DEPARTMENT OF NATURAL RESOURCES

The Importance of Radio-collared Bears

(and why we ask hunters not to shoot them)

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Bear management in Minnesota is based on multiple sources of information: statistics from the bear hunt, assessment of natural food conditions, a population model based on the ages of harvested bears (obtained from teeth submitted by hunters), and results of a long-term, active bear research program. Minnesota is lucky to have one of the longest, DNR-run bear research programs in the country. The core of this research program is radio-collared bears. **Because long-term research on individual collared bears is so crucial to management, we ask hunters not to shoot collared bears.**

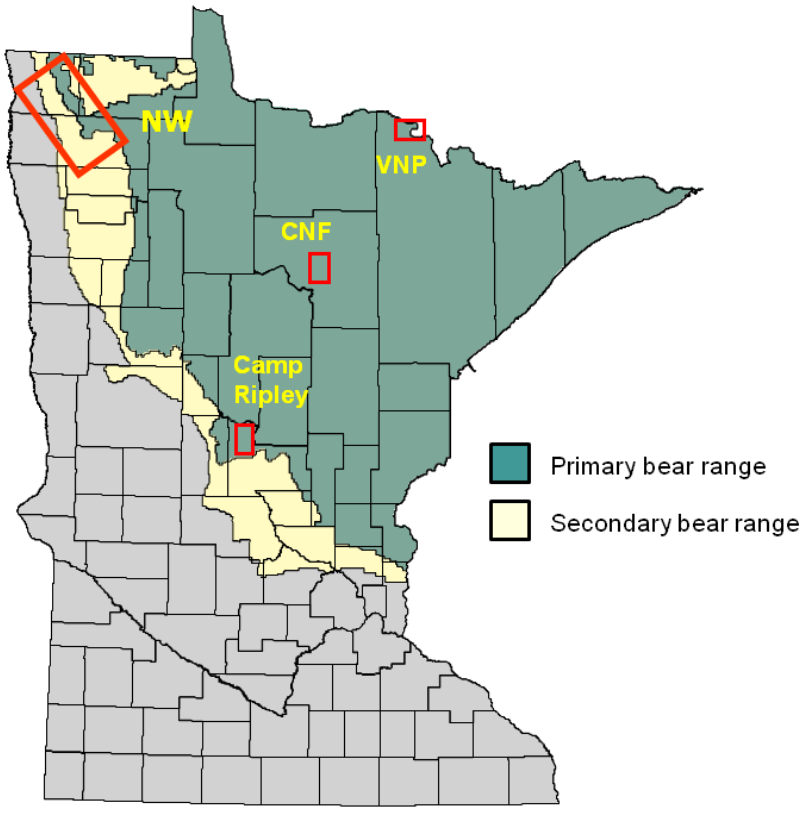
Radio-collars are not easy to see, but all bears with a collar also have large, colorful ear tags. **Look for the ear tags, not the collar.** Most collars now have sophisticated GPS units, and most collared bears also have a small heart monitor implanted under the skin near the heart.

Research Began in Early Days of Minnesota's Bear Management

1971: Bear classified as big game species: bear or deer license required to hunt.
1978: Bear harvest exceeds 1,000.
1979: Bears could only be taken during designated bear season (no longer during firearms deer season).
1981: Bears could only be hunted with a bear license.
Start of DNR research project with radio-collared bears
1982: Start of lottery-based quota on bear licenses (5 areas with separate license quotas).
1987: Establishment of no-quota zone along fringe of range.

Multiple Study Sites for Better Information

Bears in Minnesota occupy the northern, mainly forested part of the state. We have studied bears with radio-collars at multiple sites within this range in order to gain an understanding of how differences in habitat and human factors affect mortality, reproduction, movements, and ecology of bears.



Work is still continuing in 4 of the 5 study sites:

1981–present:
In and around Chippewa National Forest (CNF), north of Grand Rapids

1991–93:
Pine County no-quota area

1991–present:
Camp Ripley Military Reserve

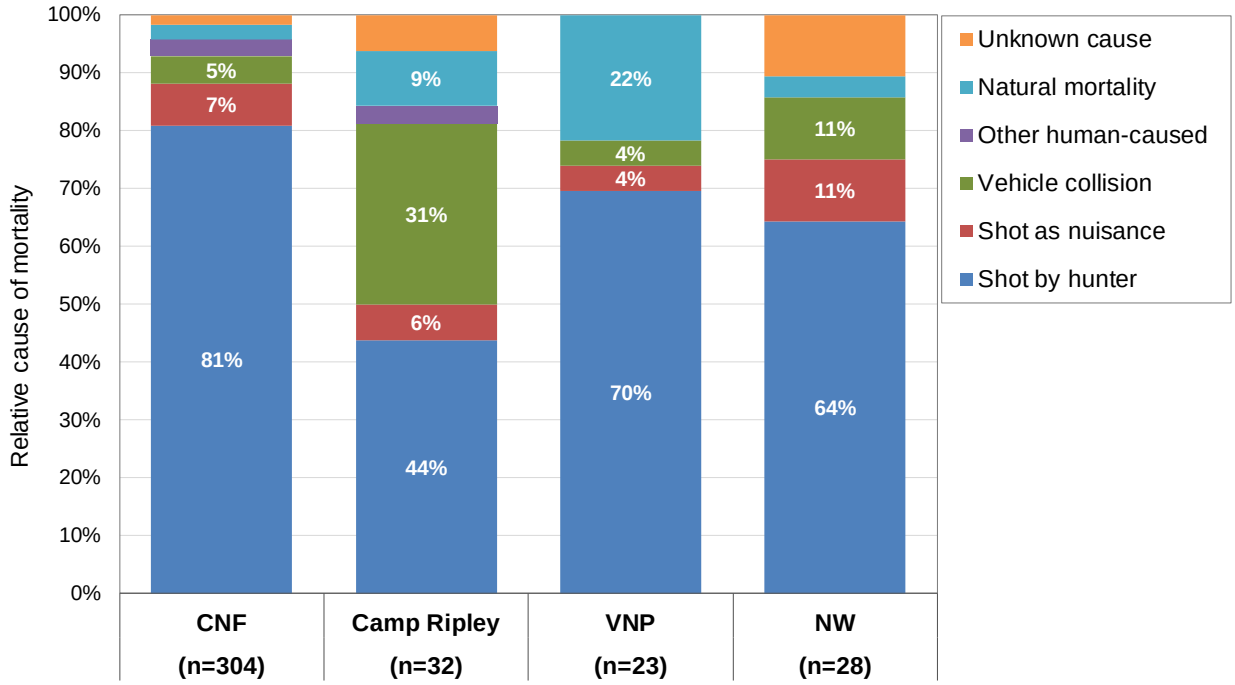
1997–present:
Voyageurs National Park (VNP)

2007–present:
Northwestern Minnesota (NW)

Research Findings Important to Management

Hunting is the main cause of mortality in all areas

About ¾ of Minnesota bears that survive their cub year eventually die from legal hunting. Bears are not hunted in Camp Ripley and Voyageurs National Park (VNP), and since the start of our study in NW Minnesota, hunters were asked not to shoot collared bears with large eartags (so hunting mortality in that area is higher than shown by the data shown below on collared bears). Despite these restrictions, legal hunting has been the dominant source of mortality for bears in *all areas*.

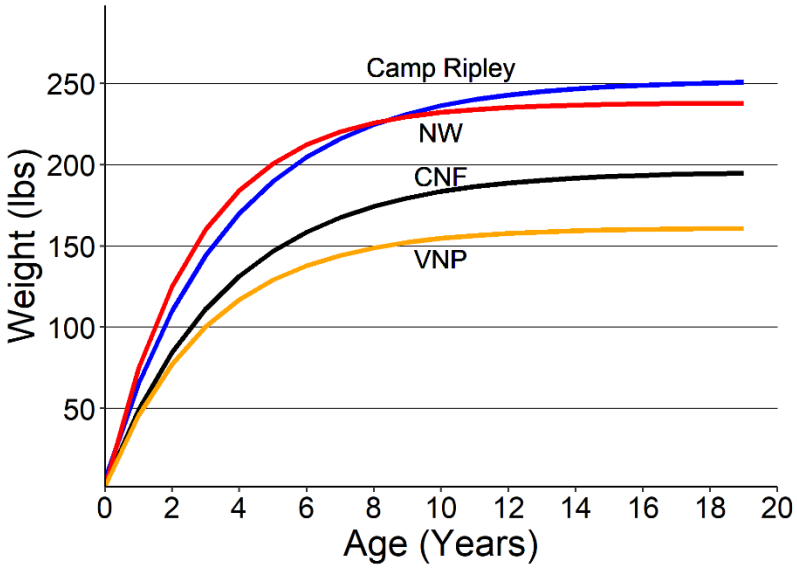


The heaviest hunting pressure among our study sites has been in and around the Chippewa National Forest (CNF), where abundant public land and easy access via numerous forest roads provide opportunities for hunters; in this area, over 80% of bears eventually die due to hunting. (Only 1 in over 300 collared bears that we monitored until death died due to old age, at 39½ years old.)

Bears in Camp Ripley and Voyageurs National Park are hunted when they leave the reserve or park boundaries during excursions to find better food in fall, and are drawn to hunters' baits. There are no places in Minnesota that are large enough to serve as an unhunted sanctuary — bears move around a lot, and virtually all bears leave unhunted areas sometime in their life.

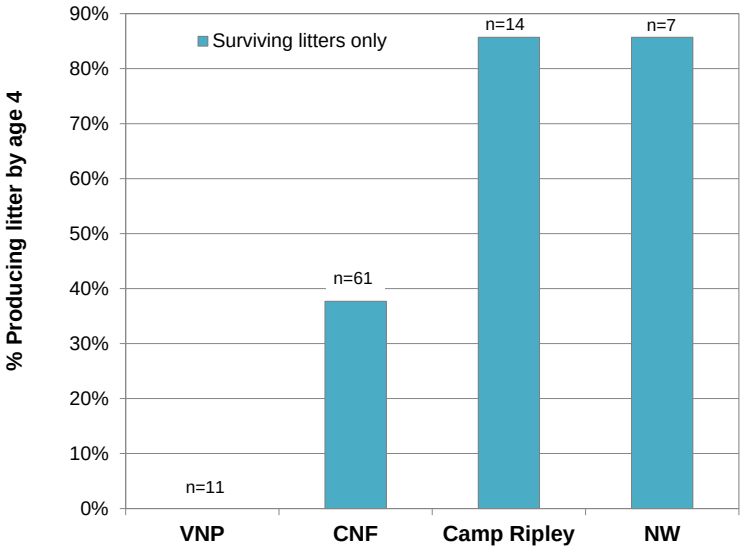
Weights and reproduction are highest along the edges of the range

We might think that the "core" of the bear range would have the biggest bears and highest reproductive rates. But for bears in Minnesota, the edges of the range provide more food. There are more oaks along the southern fringe of the range, and acorn abundance is a strong influence in how much weight a bear gains seasonally and year to year. The northwestern part of the state, which is mainly agricultural, has many small blocks of forest which have a lot of light penetration along the forest edges — this enhances fruit and nut production. And bears also benefit from feeding in cornfields, which are rare in the core of the range.



Comparing our 4 study sites, we found that bears in Camp Ripley and in the northwestern part of the state grow faster and reach a larger adult size than bears in the "core" Chippewa National Forest. Since we handle all radiocollared bears in their winter dens, we compared weights (graph above) at a single point in time —March (when their weight is near a low point late in hibernation, and so it is not as influenced by yearly food conditions). On average, females at Camp Ripley and NW reached their final adult weight (~250 lbs) by 10 years old, and attained 90% of this weight by age 5–6. In contrast, average adult weight for CNF females in March was about 190 lbs and VNP females only 160 lbs, which they reached by their early teens (90% by age 8–9).

Males also grew most quickly and to heavier maximum weights in Camp Ripley and NW (one of our collared individuals reaching 550 lb), but male sizes are much more variable within each area than those of females. In part this is because males travel much more, and some of them are more successful at finding a bounty of food. Larger males are much more likely to breed. Three-year-old males are capable of breeding, but rarely have the opportunity to do so because of competition by older, larger males.



Bears that get more food grow faster, and mature earlier. 85% of bears living along the periphery of the range had their first cubs by 4 years old (some produced at 3 years old).

By contrast, none of the collared bears that we studied in Voyageurs National Park (VNP) produced cubs by age 4, and less than half did so in the Chippewa National Forest.

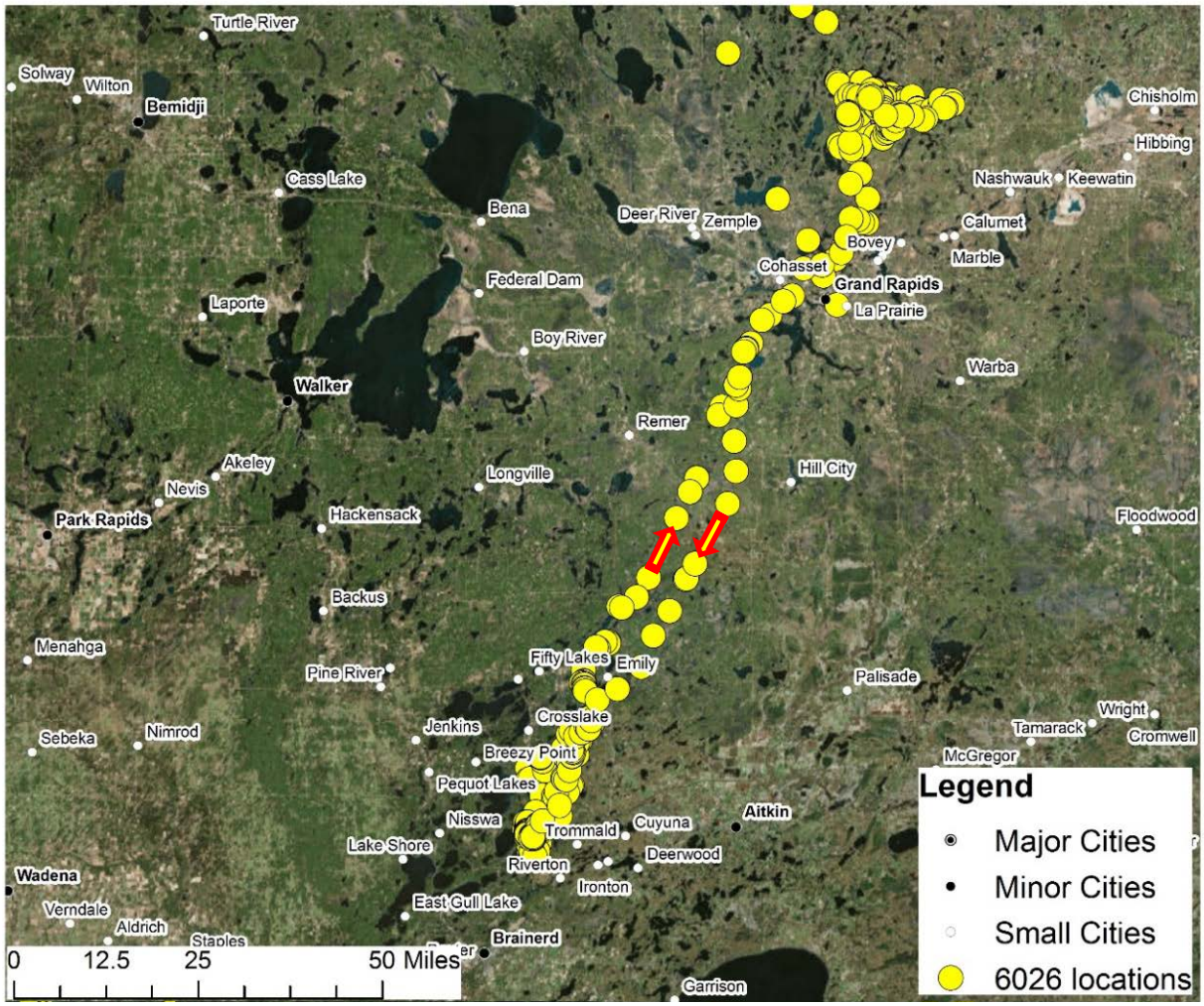
Once bears start reproducing, they typically remain on a 2-year reproductive cycle. Cubs are born in January and leave their mother about 17 months later, normally in June or July, when the mother breeds again. Only 7% of the 180 reproductive cycles that we monitored stretched to 3 years. But even in these cases, the mother typically did not spend an extra year with her litter, but spent a year alone (due to failed reproduction).

Litters of 3 cubs are the most common (55%) across the state, but 2-cub litters are more common than 3-cub litters in Voyageurs National Park. About 5% of litters are a single cub (mainly a bear's first litter), and about 5% are litters of 4 or 5 cubs.

About 19% of cubs die in their first year of life. Male cubs have a higher mortality than females, because males tend to be more adventurous, and die in more accidents. While the sex ratio of cubs starts out slightly favoring males (51% overall), by 1 year of age there are more (52%) females. Despite this, about 70–75% of 1-year-olds that are shot by hunters in the fall are males (because they travel more and are more inclined to visit baits).

Movements to fall feeding areas are extensive

Although we manage bears in separate "Bear Management Units" (BMUs), each with a separate hunting license quota (or no quota), many bears range widely across the boundaries of these units. These movements are especially extensive in the fall. Most bears that move in the fall seem to know places where food is better (often moving southward). We have evidence that even if they have never been to a feeding place before, they follow scent trails of other experienced bears.



Long-range movements of 50 miles or more are more common among Minnesota's black bears than elsewhere in the U.S. We can now track the exact travel route with the GPS collars, which collect a location every 2 hours and download the data to us by satellite daily. In the example shown above, the bear made the same fall movement 2 years in a row, following virtually the same route.

After feeding in an area for several weeks, bears often return following the same path, and den within their summer home range. These common movements across the boundaries of BMUs, which vary in extent, duration, and distance depending on food conditions, make it virtually impossible to obtain meaningful BMU-specific population estimates.

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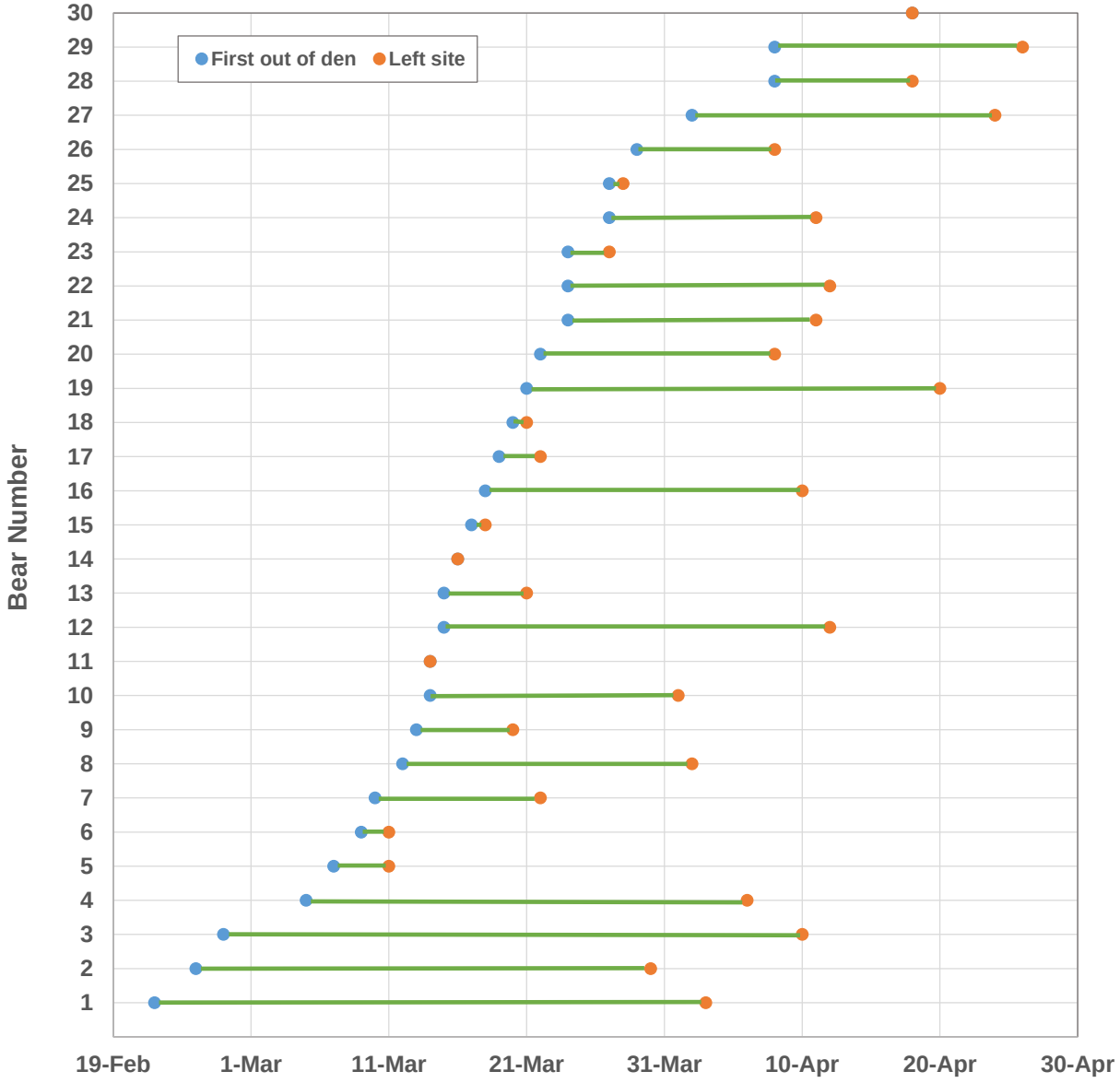
Collars, cameras, and heart monitors yield fascinating information about denning

Bears in Minnesota spend about half the year in winter dens. During their long hibernation, they survive totally on fat accumulated in the fall — which explains their fall feeding frenzy. We have not witnessed bears that died over winter of insufficient fat, but sometimes young, very skinny bears die in early spring, shortly after emerging from their den, before spring green-up.

Modern technology (GPS collars, trail cameras, and heart monitors) enables us to know when bears enter dens, when they start hibernating, when they start waking up, when they emerge from the den for the first time, when they leave the den site, and how far away they go when they do leave.



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Remote cameras placed outside the dens of collared bears also show what bears do when they first emerge. Often, after first emerging they spend several weeks in the vicinity of the den site, going in and out of the den, before departing. During this period, they warm their bodies, increase their heart rate, rehydrate (often eating snow) from 6 months without water, and cubs gain strength and mobility. But also, they commonly rake in fresh bedding material: with earlier springs, dens get wet, and insulation from water in the den is critical.

Wet dens are not only uncomfortable, but obviously a drain on energy, and for some bears, a threat to survival. (Bottom right photo above shows a wet mother removing a dead cub from the underground den; her 3 other cubs survived because she was able to build a nest for them outside the den.)

Bears rarely reuse the same den in different years, and we've seen no evidence of them picking better den sites or building better dens as they get older.

But increasingly we are seeing bears, including mothers with cubs or yearlings, using above-ground nests instead of underground dens, since underground dens are now more prone to flooding from early spring thaws.

Long-term monitoring of individual collared bears is essential for understanding new trends in bear behavior and strategies for survival.

(Top photo: mother with cubs in an open den; bottom: different mother with yearlings)