population. That is, is it increasing, decreasing, or stable over time? It may also be important to know the ratio of occupied habitat to vacant habitat, rather than the exact population size. Nevertheless, some measure of population size is often necessary to evaluate the effectiveness of changes in the environment or in management practices.

Also, since many animals show a great seasonal variation in population size, due to natural seasonal mortality, an estimate or comparison of estimates must be qualified to reflect that situation. The accuracy of the estimate must also be considered; that is, how close does the estimate come to the real population size? It may be easy to come up with a “number” but the margin of error around that number may be considerable. Finally we need to consider the cost of obtaining an estimate and the use to which the estimate will be put. Some estimation methods–especially over large areas–may cost tens or even hundred of thousands of dollars. The use to which these estimates are put, in terms of benefit to the species and its management, must be weighed against such costs, particularly if other measures will do. Due to biases, uncertainties, or lack of knowledge, it is often wise to employ a suite of estimation techniques, rather than a single indicator. A detailed explanation and assessment of wildlife population estimators is well beyond the scope of this Question. However, we can relate it to the black bear in terms of some of the population assessment measures that are used and demonstrate some of the complexities, utilities, and flaws that may affect such population estimates. A wide range of techniques have been employed to assess bear populations, including mark-recapture or mark-resight procedures, harvest sex-age ratio interpretations, questionnaires, field indices, and informed speculation.

Several indices have been used to estimate trends in bear numbers. These indices do not provide accurate density estimates or population levels. They are also unreliable in areas where bear populations are low. Some such indices include counting bear sign or the frequency of scent strikes by bear hounds on fixed routes, scent station visits, questionnaires, and interpretations of harvest data. Sign and scent stations may be useful but are influenced by weather, topography, season, amount of sign, and observer skill as well as lack of independence (i.e., bears’ taking more than 1 bait) and natural food availability. Questionnaires may be seriously affected by non-response bias. Harvest levels may change in response to factors other than population size, and sex and age composition may vary according to the availability and vulnerability of the animals and to hunting pressure. Accordingly, the unsupported use of harvest data or standing age distributions to make inferences about population size is unwise.

Mark-recapture estimators are also commonly used. These typically involve capture, tagging, and recapture of the animal, and then using the ratio of marked to unmarked animals. Sample sizes may be low and the animal must be handled more than once. Capture-resight estimators are similar, but provide for “recapture” by radiotelemetry, photography, sample retrieval, or direct observation. Mark-recapture-resight estimates assume a closed population, permanency of marks, accurate data recording, and equal vulnerability to trapping among all animals. Some individuals may also be more vulnerable to capture and resampling than do others, inducing biases that may be mitigated but not eliminated.

Computer simulations or “models” are mathematical representations of a real population or biological system. Such models are often simplified so that they contain only those relevant features necessary to develop the population estimate. Age-specific mortality and reproductive data are commonly included in bear population models to generate projections of the population size over time. A good model may also discern the trend of the population, the effects of various death rates (e.g., hunter harvest) on the population, and perhaps how deficiencies in knowledge affect the estimates. However, a model is only as good as the data that goes into it. Some components may be more important than others. Models usually need to be tested by comparing them against real-world situations. One kind of model is “deterministic”—the data that are input (e.g. litter size) are fixed and the results of the model depends on those fixed values. In a “stochastic” model, the input data varies randomly within a certain range that is set by the user (e.g. annual mast index). Stochastic models are most useful if the user is interested in variations within the population or biological system. All models require assumptions, which may not be easily met. Age- and time-specific variations in mortality and productivity are often variable and may affect the utility of the model. Density-independent factors (e.g. weather) may also need to be accounted for. Long-term field studies may be required to obtain the data or “parameters” which go into the model, and for verifying it under real-world conditions.

References: Akenson et al. 1995, Anderson 1982, Anderson 2001, Buckland 1994, Bunnell and Tait 1980, Caughley 1974, Fraser et al. 1982, Fuller 1993, Garshelis 1991, Garshelis and Visser 1997, Gibbs 2000, Grogan and Lindzey 1999, Harris and Metzgar 1987, Johnson 1994, Kolenosky 1986, Kolenosky and Strathearn 1987a, Kontio et al. 1998, Lancia et al. 1994, LeCount 1982, Lindzey et al. 1977, Martorello et al. 2001, McLean and Pelton 1994, Miller et al. 1995, Miller et al. 1997, Noyce et al. 2001, Otis et al. 1978, Paloheimo and Fraser 1981, Pelton et al. 1978, Woods et al. 1999, Young and Ruff 1982

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WAS THE ORIGINAL “TEDDY BEAR” A BLACK BEAR AND WAS IT NAMED FOR “TEDDY” ROOSEVELT?

In November 1902, 1 year into his presidency, Theodore Roosevelt set forth on a hunting expedition in the canebrakes along the Little Sunflower River in Mississippi, accompanied by plantation owners, railroad officials, and his secretary. Despite the best efforts of veteran guide Holt Collier, the first 5 days of the hunt were a failure. Other party members saw bears and deer but they wanted Roosevelt to score first. The accompanying journalists had a heyday embarrassing nimrod Roosevelt’s poor showing. On November 14, Collier’s hounds bayed a bear, but the hunters lost the chase in the heavy brush. While seeking the dogs, Collier was astonished to see the tired bear burst into a small pond, followed by the excited hounds. Lassoing the animal, he stunned it with a blow and sent back to camp for Roosevelt. Arriving on the scene, the President was disgusted to find a stunned, runty animal tied to a tree and refused to shoot it. The media seized the moment.

On November 16, Clifford Berryman’s cartoon “Drawing the Line in Mississippi” appeared on the front page of the *Washington Post*. It showed a grim Roosevelt turning away, while a squatting white guide (Collier was black) held a tiny cub by a rope. While the actual bear was of moderate size (an estimated 235 lbs.), “Teddy’s cub” played better with the public. Other cartoonists featured bears in Roosevelt cartoons, buttons and postcards were produced, and merchants seized on the imagery. Businessman Morris

Michtom of Brooklyn created a cute-appearing toy bear and called it “Teddy’s Bear”. The demand was immense and Michtom’s business grew into the well-known Ideal Toy and Novelty Company. Coincidentally, in Germany, Richard Steiff created a rather fierce-looking stuffed bear to supplement his aunt’s toy business. In March 1903, the first Steiff bear appeared at the Leipzig Toy Fair. Europeans were cool, but American buyers seized on it. Then, in 1905, Seymour Eaton’s *“The Roosevelt Bears: Their Travels and Adventures”* amused children with the antics of Teddy G. and Teddy B. By 1906, the Teddy Bear craze was in high gear. Although most early manufacturers are long out of business, Teddies of all kinds remain highly popular today.

References: Bull 1970, Morris 2001, Schullery 1988

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WHAT WERE NATIVE PEOPLES’ ATTITUDES TOWARD BEARS?

The once-famed cave bear (*Ursus spelaeus*) cult among Neanderthal man is undoubtedly a fiction, although cave bear bones may have later influenced legends of dragons and dragon-lairs in the Middle Ages. Nevertheless, humans have long felt a kinship with bears. Bear symbolism is potent, complex, and varied among cultures, but, in general, the animals were peculiarly respected among Nearctic aborigines because of the animals’ purported resemblance to humans and their perceived ability to transcend domains. The bear’s ability to hibernate was viewed as conveying a unique view of the underworld and the animal’s qualities as a mediator between humans and gods. Similarly, the bear’s diverse diet and relentless search for food promoted its identity as an icon for primitive hunter-gatherers. Legends of bear foster parents and bear lovers were also recurrent mythological themes. A classic study of bear ceremonialism concluded that “No other animal was found to attain such universal prominence as the bear, nor to have associated with it, over such a wide geographical area, such a wide series of customs”.

Bears figured prominently in Amerindian animistic religions, with Mooin–the black bear–an important Algonquian character in the Northeast. Special rites often surrounded the killing of a bear and the hunt was frequently preceded by ceremonial chants and dances intended to propitiate the spirits and ensure the success of the hunter. After the kill, additional rites celebrated the success and praised the sacrifice for its contribution to native welfare. These primal emotions of awe, fear, and reverence have remained with us from prehistory to the modern day. It is hardly coincidental that the bear has metastacized from the star-struck Great Bear of the northern skies and one-time “elder-brother” to human-like caricatures personified by Pooh, Teddy, and Smoky, and thence to “charismatic megafauna” and exemplar of the once-vast and mysterious northern forests.

References: Black 1998, Clarke 2003, Hallowell 1926, Kurten 1976, Leach 1949, Leland 1884, Shepard and Sanders 1985, Stiner 1999

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WHY SHOULD WE MANAGE BLACK BEARS?

The North American model of wildlife conservation emerged in the late 19th century from concepts promoted by far-sighted sportsmen. These concepts ultimately produced a system of sustainable development of natural resources which is unparalleled elsewhere. This remarkable system affirms that publicly-owned resources can be conserved rather than ravaged. Key components of the model include: (1) wildlife is a public trust, (2) market hunting is eliminated, (3) wildlife is allocated to the public by law, (4) wildlife may only be killed for specific legitimate purposes, (5) wildlife is an international resource, (6) wildlife policy must be science-based, and (7) hunting is a democratic phenomenon, rather than a privilege of the nobility.

Black bears were considered to be “predators” or “varmints” in many jurisdictions well into the 20th century and the animals were persecuted rather than managed. New York (1904) and Pennsylvania (1905) were among the first states to extend “game” status to the black bear, but only 7 states had done so by 1946. Massachusetts did so in 1952. At present, black bears are considered a

“game” animal or “furbearer” and are hunted during regulated seasons in 27 states and 12 Canadian provinces. Fourteen others have few or no bears (no hunting), and 2 have good-sized populations but no hunting. Populations managed primarily for conservation purposes emphasize habitat protection and minimization of non-sport mortalities. Management for sustained yield must be carefully controlled to avoid overharvest situations. In most areas, bears reproduce relatively slowly and reduced populations may recover slowly. Using generous assumptions, a black bear population reduced by 50% may take >17 years to recover. Maximum sustainable mortality has been estimated at 14.7%; however, some highly productive populations in the eastern United States are growing despite harvests >20% .

“Management” is broadly defined as “the collection and application of biological information for the purpose of obtaining optimum levels of wildlife within an ecosystem and maintaining those levels. The term includes, but is not limited to, research, census, law enforcement, habitat acquisition, preservation and maintenance, propagation, live trapping and transplantation, education and other activities effective in encouraging better conservation of wildlife...This term also includes, when and where appropriate, the periodic or total protection of a species or population, as well as regulated taking”. This definition clearly includes all the various programs, activities, and actions that have been discussed in this series of Questions. Nowhere on this planet, and certainly nowhere within the range of the black bear, do wildlife and their habitats exist beyond the influence of humans. If black bears–if all wildlife–are to be conserved and maintained for future generations, “management” actions of many kinds must be accepted and undertaken to ensure the success of this goal. Accordingly, the essence of wildlife management will increasingly be directed towards managing wildlife-related impacts, including events involving humans and wildlife, wildlife management interventions, and stakeholders.

Broadly, population “management” may be employed to raise the density of a small or declining population, exploit a population to generate a sustained yield, or to reduce or stabilize the density of a dense population or which has an unacceptably high rate of increase. At some time, any of these actions may be relevant to black bear management in North America, although in most jurisdictions the animals are managed for a sustained yield. Constraints in black bear population management include inadequate habitat protection, socio-political issues, technological limitations involving current management techniques, and inadequate funding. Long-term conservation and management of bear populations will require better trend information. However, improved techniques are unlikely to be developed or utilized until limitations in existing methodology are recognized and accepted.

References: Caughley 1977, Garshelis 2002, Geist et al. 2001, Hamilton 1999, Howard 1989, Leonard 1946, Koch 1994, Martinka 1994, McCarthy and Seavoy 1994, Miller 1990b, Riley et al. 2002

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HOW CAN WE HELP THE BLACK BEAR?

Despite the remarkable recovery and restoration of the black bear throughout much of North America, we should not become complacent. Both in the long term and the short term, there are direct and indirect threats to black bears, their habitats, and to the environment as a whole. While habitat changes are among the most important, there are other problems to be solved, questions to be answered, and challenges to be met in order to retain the black bear as an integral component of the North American landscape for the foreseeable future.

Fisheries and wildlife conservation and management should be viewed as comprising a triad of essential, mutually supporting components— (1) an organism or group of organisms, (2) habitats or communities, and (3) interest groups. Each of these components demands our continuing attention. We know far more about the biological and ecological requirements of the black bear than did Wright nearly 100 years ago. However, there are still unanswered questions. Some detailed needs and concerns include: (1) development and refinement of predictive population models which incorporate bear productivity, survival, home range, habitat use, and movements with human-associated landscape features and random changes in food production and availability; (2) understanding and quantification of the seasonal and annual nutritional capability of bear habitats; (3) continuance of long-term studies of black bear population dynamics and habitat use, using standardized and replicable techniques; (4) increasing our knowledge of black bear reproduction, survival and population genetics, whether from hunting, non-sport mortalities, habitat degradation, or geographical isolation; (5) development of accurate, practical techniques to index or census black bears over a wide geographical area; and (6) development and implementation of means to predict black bear behavior within the human-bear interface and to develop effective deterrents to avoid or mitigate “nuisance” bear problems. Bears compete with humans for areas with resources of value to both. The socio-economic, political and cultural goals inherent to an increasingly urbanized society disadvantage bears when their interests collide with those of disinterested or environmentally naive people.

Habitat destruction and alteration is now the major cause of species endangerment, but uncontrolled human population growth threatens the ability of the planet to sustain itself. Despite falling fertility rates, the global human population is expected to reach 7.3 to 10.7 billion by 2050. This will place immense demands on the land base and bears and bear enthusiasts must compete for these demands with a variety of largely incompatible human needs. People affect bear habitat by inducing changes in landscape mosaics which then influence food production and availability, by imposing landscape features (e.g. roads) which facilitate bear mortality, and by changing bear tolerance of humans, and those of humans for bears. An understanding of the processes and consequences of habitat fragmentation are integral to conserving bear populations in the face of widespread forest destruction, conversion, or fragmentation. Silvicultural prescriptions which retain mature hard-mast trees or enhance fruit-bearing shrubs can be locally effective in improving bear habitat. The virtual extinction of the American chestnut (*Castanea dentata*) dramatically affected food resources for mast-dependent wildlife in eastern North America. Newly-arising threats to oaks, especially the northern red oak (*Quercus borealis*) may have similar deleterious consequences, in the absence of effective regeneration techniques.

Most North Americans have positive views about bears and hold them in high regard, viewing them as intelligent, culturally important, highly appealing, and similar to people. Although these views may be somewhat distorted, and opposed by a significant minority who fear bears or who suffer depredations, the charisma and emotional appeal of bears demand that human attitudes play a large role in bear management. In the northeastern United States, black bears are nearing historic highs. Rising concerns about conflicts and depredations require that wildlife stakeholders be integrated into planning and management efforts. Innovative strategies to address human-bear conflicts must be developed, promoted and implemented to supplement traditional means of control.

References: Barden et al. 1995, Bunnell and Tait 1981, Decker and O’Pezio 1989, Garshelis 2002, Giles 1978, Healy et al. 1997, Kellert 1994, Kolenosky and Strathearn 1987, Manville 1983, Martinka 1994, Mattson 1990, McCarthy and Seavoy 1994, Noss and Murphy 1995, Noyce and Coy 1990, Organ and Ellingwood 2000, Reiger 1975, Rogers and Allen 1987, Schoen 1990, Schoen and Miller 2002, Trefethen 1975, Wright 1910

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HOW CAN I HELP THE BLACK BEAR?

Many of the issues and problems surrounding the black bear can only be addressed by researchers and biologists with specialized training. What is the role, if any, which can be played by the concerned lay person?

1. Habitat management is important on a small scale, as well as a large one, where an overall habitat base exists. Landowners, farmers, timber companies, communities, greenbelt associations, and other small landowners can work cooperatively to develop and implement habitat management practices that can benefit black bears. While one small property owner may be able to do little, a consortium of people working together can help. Local communities can be attentive to the conservation priorities set forth in the Massachusetts Biodiversity Initiative and the Massachusetts Biomap. Coordinate with local offices of the Division of Fisheries and Wildlife, the Division of Forests and Parks, the New England Chapters of the Wildlife Society and the Society of American Foresters, or certified foresters to learn how this may be accomplished. In Massachusetts, you can contribute to habitat preservation by purchasing a $5 “wildlands stamp” from *MassWildlife*. Monies from this stamp are dedicated to the purchase of lands which are “Forever Wild”. Since 1991, over 12,000 acres have been acquired with monies from this stamp.
2. Learn more about the black bear and its needs, and the environment in which both we and bears live, through library research, field trips, and programs by bear biologists and researchers. The interest groups which are listed in the “Links” section of this web page are good initial sources of additional information.
3. Help to communicate information about the black bear, wildlife habitats, and the environment to others. Support Project WILD, Project Learning Tree, Becoming an Outdoorswoman, the Massachusetts Envirothon and other environmental education programs which communicate environmental awareness to our peers and our youth. Ask *MassWildlife* staff, members of The Wildlife Society, and other biologists and environmental specialists to speak to your groups about black bears or wildlife habitats. Help to inform others about issues with “nuisance bears”, habitat loss or change, or poaching. Learn how to keep the “wild” in wildlife and to coexist with bears.
4. Become knowledgeable in your local community and your state. Communicate with your elected officials and let them know how you feel about black bears and wildlife in general. Your concerns about habitat destruction, pollution, poaching and law enforcement, and funding for fish and wildlife programs help the black bear as well as other wildlife. Exercise your right to vote. Write to newspapers and express your opinion about issues affecting black bears. Encourage coalitions and bridge-building among individuals and groups with common interests in the black bear and the environment.

References: Barbour et al. 1998, Division of Fisheries and Wildlife 2001, Fair and Rogers 1990, Schoen and Miller 2002

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Questions? Comments? Contact: ***MassWildlife*** at **Mass.Wildlife@state.ma.us**

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