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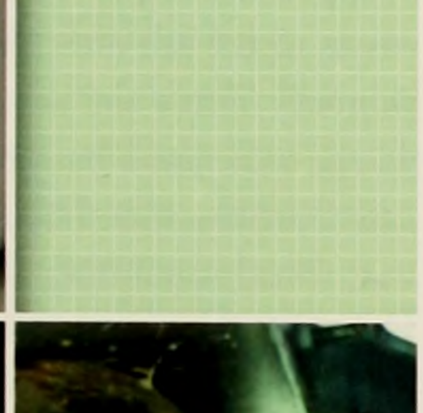
At FWP's wildlife laboratory in Bozeman, scientists search for answers to perplexing biological questions

LAB COAT DETECTIVES

STORY AND PHOTOS BY SAM CURTIS



Death is ever-present at the Montana Fish, Wildlife & Parks wildlife laboratory in Bozeman. Animal skulls, skeletons, and hides cover tables. Shelves are lined with glass jars of brain, tissue, and limbs. Coolers and freezers are filled with entire animals awaiting necropsy (animal autopsy), like victims in a police morgue. From all this animal mortality come important clues—some microscopic, some as big and obvious as a .44 magnum bullet hole—that lead to improvements in wild animal life, welfare, and management.

On a recent visit to the FWP wildlife lab, I notice several skulls atop a filing cabinet. Each of the shattered, punctured, or cracked crania tells a story, explains Keith Aune, until recently the lab's supervisor. One is from a mountain lion that had its face nearly torn off by an unknown foe. Another is a bear whose eye had been poked out by the skull-crushing bite of another bear. A third comes from a bobcat that had been shot in the head with a .22 bullet.

Aune leads me upstairs to a cavernous room lined with metal shelves piled with labeled boxes then up a ladder to another storage area in the eaves with still more boxes.

"This is probably the largest collection of grizzly bear skulls and skeletons in the world," he says. "We've been collecting them since 1967, and people are still using them for research."

The animal skulls and skeletons, with their telltale clues, represent some of the stories the lab's staff tease out of animal carcasses. Some stories are of birth and health, others of disease and death. All are part of the vast warehouse of information that wildlife managers draw on when making decisions on how to manage Montana's elk, deer, bears, mountain goats, and other wild animals.

"The lab's priorities are dictated by the current needs, issues, and questions coming from FWP wildlife managers and researchers," Aune says. "We exist to provide answers to questions that come up in the day-to-day management of Montana's wildlife."

Aune began supervising the FWP lab in 1989. Recently promoted to head the department's Wildlife Research Unit in Helena, he remains one of the lab's chief authorities. The research facility, he tells me, was first established in 1957, when it became clear to wildlife managers that they could not make sound management decisions without sound scientific information to guide them. At first the lab gathered basic information such as animal anatomy or stomach contents to learn what animals eat. Over time, however, the science of wildlife management moved away from collecting broadly descriptive information to much more focused research meant to answer specific questions.

For instance, the lab helped scientists discover they could learn more about mountain lions by examining the predators' teeth. During a ten-year study of 750 lion skulls sent to the lab by hunters, Montana wildlife biologists were able to determine a lion's age and sex by the wear patterns on its teeth. That information now provides wildlife managers with valuable tools for determining the age structure of harvested mountain lions and for evaluating population trends to make informed management decisions on how many cats can be harvested each year.

FOCUS ON DISEASE

In recent years, the lab's staff has been studying wildlife diseases and how they operate in the environment. Chronic wasting disease (CWD), brucellosis, and West Nile virus—all headline news topics—are among the diseases being studied at FWP's wildlife lab.

On my visit to the laboratory, I meet Neil Anderson in the necropsy room. Recently promoted from lab biologist to lab supervisor, Anderson has just rolled a barrelful of deer heads out from a cooler. He and Jen Southers, a work-study student majoring in wildlife management at Montana State University, are surgically removing brain tissue from the heads. The tissues are later sent to the National Veterinary Services Laboratory (NVSL) in Ames, Iowa, where they are examined for the prion proteins associated with CWD. Over the past five years, FWP's wildlife laboratory has removed brain tissue from more than 4,700 Montana deer and elk heads to monitor for the possible presence of the brain-wasting disease, which, so far, has yet to infect Montana's wild herds.

COOPERATION

Though the wildlife lab houses state-of-the-art equipment and a highly trained and experienced staff, the demands for scientific data are too vast for one facility to fulfill. That's why Montana FWP works cooperatively and shares technical knowledge, expertise, and equipment with Montana State University, the Montana Department of Agriculture, Montana and Wyoming state diagnostic laboratories, and federal agencies such as the U.S. Departments of Agriculture and the Interior.

One such collaboration took place in 2000 when Tom Roffe, a veterinarian and disease ecologist with the Interior Department's Biological Resources Division, came to Montana to study brucellosis in the Greater Yellowstone Ecosystem. He called Aune, the region's brucellosis expert, who set him up with office space, infrastructure support, and use of the lab. In return, Roffe provided in-kind help and services, such as teaching FWP biologists about wildlife capture and immobilization techniques. "I'm also a trained pathologist," Roffe adds. "So Keith and Neil have called me in and asked my advice on forensic matters." The collaborative arrangement has benefited both the federal and the state agencies at little expense to either.

"The multidisciplinary, team approach has really become the foundation of all wildlife research these days," says Aune. He hands me a study published in the *Journal of Wildlife Management* titled "Brucellosis in Yellowstone Park Bison: Quantitative Serology and Infection." The lead authors include Roffe, Aune, and Jack C. Rhyan, of the NVSL. The study demonstrates the cooperative nature of wildlife science and the type of published research the wildlife lab helps produce.

CRIME BUSTERS

The lab also plays a large role in legal matters, such as investigations into poaching. After Anderson has finished his work on CWD for the day, he hauls a dead grizzly bear out of the lab cooler on a ceiling hoist. The bear was brought in by special agents from the U.S. Fish and Wildlife Service who think it was killed by a gunshot wound. If so, it could be a criminal matter, and they'd like to have the bullet and know its trajectory.

"Taking a grizzly bear from here to the USFWS Forensic Laboratory in Ashland, Oregon, isn't easy," explains Aune. "So we support the federal agents and our wardens by giving them some immediate forensic information that they can go right out and use in their investigations."

The lab's forensic work centers mostly on determining how grizzly bears or gray wolves died and whether or not they were killed illegally. But the lab also investigates possible environmental pollution. One of the most highly publicized cases was in 1995, when dead snow geese were found in the water filling the Berkeley Pit open-pit mine in Butte. When the lab's scientists determined the birds had died from water contaminated by mining wastes, the news was covered nationwide.

The range of research conducted at the laboratory is mind boggling. As Aune ticks off a list of studies done over the past decade, it seems there isn't a mammal they haven't investigated in one way or another: pine marten winter diets, otter reproduction, coyote age structure and reproduction, bear biogeographics, mountain lion mortality, wolverine reproduction, and more. With the help of the lab, a former neurosurgeon is even conducting a study on bear brain microanatomy.

During winter, Anderson focuses his attention on furbearers such as wolverines, otters, and fishers. Trappers are required to submit the carcasses to the lab after the animals are skinned. While the skins are tanned elsewhere to become hats and coats, the carcasses are examined by Anderson for clues that reveal something about the animals. He's especially interested in wolverines, a secretive and reclusive species biologists know little about.

"When a carcass comes in, we take out the reproductive tracts of females and count pregnancy scars in the ovaries to determine potential reproductive rate," he says. "Then we take out the stomach and the colon to examine food habits."

Working with Christine Cegelski, a research student from the University of Idaho, Anderson takes tissue samples to test for disease and determine genetic distri-

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BLOODY BUSINESS Working in the wildlife lab is not for the squeamish. Neil Anderson (above) begins a necropsy to determine why a gray wolf died and (left) checks the identity of a grizzly brought in to determine whether it was killed illegally. Far left: Anderson and MSU student Jen Southers remove brain tissue from dead elk and deer. Samples are placed in bottles (above left) and sent to a federal lab in Iowa to test for chronic wasting disease.

bution. "This gives us a pretty good picture of the wolverine," he says.

What the scientists learn, wildlife managers use. For example, if trappers are killing too many female wolverines, that could harm populations and require changes in trapping regulations. Also, the genetic work Anderson has done shows Montana supports three or four distinct wolverine populations of different sizes. This information may lead FWP to tailor trapping regulations to suit individual wolverine populations.

"Until this study we didn't have that kind of information," he says.

SKELETON TRUNKS

The lab has other purposes, too. It sends out trunks of hides, skulls, and other materials used at Montana schools ranging from elementary to college level. It also loans 20 to 50 specimens to schools and agencies around the country each year.

The lab coordinates radio frequencies for biotelemetry and helps make radio telemetry devices such as the tracking collars used to follow deer, elk, bears, and bison. And it manages the distribution, licensing, and development of wildlife-immobilizing drugs. After talking to Aune, I was surprised to learn that much of this activity occurs outdoors.

"Don't get the idea that we're just lab rats, looking through microscopes all the time," he says, laughing. "About a quarter of our work takes place in the field."

The day of my visit, lab technician Coleen O'Rourke has just returned from a game check station near Philipsburg, where she was collecting brain tissue samples from deer as part of the CWD surveillance. Anderson is frequently called to test captured bighorn sheep for a wide range of diseases before the animals are released in new locations.

Aune spent many days in Yellowstone Park monitoring bison fetuses intentionally soaked in brucellosis to study the persistence of the bacteria in fetal tissue. And in a related study, he and colleagues monitored scavenging activity on uninfected bison fetuses in the Yellowstone ecosystem. These and other studies are helping scientists better understand how brucellosis is spread in the wild.

"Both our field work and our work in the lab are directly related to the real world and to real management issues," Aune says. "When we study how a disease operates in an environment, for example, we can define how it is transmitted and the ecological processes going on and then try to help create healthier wildlife populations."