Solving the Bitterroot Elk Mystery

How biologists and local volunteers finally figured out what was reducing the popular Ravalli County elk population. By Perry Backus

In 2009 the southern Bitterroot Valley's elk herd—for years one of the state's most productive populations and a source of pride among local hunters—was in trouble.

The ratio between cows and calves in certain areas was below anything Montana Fish, Wildlife & Parks biologists had ever seen during nearly 50 years of conducting annual spring monitoring flights. In some hunting districts, the ratio was half that needed for the population to sustain itself. The worst declines were in the West Fork of the Bitterroot where, not long before, the elk herd had grown dramatically following massive wildfires in 2000 that created abundant grassland parks where the animals could forage. In 2005, the West Fork herd numbered close to 1,900. Four years later, it had dropped to just 774.

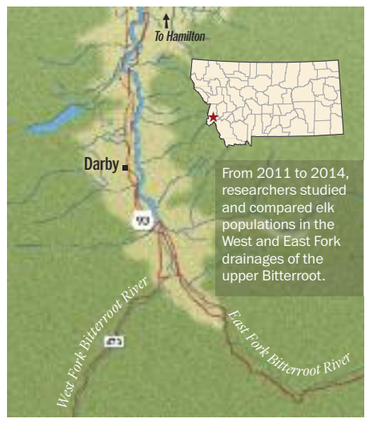
Local hunters, accustomed to seeing abundant elk, were shocked by the declines.

Even worse news came in 2009, when FWP biologist Craig Jourdonnais (since retired) found only 9 calves per 100 cows in the West Fork during his annual spring monitoring flight. A heavily hunted elk population that is also taking a hit from predators, like the one in the West Fork, needs a ratio of 30 calves per 100 cows to be sustainable, says Jourdonnais. He explains that the higher the ratio of calves to cows, the more likely a herd is growing or at least staying stable. Low ratios indicate a poor "year-class" (also known as a "cohort") of elk and signal a declining population. "We were seeing elk calf survival beginning to plummet throughout the Bitterroot," Jourdonnais says. "In the West Fork, it was plummeting on steroids. There were a lot of questions about why it was happening and we didn't have the answers. We could guess, but that's all we could do without a study."

Ideas surfaced from all quarters on what was causing the population free fall. Some pointed to the large cow elk harvest, carried out to lower the population as mandated by Montana statutes, in the years leading up to the crash. Others suspected that the cold and wet spring of 2009 had played a role in calf number declines.

But most local hunters thought they knew the reason. Wolves were a relative newcomer to the upper Bitterroot region and had been steadily increasing at the same time elk numbers were plummeting. The connection seemed obvious, as did the solution: Kill more wolves. "Probably 9 out of 10 people would have told you then that wolves were tipping the balance in the West Fork," Jourdonnais says. And that included Jourdonnais himself, as well as University of Montana researchers curious about the elk declines.

Every one of them was in for a surprise.



Journalist Perry Backus lives in the Bitterroot Valley.

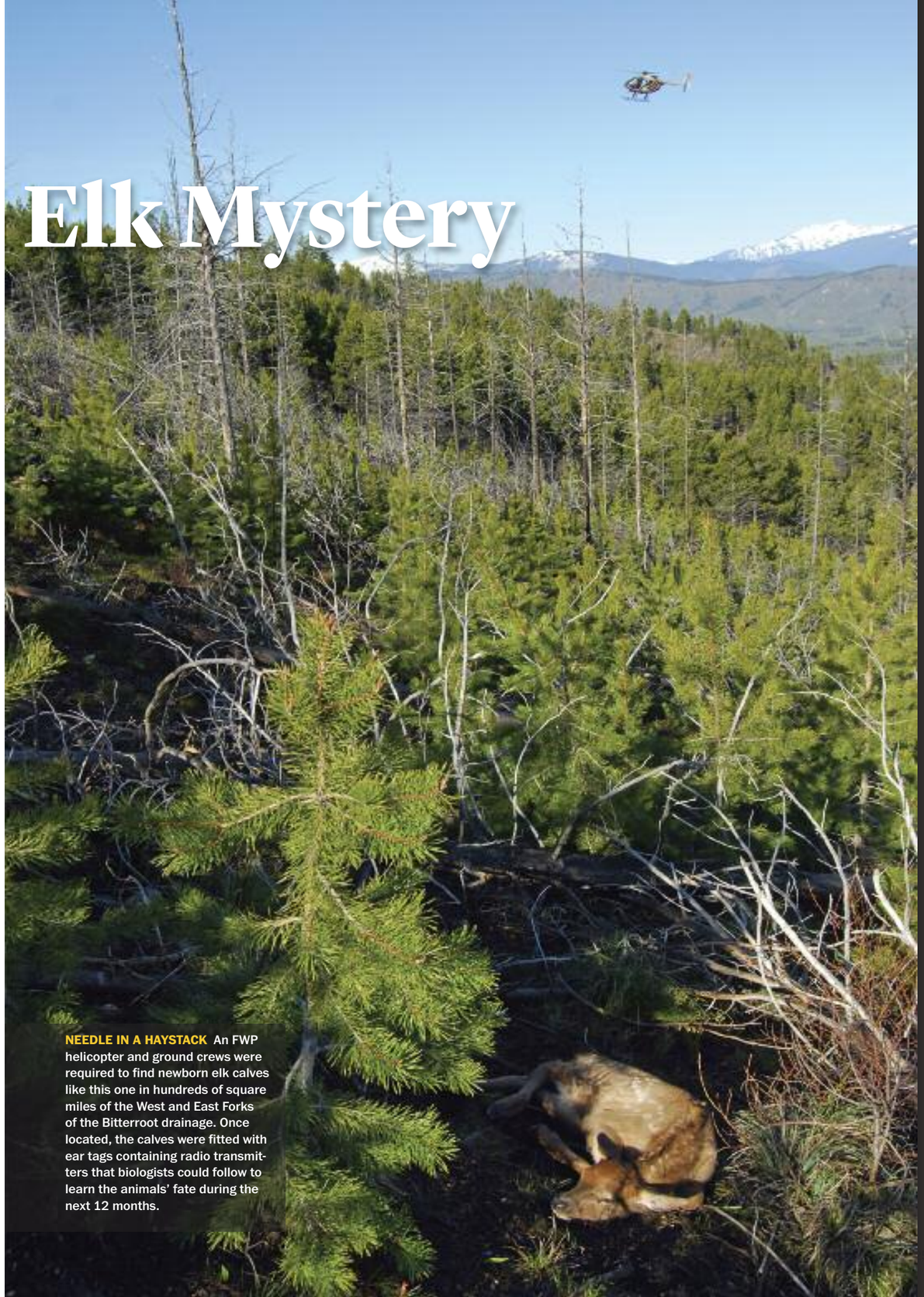
EAST VERSUS WEST

Following a groundswell of local support that included financial backing from Bitterroot hunters and conservation clubs, researchers from FWP and the University of Montana joined forces to develop a three-year study. The goal was to understand the relationship between predators and elk in the valley's southern reaches. Specifically, researchers wanted to figure out why calves weren't surviving as well as they should. Were they born especially weak due to nutritional deficiencies in the mother elk caused by inadequate habitat? Were predators—wolves as well as black bears and mountain lions—the culprits? Or was it some combination of those and other factors?

Researchers focused on comparing the widely differing herd dynamics and habitat conditions in the southern Bitterroot's East and West Fork areas. The East Fork had fewer wolves and, with less snowpack and more open winter range, was thought to contain better elk habitat. The steeper West Fork is more heavily timbered, receives more snow, and holds more wolves.

With the calf predation and habitat information, FWP wildlife managers hoped to figure out how to increase elk calf survival and thus the overall southern Bitterroot elk population. "But without reliable data on what the problem was, there was no way of devising a likely solution," says Justin Gude, head of FWP wildlife research. "All we had was diverse opinions."

The study began in February 2011, when researchers captured 44 cow elk—18 from the West Fork and 26 from the East Fork—and fit them with radio collars containing GPS units. The collars recorded each animal's location every two hours for about a year before automatically releasing so they



NEEDLE IN A HAYSTACK An FWP helicopter and ground crews were required to find newborn elk calves like this one in hundreds of square miles of the West and East Forks of the Bitterroot drainage. Once located, the calves were fitted with ear tags containing radio transmitters that biologists could follow to learn the animals' fate during the next 12 months.

MAP: LUKE DUBAY/*MONTANA OUTDOORS*; PHOTO: CRAIG JOURDONNAIS/FWP

CATCH AND RELEASE Clockwise from facing page: Helicopter capture teams follow a herd in order to net, from the air, six-month-old calves; volunteers examine tooth eruption patterns in a newborn calf to estimate its age; volunteers release a calf after weighing, aging, and determining the animal's sex; an ear tag and ear tag applicator. The tags emitted a steady radio signal for an entire year. If a tagged calf remained stationary for more than six hours, indicating that it had died, its tag gave off a distinct double-pulse signal. Alerted to the fatality, biologists rushed to the site to investigate the cause.

could be collected and biologists could download the data. Roughly the same number of cows were collared in the two years that followed, for a total of 124 research elk.

The information gathered by the GPS collars provided biologists with solid information on where elk in the southern Bitterroot moved through the seasons. For instance, many people had believed that a significant portion of the West Fork herd migrated freely back and forth between Montana and Idaho's Salmon River watershed to the south. Yet in the entire three-year study, only four collared cows moved from the West Fork into Idaho, and they went west and northwest toward the Selway River watershed. This group included one cow that made her way over a 7,000-foot pass across the Bitterroot Divide.

In addition to tracking adult elk movements, researchers collected information on pregnancy rates and body fat levels to better understand cow body condition and reproductive performance. Biologists also studied the diet of elk in the study areas and the availability and abundance of various grasses and forbs (flowering plants) the animals eat during different times of the year. The goal: to learn what effect habitat has on elk health, especially during pregnancy.

The project, which cost $500,000, was funded in large part (more than 50 percent) by donations from individuals, local groups, national conservation organizations, and science agencies hoping to understand the cause of the Bitterroot elk declines.

> "Without reliable data on what the problem was, there was no way of devising a solution."

WHAT THEY FOUND

It turned out that habitat may be why East Fork elk produce more calves than those in the West Fork. FWP research biologist Kelly Proffitt, study co-leader, found that pregnancy rates in the East Fork varied across three years from 83 percent to 97 percent, averaging 90 percent, while rates in the West Fork, varying from 57 percent to 82 percent, averaged 73 percent and the elk there had far less body fat. "There may be some nutritional limitations in the West Fork herd preventing cow elk from accruing enough fat reserves to remain pregnant," Proffitt says.

Even if a cow could produce a calf, there was a good chance the young elk wouldn't survive long. During the study, biologists placed ear tags containing tiny radio transmitters on a total of 286 newly born elk calves. They monitored the signals during each animal's first year. When the transmitter indicated that a calf had died (by a special signal that the young elk hadn't stirred in several hours), biologists raced to the site and investigated.

If they were able to arrive at the death scene before too many scavengers degraded evidence, they could identify the cause of death: natural causes such as starvation or freezing, human hunters, or predation by bears, wolves, or mountain lions.

Researchers learned that West Fork calves had about a 40 percent higher risk of mortality than East Fork calves. "This wasn't especially surprising because we knew going in that the West Fork was a harsher environment for elk," says Proffitt.

However, what did shock the scientists was the makeup of calf mortality.

ALL PHOTOS: CRAIG JOURDONNAIS/FWP

Figuring out which of the three large carnivores may have killed a calf required knowledge of the species' unique trademarks, explains Proffitt. A mountain lion often attacks prey from the front end, leaving deep wounds around the neck and jaw area. The carcass may show claw marks throughout the body. Mountain lions also tend to pluck all hair away from an area before they feed, and they often cache their kills. Bears usually kill with a crushing blow, cause more damage, and are far less tidy than lions. A wolf kill site, as one researcher described it, looks like a bomb has exploded, with bones and other body material scattered over a large area. Wolves also leave abundant tracks and scat.

> "Not to have even one confirmed wolf kill out of 36 confirmed elk calf fatalities is shocking to me."

Of the 171 calves in both study areas whose fates were documented (the 115 remaining calves had unknown fates primarily due to ear tag failures), 33 percent survived to age one and 67 percent were confirmed dead. When investigating the mortalities, researchers were surprised that 36 percent were killed by lions, compared to 5 percent by wolves (see pie chart on page 29 for other causes). "When we look at the number of elk calves that we can document were killed by wolves, the number is fairly insignificant," says project co-leader Mark Hebblewhite, a professor of wild ungulate habitat biology at the University of Montana. "For instance, we didn't have even one confirmed wolf kill this past year. Not to have even one out of 36 confirmed elk calf fatalities is shocking to me."

None of this is to say that wolves in the Bitterroot aren't eating elk. Researchers examined wolf scat and found that elk comprise 61 percent of the carnivores' diet. But because the number of Bitterroot wolves is relatively small when compared to the number of elk and lions, wolves aren't the large carnivore taking the biggest bite out of elk numbers; lions are.

Backers big and small

Financial support for the Bitterroot Elk Research Project came from

Ravalli County Fish & Wildlife Association
Montana Bowhunters Association
Hellgate Hunters & Anglers
Rocky Mountain Elk Foundation
Safari Club International Foundation
Western Montana Chapter of the Safari Club International
Pope and Young Club
Shikar-Safari Club International
McIntire-Stennis Foundation (USDA)
Montana Mapping & GPS
Montana Institute on Ecosystems
U.S. Forest Service (USFS)
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100 years of elk conservation

Residents of the Bitterroot Valley have been volunteering to help their elk population for more than a century. According to an early article in the *Missoulian-Sentinel* (date unknown), the Stevensville Rod and Gun Club sponsored two shipments of 100 Yellowstone National Park elk in 1912. Wives of club members cooked and served community dinners to pay for the shipments. Local residents modified their horse-drawn wagons to transport the elk to the Burnt Fork drainage east of Stevensville.

The Ravalli County Fish & Wildlife Association and other local conservation groups continue to use fund-raising dinners to help pay for wildlife projects throughout the Bitterroot Valley, including the recent elk study.

Biologists say that elk calves radio-tagged over the last three years as part of the study could very well be direct descendants from those 1912 boxcar elk. Very few native elk existed in the Bitterroot during the early 1900s. The 1912 transplant augmented existing populations and started a new chapter in the Bitterroot wildlife conservation story. ■

—Craig Jourdonnais

Elk captured in Yellowstone National Park, at the time home to the continent's last herds, being released near Butte in the early 1900s. Similar transplant operations were conducted in the Bitterroot Valley.

Stepping up

by Craig Jourdonnais

Five years ago, the decline of elk in the southern Bitterroot was a complete mystery. Sure, many people thought they knew the reason, but there was no proof. Today we know a huge amount about that elk herd, its habitat, and the role of large carnivores. That's largely due to the dedication and contribution of local volunteers.

Professional wildlife biologists from FWP, the University of Montana, and federal agencies provided valuable leadership and scientific expertise for the capture teams. But research leaders Kelly Proffitt and Mark Hebblewhite needed help. They understood the importance of organizing dependable, disciplined, and experienced field teams for calf capture. So they sounded the call for citizen volunteers who had experience traveling through wild, rugged places in tough weather conditions.

Missoula high school student Hailey Jacobson, the author, and FWP warden Tyler Ramaker

Volunteers came from across Montana to help with the often grueling work. A calf capture field day might begin at 4 a.m. and last well into the night. Bedtime, if we didn't fall asleep at dinner, often came after midnight.

One volunteer was Hailey Jacobson, then a senior at Missoula's Hellgate High School, who loves competitive swimming and biology. Her interest in science has taken her to Costa Rica and the Baja peninsula, yet the experience of catching elk calves in her backyard of the upper Bitterroot topped anything she's ever done. "Being that close to new life, to a five-day-old elk calf, was incredible," she says. "Initially, I was very impatient. We would see a cow elk and just watch her. I wondered why we didn't go and find her calf. Then, as the day went on, I began to understand that it is more about observing and gaining information than just acting."

Another volunteer was Charlie Johnson, 67, a self-described "Bitterrooter" who trains for marathons by running 50 miles a week. He brought to the study decades of experience navigating wild places. He came away with renewed respect for the biologists and volunteers he worked with. "The long days and lack of sleep were demanding, but it didn't impede the professionalism and enthusiasm exhibited by the field staff," he says.

"Elk have provided me with a lifetime of memorable experiences and enjoyment," adds Johnson, a past president of the Montana Bowhunters Association. "It seems only fitting that I offer something in return. I only wish I could do more."

The 60-plus volunteers who helped with the study assisted in radio-tagging more than 200 calves from spring 2011 to spring 2013. Many told me they came away with an enhanced knowledge of the area's landscape, people, and wildlife management challenges. Equally important, their experience has made them "ambassadors" of the project. They can spread the word about wildlife management challenges in the Bitterroot and the importance of using rigorous scientific research to learn answers.

Bitterroot Valley residents have a passion for managing, conserving, and hunting their elk. Often lost in the debates over the return of large carnivores to Montana is the fact that these and other elk advocates across Montana helped restore the herds a century ago and still work on maintaining healthy populations. Montana would contain far fewer mountain lions, grizzly bears, and wolves if private landowners and local conservation clubs hadn't assisted in reestablishing the carnivores' abundant prey base and weren't continuing to help conserve it.

Of course, restoring large carnivores was not their objective. The motive was to bring back elk, a species many hoped to pursue someday with a gun, bow, or camera. Over the decades people like Hailey Jacobson, Charlie Johnson, and local ranchers, farmers, and hunters have chosen to participate in conservation work primarily for one reason: to leave a positive influence on their and other Montanans' way of life. ■

Craig Jourdonnais was the FWP Bitterroot area wildlife biologist when the study began. He now works as a wildlife biologist on the MPG Ranch near Florence.

CORRECT CARNIVORE Researchers learned that mountain lions kill seven times more elk calves in the upper Bitterroot than wolves do. Knowing this, FWP increased lion hunting quotas in the hopes of reducing elk predation and helping the herds recover.

MORE LIONS

Faced with this new knowledge, researchers wanted to learn how many mountain lions lived in the southern Bitterroot. To find out, the biologists used new population modeling techniques coupled with DNA sampling collected from live and hunter-harvested animals. They were surprised to learn there were far more lions in the area than previously thought. The upshot was that one possible way to boost overall elk calf survival would be to increase the number of lions that hunters could harvest. "This was a case where it's very clear that if FWP had initially listened only to popular opinion and killed a bunch of wolves, they would have done nothing but wasted time and money without doing anything for elk," Hebblewhite says.

Ravalli County Fish & Wildlife Association president Tony Jones admits he was surprised. "Everyone assumed it was wolves, and I did too," he says. "It turns out that elk in the Bitterroot die for a lot of reasons. They drown in creeks, get hit by cars, and are killed by lions, bears, and wolves."

Jones says the study has helped him and others in the area better understand what has happened to the Bitterroot elk herd over the past 15 years. The West Fork elk herd peaked at nearly 2,000 animals in 2005 following years of relatively restrictive cow elk hunting seasons, heavy mountain lion harvest by hunters, and, at the time, few wolves in the area. But from there the population went downhill. Required by state statutes to lower elk numbers to more closely meet objectives outlined in the state's elk management plan, FWP responded by increasing cow harvest quotas. At the same time, concerns that lion numbers were dropping too low led FWP to cut back on lion harvest quotas so the population could rebound. Meanwhile, wolf numbers started rising. The combination of increased human and carnivore harvest was more than even the Bitterroot's once-robust elk population could sustain. "It was like the perfect storm," Jones says.

"People here were worried they might lose their elk herd, and that's why you saw them step forward," Jones adds. "It says a lot about how much folks in the Bitterroot care about elk. They wanted to know what was happening to their elk, and they were willing to reach into their pockets and help pay the bill." 🐻

Elk calf mortality

Bitterroot Elk Research Project results, 2014

- **36%** due to lion predation
- **24%** unknown causes
- **14%** unknown predation
- **11%** bear predation
- **8%** natural, non-predation causes
- **5%** wolf predation
- **2%** human-related causes (such as hunting and fence entanglement)

CREW CAPTAIN Ben Jimenez, FWP research technician, led the field teams throughout the three-year elk mortality study.

CLOCKWISE FROM TOP LEFT: FWP; MARK MILLER; CRAIG JOURDONNAIS/FWP; CRAIG JOURDONNAIS/FWP