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In the fall, when coastal bears feed on salmon, bears may bed down in more open areas such as sand bars (top). The large and small beds seen in the photo, and tracks at the site, indicated use by a grizzly bear family group. In very warm weather, bears may bed in cool sites such as old river channels (bottom) in riparian forests.



2.8. Bear Dens

All bears in British Columbia make a winter sleep¹, generally from late October to early May. The exception being rare cases of individual coastal grizzly and black bears that have been reported not to den or to have left their dens for brief periods to feed on winter spawning coho salmon (MacHutchon et al. 1993; Van Daele et al. 1990; Schoen et al. 1987; S. Himmer unpubl. data). Suitable dens for bears are sheltered, dry, and secure. Although grizzly bears sometimes use a natural cavity such as a hollow tree or log, rock crevices, or natural caves for denning, they generally dig their own dens. Some grizzly bears dig dens in alpine and subalpine slopes (Demarchi and Johnson 2000). Many researchers have found that denning under the roots of trees was typical for coastal grizzly bear populations (MacHutchon et al. 1993; Schoen et al. 1987; S. Himmer unpubl. data and A. Hamilton pers. comm.); this has also been described in other areas (Craighead and Craighead 1972; Judd et al. 1986). Tree root den site selection by bears is likely based more on den structure, rather than on a particular tree species. Occasionally, a grizzly bear may excavate a den entirely within a snow bank (Lentfer et al. 1972). While some dens are used for more than one season, most bears probably excavate a new den or re-excavate an existing older den each year (MacHutchon et al. 1993). After emerging in the spring, grizzly bears may often use their dens for bedding for a short time. Female bears with young may remain near their winter dens for 2-3 weeks after emergence, especially if good early spring feeding habitat is located nearby.

The large front claws of grizzly bears are highly adapted for digging (Figure 1) and are crucial to the excavation of dens under the roots of large trees or on alpine/subalpine slopes. Grizzly bear dens have three main structural features: an entrance, a tunnel, and a chamber. Sizes of dens and den features vary greatly and may be contingent on site conditions more than anything else. However, the size of the den entrance is usually about 75 cm in diameter and the chamber may be roughly 150 – 225 cm in diameter with a height of 125 cm. Bedding material in the chamber may consist of shrub branches, tree boughs, duff, or grass but in some cases dens may not have any bedding material. The bedding material is generally 10-20 cm deep in the chamber. Some bears may also use twigs to plug holes in the sides of the chamber (MacHutchon et al. 1993). In dens that have been excavated, large debris piles of soil material, rocks and wood may be found downslope of the den entrance. Conditions of the debris pile may give some indication of the age of the den. Fresh material with little or no vegetation growing on the debris pile may indicate a freshly dug den or one that has recently been re-excavated. Conversely, herbs, moss and even small trees growing on the debris pile indicate an older den, which may, however, still be used by bears. Conditions in the chamber and tunnel may give a better indication of whether the den is active. Often the roof may have collapsed making the den unusable; in some cases upon closer inspection it may be determined that the excavation may have only been a test digging and was never used as a den; however, in both cases other active dens may be in the vicinity (i.e. within a 100m radius) and further searching may be warranted.

¹ The term hibernation is no longer used for bears because they are not true hibernators.



Typically, grizzly bears dig dens on moderately steep, to steep slopes. A review of the literature on grizzly bear dens sites suggests that the angle of slope in which dens were excavated ranged from about 41% to 90% (LeFranc et al. 1987). Sloped sites are often selected because they facilitate easier digging and the slope surface is generally stabilized by root systems of herbaceous plants and trees or boulders. Grizzly bears may, on occasion, den on gentle to moderate slopes ($\leq 35\%$) but generally do so only in association with cliffs or rock outcrops (Van Daele et al. 1990).

Elevation is a characteristic of grizzly bear den sites which may vary greatly between geographical regions but which may be uniform within a particular ecosystem or landscape. In coastal British Columbia, most grizzly bear dens are located on steep, well-drained slopes near the transition between the Coastal Western Hemlock and the Mountain Hemlock biogeoclimatic zones (approximately 600-1000 m elevation, depending on latitude and aspect) (Hamilton 1987; MacHutchon et al. 1993). The average elevation and slope at 121 den sites surveyed in south coastal Alaska were 640m and 70% respectively (Schoen et al. 1987). This is comparable to den elevations for coastal grizzly bears in the Kimsquit River valley (A. Hamilton, pers. comm.); Bella Coola River valley (S. Himmer unpubl. data); Kodiak Island (Lentfer et al. 1972; Van Daele et al. 1990); and the Alaska Peninsula (Lentfer et al. 1972). Schoen et al. (1987) speculated that snow was probably less important for insulation in south coastal Alaska where temperatures rarely fell below -20°C . They suggested that bears needed dry, cold sites where temperatures generally remained below freezing and surface water was rare. MacHutchon et al. (1993) suggested that grizzly bears in the Khutzeymateen study area may den above 350 m to avoid winter rainstorms and meltwater seepage. Most Khutzeymateen den sites were in relatively steep ($>45\%$) rugged terrain in stringers of trees at the edge of avalanche tracks or steep-walled gulleys. The use of steep, high-elevation denning sites by grizzly bears has also been reported for Alaska (Lentfer et al. 1972; Schoen et al. 1987; Miller 1990; Van Daele et al. 1990), the Yukon (Pearson 1975), and the Rocky Mountains (Craighead and Craighead 1972; Servheen and Klaver 1983; Judd et al. 1986). In most studies, den aspects were found to be variable and may not be important in determining the suitability of a den site.

Many researchers identified old-growth forest as an important component in grizzly bear den site selection (Craighead and Craighead (1972), Vroom et al. (1980), Judd et al. (1986), MacHutchon et al. 1993, S. Himmer (unpubl. data) and A. Hamilton (pers. comm.)). Schoen et al. (1987) also found that 88% of old-growth forest dens occurred in commercial timber stands. At mid-elevation den sites, the tree species were predominantly western hemlock mixed with either Sitka spruce or western red cedar. At higher-elevation den sites, tree species were dominated by mountain hemlock mixed with Sitka spruce, western hemlock, and, in some cases, yellow-cedar. Grizzly bears may also den in alpine and subalpine habitats such as in patches of krummholz conifers or stands of subalpine timber (Demarchi and Johnson 2000).

While grizzly bears typically den on mountain slopes, black bears normally den on, or close to, the valley bottom (Herrero 1985). Black bears may also den at lower elevations than grizzlies, thus avoiding encounters with them. Black bears sometimes dig dens under the roots of trees, or under logs or brush piles, but their excavations are not as extensive as those of grizzlies. Cavities in old-growth structures, including large old trees, stumps, root masses and logs having a diameter greater than 85 cm are suitable black bear dens (Helen Davis pers. comm.).



In coastal British Columbia, black bear dens have been recorded in or under large trees; mainly red and yellow cedar. Large diameter balsam poplars also provide excellent cavity den sites for bears. However, black bear den sites are likely based on den structure, rather than on a particular tree species. Tree den entrances were sometimes as high as 16m above the ground (Helen Davis pers. comm.). Denning in second growth forest stands is limited by suitable denning locations, unless residual old-growth features such as large logs and stumps are present.

Wolves often dig their own dens into the sandy or gravelly soil of a slope or ridge, and their dens may be mistaken for those of bears. However, although bears sometimes excavate their dens in summer, they only occupy them in winter, while wolf dens are active between April and October, the time for birthing and rearing of pups (Paquet and Darimont 2002). Unlike bear dens, wolf dens may have more than one entrance. The entrance to an excavated wolf den is usually less than 60 cm in diameter. To identify the species involved, look for tracks, scats, and hair, and also for the remains of prey. Wolves, but not bears, regularly bring food to their dens and the site is often littered with evidence of predation. The presence of an anal plug may indicate a bear's den nearby. An anal plug is a bear scat up to 30 cm long, comprised of leaves, pine needles, and bear hair. This results from the bear consuming roughage prior to winter sleep and the anal plug is voided when the bear emerges from the den in the spring (Whitaker 1996).

Factors likely to influence choice of den sites for grizzly bears include:

- ease of accessibility (i.e., sites that are accessible to a bear in regard to distance and topography);
- ease of den construction (i.e., the degree to which the soil or substrate can be excavated);
- stability of terrain (i.e., the probability that the den will not collapse before the bear leaves in the spring),
- good drainage (i.e., the likelihood of rain or meltwater not seeping into the den chamber);
- likelihood of freeze-thaw events during the winter (dens are more likely to be above the freezing elevation for the duration of the winter);
- the extent of snow cover (i.e., the accumulation of an insulating layer of snow over the den entrance);
- seclusion (i.e., the likelihood of not being disturbed by humans or other bears (Demarchi and Johnson 2000).



2.8.1. Grizzly Bear Den Characteristics

- Grizzly bear dens have three main structural features: an entrance, a tunnel, and a chamber.
- Sizes of dens and den features vary greatly. However, the size of the den entrance is usually about 75 cm in diameter and the chamber may be roughly 150 - 225 cm in diameter with a height of 125 cm.
- Bedding material is generally 10 - 20 cm deep in the chamber and may consist of shrub branches, tree boughs, duff, or grass but in some cases dens may not have any bedding material.
- Cavities under old-growth structures, including large old-growth trees and root masses, make suitable den sites for grizzly bears in coastal BC.
- Natural caves, rock crevices and hollow trees or logs are also used by grizzly bears as dens.
- In dens that have been excavated, large debris piles of soil material, rocks and wood may be found downslope of the den entrance.
- Conditions of the debris pile and den chamber may give some indication of the age of the den, for instance:
 - fresh material with little or no vegetation growing on the debris pile may indicate a freshly dug den or one that has recently been re-excavated;
 - conversely, herbs, moss and even small trees growing on the debris pile may indicate an older den, which may, however, still be used by bears.
 - if the roof has collapsed the den may be unusable;
 - in some cases it may be determined that the excavation may have only been a test digging and was never used as a den; however, in both latter cases other active dens may be in the vicinity (i.e. within a 100m radius).
- Typically, grizzly bears dig dens on moderately steep, to steep well-drained slopes. The most common bear dens sites are on slopes ranging from 40% to 90%.
- Elevations of grizzly bear den sites vary greatly between geographical regions. In coastal BC, most grizzly bear dens are located near the transition between the CWH and the MH zones. They are generally not found below 350 m ASL and may rarely ever be found in valley bottoms.



2.8.2. Grizzly Bear Den Photos



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Many bear researchers have found that denning under the roots of trees was typical for coastal grizzly bear populations. The rather unique den, on the left, was created when a grizzly bear dug a natural cavity in the tree possibly as a result of the tree having grown on a nurse log or stump. The den on the right is more typical of tree root dens found on the coast of BC. No new debris piles indicate both dens have existed for several years.

