ONE BEAR OF A STUDY

It took nine years, hundreds of volunteers, and four computer hard drives, but FWP researchers now know how hunting affects black bear populations.

BY TOM DICKSON

Things looked grim for Montana black bear hunters and managers during the early 1990s. Environmental groups had shut down the state's grizzly bear hunt by arguing successfully in federal court that Fish, Wildlife & Parks lacked data to prove hunting harvest was not reducing the population. The Fund for Animals was threatening to push for a statewide voter initiative to outlaw spring black bear hunting in Montana. And in Oregon, Colorado, and several other states, animal rights groups were successfully restricting bear hunting seasons.

FWP biologists had gathered and studied extensive reports on black bears from previous research in Montana, Idaho, and other states. But they knew the information was inadequate for producing a sound management strategy. "We were basically managing black bears by the seat of our pants," says Gary Olson, FWP wildlife biologist in Conrad, who wrote the department's bear management plan in the early 1990s. Biologists knew the age and sex of harvested bears, harvest totals, hunter success rates, and how many days on average it took to kill a bear. But they lacked the most critical information: the number of bears living in the state's 25 bear management units (BMUs), the percentage of each BMU population that hunters killed (harvest rate), and if rates were sustainable. In other words, they didn't know if hunters were killing more bears each year than the population could support.

The lack of critical information concerned biologists, because they were charged with ensuring the health of Montana's wildlife populations. "We knew we might be killing too many bears in some districts and maybe should be restricting harvest," says Olson. The department's data gaps also made black bear hunting vulnerable to lawsuits by animal rights groups. Other states were having to restrict their bear hunting seasons. Would Montana be next?

KEEPING CLOSE TABS ON BEARS

Black bears are a charismatic species found throughout North America. Though often overshadowed in Montana by the widely publicized grizzly, *Ursus americanus* is a popular big game animal sought by photographers, wildlife watchers, and roughly 11,000 hunters who buy licenses each year.

Black bears are smaller than grizzlies, weighing an average of 100 to 300 pounds compared to the grizzlies' 300 to 600-plus pounds. Their ranges overlap in several parts of the state, notably in and around Glacier and Yellowstone national parks. The bears coexist, though grizzlies will kill smaller black bears. As with grizzlies, female black bears are

POPULATION DRIVER Because female black bears sustain populations, Montana has taken steps to reduce their kill by hunters. To find out if the restrictions are sufficient, FWP biologists conducted a nine-year study on black bear mortality and reproduction.

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roughly 20 percent smaller than males. The species' name is misleading: In western states, coat color ranges from black to cinnamon to honey blond. Black bears range throughout western Montana and east to the mountains around Lewistown and southeast to the Custer National Forest surrounding Ashland.

Though the black bear was considered a varmint in many states until the 1940s and '50s and could be shot on sight, Montana designated it as a big game species in 1923 with protection of regulated hunting seasons and limits. Hunting with dogs was banned, as was shooting bears lured to bait—practices still allowed in many states. Later, as part of the state's new black bear management plan, Montana adjusted the spring hunting season so hunters were less likely to encounter females with cubs. Females, known as sows, emerge from hibernation several weeks later than males. Reducing female bear harvest also lessened cub orphaning.

Montana's overall black bear population appeared in no danger of overharvest. Hunter numbers had remained relatively stable over the previous 20 years, as had statewide bear harvest. But harvests were increasing in some BMUs. To find out if harvest rates were sustainable, the department assigned FWP research scientist Rick Mace to learn more about black bear mortality and reproduction by intensively monitoring a single large representative population. From 2000 to 2004, Mace and his mostly volunteer assistants trapped and tranquilized 146 black bears in the Swan Valley, fitted them with radio transmitter collars, then used telemetry to track the animals. When a bear stopped moving for a certain length of time, indicating it had died, biologists rushed to the site to learn what caused the death. Researchers also looked for hibernating bears in dens to learn when the animals began and ended hibernation, how many cubs females produced, and at what age they reproduced.

Tom Dickson is editor of Montana Outdoors.

MONTANA FWP

INACCESSIBLE Mace's initial study required checking black bear dens. But the sites, like this cliffside den, were often impossible for study crews to reach.

"We got some valuable information, but not all our efforts were successful," says Mace, who is based in Kalispell. Particularly frustrating was reaching den sites, more than 80 percent of which turned out to be in trees, cliffs, or other hard-to-reach places, says Tonya Chilton, who began working for Mace as a University of Montana graduate student and was later hired to assist with the bear project. "There were all kinds of crazy den locations, like one that was 80 feet up an old cottonwood tree with loose bark and a swaying trunk that made it impossible to climb," she says. Dense cover added to the researchers' difficulties. During several hundred flights to check 1,031 different bear locations indicated by radiotelemetry, observers saw only nine bears.

READING THE HAIR

After two years working in the Swan Valley, Mace realized he needed to devise a bear survey technique that would provide harvest rate information faster. The internationally renowned bear biologist knew of colleagues worldwide using new DNA technology to survey bear populations. "I sat in my office for days figuring out a way to make [the technology] work to estimate hunter harvest rates in Montana," he says.

One way biologists determine harvest rates is to count all animals in an area and divide the harvest number by the population number. But accurately counting bears, which live in dense brush and timber, is nearly impossible. Another way is to use a simple statistical formula: Identify, or mark, a large sample of bears in an area, then divide the number of the marked bears that hunters harvest by the original number. The challenge with this method is identifying individual animals. For years biologists have trapped bears and given the animals an ear tag or other marker. But the procedure is expensive, dangerous for trappers, and stressful to bears. More painless and effective is to "trap" bear hair and analyze its genetic code to identify individual animals. That's what Mace decided to do, on a monumental scale.

Whereas the Swan Valley study looked at a single bear population, Mace devised his new DNA project to survey black bear populations across the species' entire Montana range, covering 8,000 square miles. For seven years starting in 2002, his volunteer crews set scent traps at more than 1,700 sites in 11 BMUs in western and central Montana that had high black bear numbers. More than 400 hunters, landowners, other citizens, and staff from FWP and other agencies volunteered to help. "All the volunteers were essential, especially the local FWP wildlife biologists," says Mace. "They knew the local landscape and the landowners and people who might be interested in volunteering. They made maps where bears were likely to be, got us keys to gates, and arranged campsites for volunteers."

> **"The logistics were mind boggling. We had to produce and then store 300 gallons of blood lure."**

Each July Mace's crews drove, hiked, boated, rode horses, and were helicoptered into sampling sites across the landscape. Some sites were next to roads, while others were deep in remote wilderness. Crews set up hair trap stations consisting of small woodpiles soaked in a foul concoction of fermented blood and liquefied fish, surrounded by a single strand of barbed wire to capture a curious bear's hair. Two weeks after building the lure stations, crews returned to gather the snagged hair samples, which were sent to a private genetics laboratory in British Columbia for analysis.

Coordinating the vast project required extensive preparation and oversight. "The logistics alone were mind boggling," says Chilton. "We had to produce and then store more than 300 gallons of blood lure. We had to feed and house the volunteers, teach them how to use GPS, and above all keep everyone safe. Then we had to deal with all the bear hair we sampled and thousands of envelopes that had to be labeled and mailed to Canada." The vast volumes of data collected and analyzed overloaded Mace's computer. "It's laughable," he says. "I've gone through four hard drives."

From each hair follicle, genetics technicians could identify a bear's species, sex, and genotype (the genetic makeup of each individual animal). Next, researchers obtained hair samples from bears killed by hunters the following fall and sent them to the lab. The last step was a simple math equation. "Let's say we identified 200 different bears through DNA analysis in a BMU," Mace says. "Then let's say we found that 10 of the bears that hunters killed that fall were among those of the 200 identified earlier in the year. That meant the harvest rate for the hunting district was around 5 percent."

Mace was surprised by what the study showed. "To be honest, when we started this project I thought that maybe hunters were overharvesting bears," he says. No longer. Mace now calculates that statewide, an average of about 3 percent of Montana's female black bears are killed by hunters each year—well below the 10 to 15 percent harvest rate he estimates is sustainable. (Mace explains that Montana's sustainable harvest rates are

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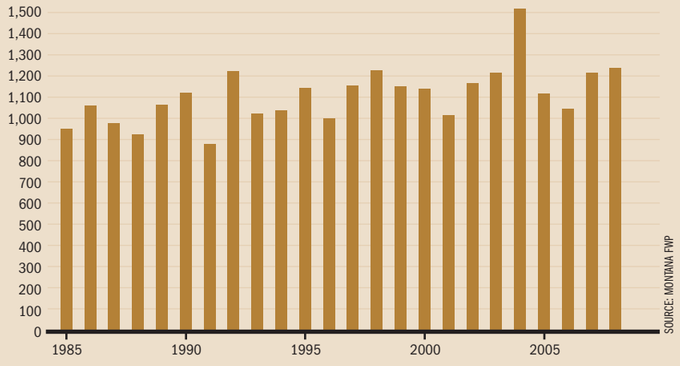
QUALITY HUNT Each year 11,000 hunters kill roughly 1,200 bears, half in the state's northwestern region. Though the roughly 11 percent success rate is relatively low, most hunters say they are satisfied with the quality of bear hunting that Montana provides.

Black bear harvest 1985–2008

Over the past 24 years, Montana's black bear harvest has remained steady, with no major declines. Biologists have long suspected that the statewide population was sustaining existing harvest. But to be certain, they needed to determine the annual harvest rate—the percentage of the population that hunters kill each year.



MONUMENTAL TASK Rick Mace (far right) revised his study to use barbed wire around scent stations to gather bear hair (inset). DNA analysis of hair allowed him to identify individual animals. Setting up the stations and gathering hair required 400-plus volunteers. Below: The volunteer crew that sampled bears in the Yaak Valley, one of 11 study areas spread across the state's black bear range.

ALL PHOTOS: MONTANA FWP

likely far lower than the roughly 40 percent in eastern states, where growing seasons for bear foods are longer and the animals reproduce at an earlier age, repopulating faster.) Many Montana BMUs showed harvest rates of less than 1 percent. "Hunters are hardly making a dent in those populations," he says.

Though Mace's study covers only a single year's harvest rate for each BMU, he can roughly estimate past rates by comparing harvest numbers of the study year to those of previous years. "For example, we determined that the harvest rate for female black bears in the Yaak Valley in 2002 was about 1 percent," he says. "The harvest that year was similar to each annual harvest over the previous two decades. That tells me the harvest rate in the Yaak has been roughly 1 percent during that entire time, which is definitely sustainable." Mace acknowledges the imprecision of determining harvest rates by comparing harvest numbers, because the bear population size—an unknown number—could vary from year to year. But he notes that bear populations usually don't fluctuate much. "Knowing at least the harvest rate of one year tells us a lot more than we knew," he says.

BREATHING ROOM

FWP officials are encouraged by the low harvest rates Mace found. FWP Wildlife chief Ken McDonald says the study shows that the number of black bears harvested in Montana each year—about 1,200—is sustainable. "Certainly if harvest began to increase or there were other indications that bear numbers were decreasing, we'd look at some further restrictions, but right now Rick's study shows we've got lots of breathing room," he says.

> "Montana requires hunters to locate and hunt bears on the bears' turf. That means it's tougher to kill a bear here than in other states."

According to McDonald, hunters don't kill a higher proportion of bears because the state does not allow hunters to use bait or dogs to hunt bears. "Montana requires hunters to locate and hunt bears on the bears' turf," he says. "That means it's tougher to kill a bear here than in other states."

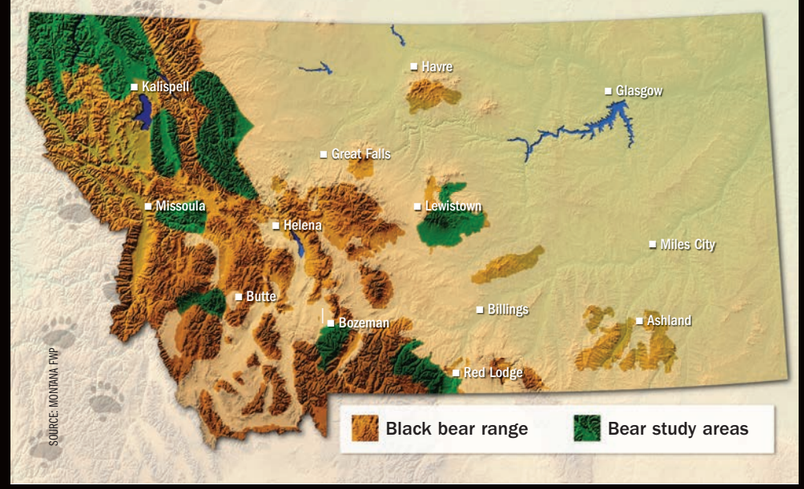
Do the low harvest rates suggest Montana should loosen bear hunting regulations, maybe by allowing bait or lengthening seasons? "We're not ruling out any regulation changes, but my hunch is that liberalizing bear hunting wouldn't fly with most Montanans," says McDonald. He adds that Mace's study applies only to existing season structures and may not apply to different seasons, making them less defensible to legal challenges. "We also wouldn't want to do anything that would result in more orphaned cubs in spring. As for using bait, most hunters and nonhunters don't consider that fair chase—for bears, deer, ducks, or other species."

McDonald notes that despite all the information the study produced, it's still only a snapshot of one year for each area where hair samples were collected. "It doesn't tell us if rates are increasing or decreasing. That would give us a better idea of how bear populations are doing. So we'll need to continue DNA studies on some BMUs every ten years or so to follow the harvest rate trend," he says.

Mace will submit a final report on his study later this year. The department plans to revise its bear management strategies with the new information. The update will also include Mace's upcoming estimate of the statewide black bear population and a more precise estimate of sustainable mortality rates.

Unless harvest numbers change drastically, says McDonald, Montanans can be confident their black bears are doing well. "Hunters are generally happy with the opportunities they have, and we're satisfied we're maintaining healthy populations," he says. "The big picture for black bears and black bear hunting and watching in Montana is definitely good."

Black bear range and study areas



SOURCE: MONTANA FWP

BIG STUDY AREA Black bears live mostly in mountainous areas of western and southern Montana (left). To determine harvest rates, Mace's crews set up 1,700 hair trap stations in areas with the highest bear concentrations, covering 8,000 square miles from the Yaak Valley to Red Lodge.

WORTH THE WAIT The study proved that using DNA hair analysis is an effective way to monitor bear populations without having to trap and drug the charismatic animals (right). It also showed the value of long-term research. "It takes years to gather information to determine things like bear harvest rates," says FWP Wildlife chief Ken McDonald. "But the payoff of that investment is enormous, because we'll be using the results of this study to improve bear management for years to come."

TOM REICHNER