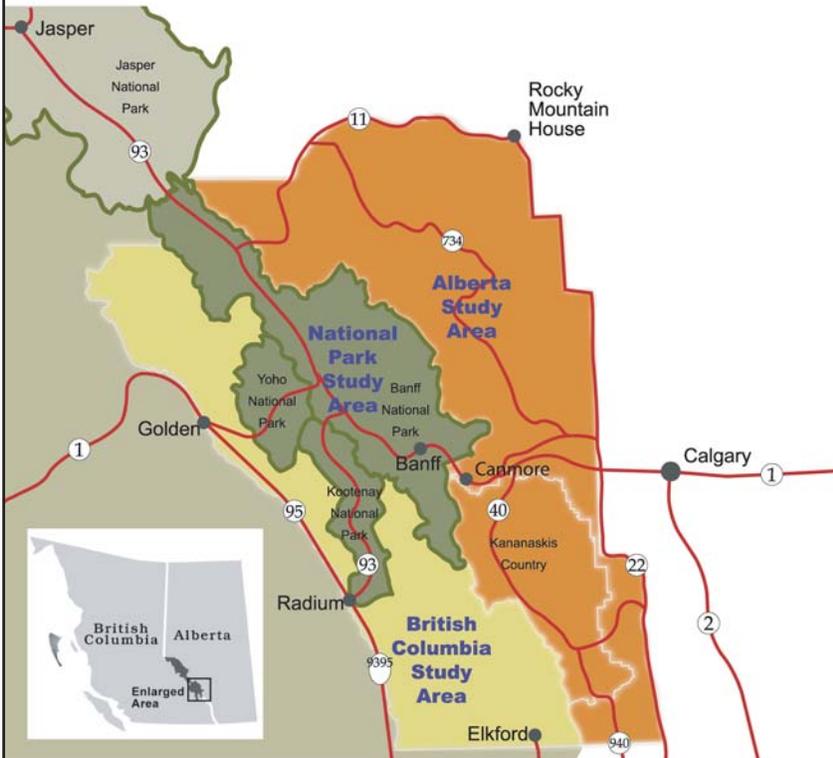


# CHAPTER 14

## DENNING



## 14. DENNING

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Vroom et al. (1980) first documented winter den ecology of grizzly bears based on locating and examining 29 completed and 18 partly excavated dens, including those from a small sample of radio-collared bears in the Cascade Valley of Banff National Park. Research beginning in the late 1970's has shown that pregnant females are usually the first bears to den in the fall and the last emerge in the spring. Male grizzly bears are almost always the last to enter their den in fall and the first to emerge in spring. These patterns in den use vary depending on the age of the bear and the local climate. In addition to documenting timing of den entry and emergence of bears, Vroom et al. (1980) documented environmental and structural parameters of winter den sites. They did this largely by using a sample of den sites visually identified by helicopter surveys and ground searches of nearby areas. Vroom et al. (1980) acknowledged that this method might have biased their analysis, typifying dens that were most visible in open habitats.

The ESGBP has observed the nature and distribution of grizzly bear dens since the initiation of the project in 1994. In particular, research has focused on identifying den sites used by radio-collared grizzly bears. Following a sample of approximately 25 radio-collared bears to their dens each year complemented earlier research, and eliminating the possible bias for dens visible from the air. In late fall, we located den sites using aerial telemetry. The dens were then visited in the spring after the bears had moved on to spring feeding sites. Field researchers surveyed den sites of radio-collared bears opportunistically while in field for other research purposes. Therefore, of 173 den locations obtained by aerial telemetry (1994-2001) only 30 of those sites were characterized from the ground.

Over the past two decades, research on grizzly bears in the Rocky Mountains of Alberta has determined that bears spend, on average, 4.5 months of the year in or near their den sites (Vroom et al. 1980). Over the course of the ESGBP research, we documented grizzly bears entering their dens between mid-October through to the end of November. In the spring, the earliest emergence documented was mid-March and the latest was mid-May. Radio-collared females with cubs in our study had a mean emergence date of May 12 compared to April 16 for adult males.

Grizzly bears in the eastern slopes of the Rockies almost always excavate their own dens but, on occasion, they will use a natural chamber such as a cave. One radio-collared female with three cubs denned in the same natural rock cave for three consecutive winters. As previously reported (Vroom et al. 1980) grizzly bears often showed a preference for a particular denning area. On five occasions, old den sites were found within a few hundred meters of active den sites. This could also indicate that offspring will return to where they and their mother denned in earlier years. Old dens were characterized by the amount of vegetation growth in the pile of tailings.

Dens are usually dug horizontally into slopes, where the bear heaves an incredible amount of rock and rubble out between its legs and down the mountainside. Each den contains a tunnel that opens up into a chamber, the chamber being larger in height and width than the tunnel. The chamber is cup-shaped and often lined with fir boughs, grass or small twigs. We did not document any grizzly bear re-using its excavated den over consecutive years. Most often it seemed the den ceiling collapsed after the soil thawed in the spring, and therefore deemed the den unusable for the next winter. For this reason too, many of the dens we visited could not be reliably characterized in our analysis because of their poor condition.

We adopted Vroom et al's (1980) list of standardized measurements of den site parameters. These measurements were taken at each site visit so that den characteristics could be compared amongst our sample and with results from Vroom et al. (1980). We found the average total length of dens, measured from the entrance to the back of the den chamber, is 2m. The average width of the den entrance is 63.5cm and the average height of the entrance is 63cm. The chamber of the den is usually just large enough for the bear(s) to curl up and turn about. The den chambers we surveyed ranged between 0.95m and 1.75m wide with an average chamber height of 98cm.

Similar to Vroom et al. (1980), we also described the environmental parameters (elevation, slope aspect and slope angle) of each den site. Estimates were made of the relative abundance of different species within tree, shrub and herbaceous layers near the den. We did not do any detailed soil structure/classification analysis.



All dens we surveyed were found in the upper sub-alpine at elevations between 2012m (6700ft) and 2432m (8100ft) or an average of 2253m (7500ft). Research in the late 1970's documented an average elevation of 2280m (7592ft) (Vroom et al. 1980). Vroom et al. (1980) explored thermal inversion as an environmental variable relating to the altitude of den sites. All of our grizzly bear dens surveyed were located at altitudes where preliminary data suggests that thermal inversion is a prevalent phenomenon. Extreme temperatures and heavy precipitation influence the sub alpine region (Vroom et al. 1980). At these elevations the forest becomes diffused with glade openings and small, scattered colonies of dwarf krummholz. The tree species we documented in the den areas were subalpine fir, subalpine larch, and Engelmann spruce.

The most widespread plant associations of den habitats were grouseberry, heather, false azalea and rhododendron. Some dens were at the top or near the edge of avalanche tracks cutting into the forest. Tall herb-grass meadows on southwesterly slopes, and willows on northeasterly slopes dominated these avalanche areas. We documented 15 dens buttressing trees or shrub root complexes. 14 dens were found in small glade openings or herb/meadow slopes and 1 den in a natural rock cave.

Bears often dig dens with a particular slope orientation or aspect. Studies completed in the late 1970's revealed the aspects of 36 of 47 dens and partial dens ranged between a compass orientation of 45°(NE) and 112.5°(ESE) (Vroom et al. 1980). ESGBP den surveys found no preferred aspect as they varied widely between 80° (NEE) and 295° (WNW). Knowing that the prevalent winds in this region are traditionally out of the west, we would have expected more den aspects to be facing eastward, leeward of the west wind. However, the compass orientation of this lee may vary from place to place even within the same locality, according to topographic and microclimatic factors. We presume that local climate and micro-terrain is more a factor for den site selection than a specific aspect/orientation. Bears usually try to dig their dens where deep snow will accumulate and where the entrance is sheltered from strong winds. A thick blanket of snow over the entrance of the den provides a layer of insulation for the long winter. A small rock outcrop or terrain feature in proximity of the den entrance can theoretically accommodate snow accumulation on any aspect.

Grizzly bears do seem to be specific about the slope angle on which they dig their den. The mean slope angle for dens we investigated was 33 degrees. All dens were on slopes greater than 26 degrees and none were on slopes greater than 39 degrees. Vroom et al. (1980) documented their dens also having been dug into slopes averaging 33 degrees. Studies have shown that this narrow range of slope angle is steep enough that there is plenty of soil or rock overhead to form a nice thick den roof that is unlikely to collapse during the winter yet is still an angle shallow enough for the den opening to be covered by a heavy blanket of snow (Vroom et al. 1980).

Overall, our research on grizzly bear den sites contributes additional data to help substantiate some of the earlier knowledge of the physical characteristics common to den sites in the Rocky Mountains. This information, especially when combined with results from previous studies, provides for a comprehensive understanding of the nature of suitable denning habitat for grizzly bears in the Central Rockies Ecosystem.

## LITERATURE CITED

- Vroom, G.W., S. Herrero, and R.T. Ogilvie. 1980. The ecology of winter den sites of grizzly bears in Banff National Park, Alberta. Pages 321–330 *in* C.M. Martinka and C. McArthur, editors, Bears their biology and management, Proceedings of the 4<sup>th</sup>. International Conference on Bear Research and Management.

