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In 2 Years, Wolves Reshaped Yellowstone

By **JIM ROBBINS**

JUST two years after gray wolves were reintroduced to Yellowstone after what is believed to have been a half century's absence, they have dramatically made their presence felt.

They have killed half the coyotes in the area, forced elk to become more vigilant and provided many opportunities for scavengers to share their kills. Because there are fewer coyotes, rodents are more plentiful, a boon for predators like hawks and bald eagles, and overall biodiversity has sharply increased.

Research here on how a large ecosystem responds to the return of a major predator is unparalleled because officials knew far in advance that the wolves were coming back and began assembling data on the existing situation. Changes have never been seen before on this scale.

"It's exciting," said Dr. Robert Crabtree, a biologist who runs a private, nonprofit, research institute called Yellowstone Ecosystem Studies. He has conducted 8 years of a planned 15-year study of the effects of wolves on the Yellowstone ecosystem. "This is one of the great ecological experiments of this century, and the opportunity of a lifetime for an ecologist to answer the question of how large predators affect a system," he said.

The presence of wolves in Yellowstone was thrown into legal limbo this month when a Federal district judge ruled that the Federal recovery program was illegal because the experimental designation for transplanted wolves did not provide enough protection for wolves that had returned on their own. The judge, William Downes, in Casper, Wyo., ordered the wolves removed but stayed that order to give Federal agencies time to appeal.

Thirty-three Canadian wolves were trapped and brought to Yellowstone in 1995 and 1996; there are now about 97.

On a recent bitterly cold morning at sunrise, Dr. Crabtree scoured the dun-colored prairie in the elk-filled Lamar Valley, home to three of the park's eight wolf packs. Dr. Crabtree, who began seven separate studies of different ecosystem components from two to five years before the wolves returned so he could study their impact, was looking through a spotting scope for coyotes that were howling and yipping in the distance.

Coyotes have suffered severely as a result of the reintroduction of wolves, Dr. Crabtree said. Since 1989, Dr. Crabtree and his wife, Jennifer Sheldon, an expert on canids and author of "Wild Dogs: Natural History of the Nondomestic Canidae," have radio-collared

179 coyotes, tracking their movements and gathering data. Until the wolves returned, this was one of the densest and most stable coyote populations in the country because of the lack of human effects, Dr. Crabtree said.

In just two years, 50 percent of the pre-wolf population of coyotes has been killed. "They're being forced to shift their territories, and to give up their territories, and if they don't they get killed," Dr. Crabtree said.

There were 13 coyote packs with 80 individual coyotes in this remote valley known as America's Serengetti because of its abundance of wildlife. There are now 9 packs with just 36 coyotes, a sudden change for a social structure that has been in place for 50 years. Dr. Crabtree predicts that wolves will kill two-thirds of the coyote population.

Those coyotes that survive, he said, usually on the edge of wolf habitat, are flourishing because of the carcasses the wolves leave behind. One group of coyotes, called the Amethyst pack, has 10 members, the largest Dr. Crabtree has seen in the park. Most coyote packs averaged six before the wolves arrived. "If you get in there to a carcass, and don't get killed, you've got a bonanza."

Even though coyotes, at about 30 pounds, are a third the size of the average wolf, they are not pushovers. Only when wolves outnumber coyotes do they attack. When coyotes outnumber wolves, they will sometimes attack them. Dr. Crabtree is not aware of any coyotes' killing adult wolves, but thinks they might have killed some pups.

Dr. Crabtree watched four coyotes attack a wolf pup. A female wolf chased the coyotes off, but eventually they turned on her. They pinned her down, but she escaped, and swam across the Lamar River, where she was attacked on the other side by another pack of coyotes. She and the pup survived.

As expected, the primary food source for the park's new predators is elk. There are roughly 20,000 elk on the Northern Range, the major ungulate habitat in the park, where the majority of the wolves are located. During 1996 there 142 kills, 124 of which were elk. Only two bison have been taken.

On average, a pack of wolves killed an elk every one to five days, according to a biennial report on the wolf project released in mid-October. Most of the elk killed were females, either very young or old. The wolves kill calves in the early part of the winter, said Dr. Douglas W. Smith, the director of the Yellowstone wolf project, and as the snow and cold build in January, they turn to adult bulls and cows that have been weakened by winter. The average age of a cow elk killed by wolves is 14 years, which is old for an elk, he said.

Studies show that wolves are unsuccessful far more often in their predation than they are successful. "For every 100 elk they chase, they kill 2 or 3," said Dr. Smith. Elk that stand their ground against wolves have a much better chance of surviving than those that run, he said.

Dr. Crabtree said the jury was still out, but that from his observations, the elk had changed their behavior and had been forced to become more vigilant. This could result in more winterkill, he said, since they spend less time foraging.

There is a long simmering controversy over whether park officials have allowed the elk herd in the park to grow too large, resulting in heavy damage to vegetation and, indirectly, to other wildlife. Because elk increase their reproductive rate when their numbers decrease, the wolves are not expected to cause a serious reduction in elk numbers. But they may indirectly benefit the plant species affected by the elk, like willows and aspen, by forcing the elk out of the river bottoms to higher ground, where they can be more aware of predators.

The increased numbers of wolf kills of elk have greatly benefited the scavenger complex in the park. While there have been huge numbers of elk in the park, elk meat has been available to coyotes and other predators only in the spring, after the winterkill.

"A lot of other predators and scavengers have a seat at the wolf kill table," said John Varley, chief scientist for the park. "The wolves knock down an elk, eat their 15 to 18 pounds of meat and go sleep it off. When the sun comes up on the kill it can be stunning. You can see a grizzly bear, four or five ravens, coyotes, a fox, bald eagles and golden eagles on the carcass. All at once. "

"It's amazing to see how fast 900 pounds of meat goes," he said. "All that's left is a puff of fur." The wolves also kill moose, deer, an antelope and, surprisingly, killed a single mountain goat in recent years.

Studies show that scavengers have increased. The number of ravens has gone from four per carcass before the wolves, to eight per carcass now. The number of eagles has gone from one for every four carcasses to five for every four carcasses. "I'm suspicious that ravens and eagles are following wolves around," Dr. Crabtree said.

There are a number of changes taking place in the ecosystem that are based on observation and have not yet been quantified. Indirectly, wolves have been a boon to predators like foxes, hawks, owls, eagles, badgers and pine martens. Until the wolves came along, coyotes ate 75 percent of the total number of voles, a third of the ground squirrels and a quarter of the pocket gophers. With far fewer coyotes around, there are many more rodents available to other predators. "Wolves are causing an explosion in species diversity," Dr. Crabtree said. An increase in species diversity means a better balance among the species: numbers drop for animals with big populations, while scarcer species grow in number.

Unlike the portrayal of wolves in the film "Never Cry Wolf," Dr. Crabtree said, a typical wolf diet is 10 percent rodents, and far less for the wolves in Yellowstone, where so many elk are available. "It takes 6,000 mice to equal one elk," Dr. Crabtree said. "Imagine how much energy it would take to catch that many mice."

In fact, there is so much meat available in Yellowstone that it is redefining the average size of wolf packs in North America. "It creates delayed dispersal," Dr. Crabtree said. "There's room for young wolves to break out and establish new packs. But because food is so plentiful and there's less competition, they're delaying their dispersal, and packs as large as 15 have formed. They could likely get bigger." Eight is the average pack size in North America.

The population of the threatened Yellowstone grizzly bear appears to be getting a boost from the wolves. Cubs are born in the den in winter during the mother's hibernation. The number of cubs is directly dependent on the mother's nutrition, which has been enhanced by the newly available elk carcasses. "I found eight wolf kills this October," Dr. Crabtree said. "All of those kills had grizzlies' consuming part of the elk. I've been there eight falls, and I usually see no grizzlies or one in October."

Because of the density of the wolf population, the fact that the animals are out in open meadows rather than in forested areas, and because the park is a protected environment, the information coming from Yellowstone is expected to greatly enhance the body of scientific information on wolves.

Yellowstone Ecological Research Center maintains a Web site (www.yellowstoneresearch.org) with information from its research