

The New Coyote and Deer Predation

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I have had two careers: one as a wildlife professor at West Virginia University and a second career as an outdoor writer that started in 1969. In 1971 I began writing a column for *Bowhunter Magazine*, in the very first issue of that magazine. In that column I take the scientific wildlife literature and regurgitate it for hunters and others in non-scientific, more easily read language.

For the last thirty years, *Bowhunter Magazine* has sent me to a meeting called The Southeast Deer Study Group Meeting. It's a national conference on whitetail deer. About five hundred graduate students, professors, and biologists go there annually and present the latest research on whitetail deer. Attending that conference is extremely enjoyable. In recent years there have been a number of studies presented at that conference on coyotes and their impacts on deer. One conclusion is that the coyote we now have in the eastern United States is a different critter than the coyotes in the west. Today I'm combining my wildlife experience and knowledge, and my outdoor writing experience, to talk with you about coyotes in the east. The material presented is not my original research. It's a synthesis of what I have garnered from different research papers and from years of attending the Southeast Deer Study Group Meeting.

Are coyotes impacting our deer? That question is obviously a leading one and the answer is "yes." But before getting to those specifics, note that today we have things going on in the predator-prey world that we did not see in the past. When I was in school (okay, many years ago), we learned that the old classic predator-prey relationship was that when the prey increased, then the predators would follow in numbers and increase. When the prey decreased, the predators would go down (see Figure 1). Today, that has changed. We now have a lot of examples where that old model does not hold true. Mountain lions and bighorn sheep in New Mexico provide one example. Mountain lions are hammering the bighorn sheep, but their numbers don't go down when the sheep go down—the mountain lions are still there. Wolves and elk in the west, in parts of Idaho, are another example. We brought wolves to Yellowstone, and that's fine, but in some areas the wolves have hammered elk and moose to the point that the prey are disappearing in parts of Montana and Idaho, and the moose around the Tetons are almost gone. Even though prey numbers are low, the wolves are still doing fine.

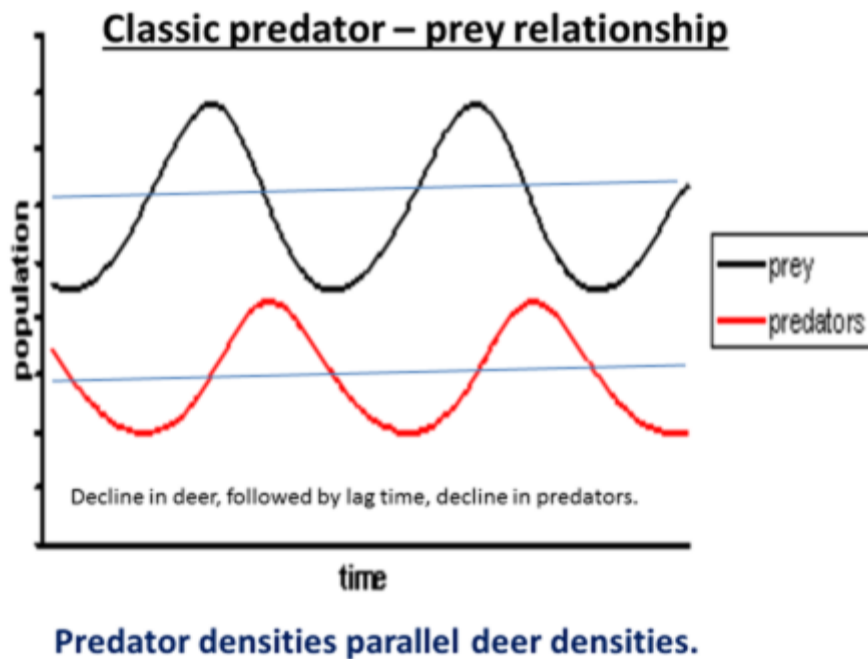


Figure 1: Classic Predator-Prey Relationship.

The question is whether coyotes, as an apex predator, are now going to hurt our deer. And, in some areas, they are.

Let's talk about their expansion and how coyotes got here over the last hundred years. Their range expansion is partly explained by changes in the landscape, and also partly by the fact that the wolf has ceased to be the apex predator in the eastern United States. But there is one other very important factor: hybridization. The coyote we have in the east is not the same as the coyote we have in the west. Coyotes aren't native to the east—wolves were.

Look at Figure 2 and you can see where coyotes were 200 years ago, but here's what has happened. They have moved east over the years in a northerly route, through Ontario to New York, and then into Pennsylvania. One might think that the coyotes in West Virginia arrived by crossing the Ohio River, but that is not the case. They went from Pennsylvania into the eastern panhandle of West Virginia. They didn't get to Pennsylvania or West Virginia by crossing the Ohio River until later. We also see a later movement from the south. Coyotes came from the southeast into Virginia. These two populations—the one from the north and the one from the south—have now met in central Virginia and are breeding together.

That's how the coyotes got here, but the interesting thing is that with DNA work, scientists have now learned that the northern-route coyotes hybridized with wolves—not a lot, but 12 to 15% of the DNA of the coyotes in West Virginia and in northern Virginia is wolf DNA. That wolf component in our

coyotes right here in central Pennsylvania and in West Virginia and Northern Virginia makes them one-third bigger than the western coyotes. That's about ten pounds. That probably makes them better able to kill adult deer in the winter. That wolf DNA not only makes our coyotes bigger, it makes them more aggressive and allows them to adapt to life in forest environments a lot better.

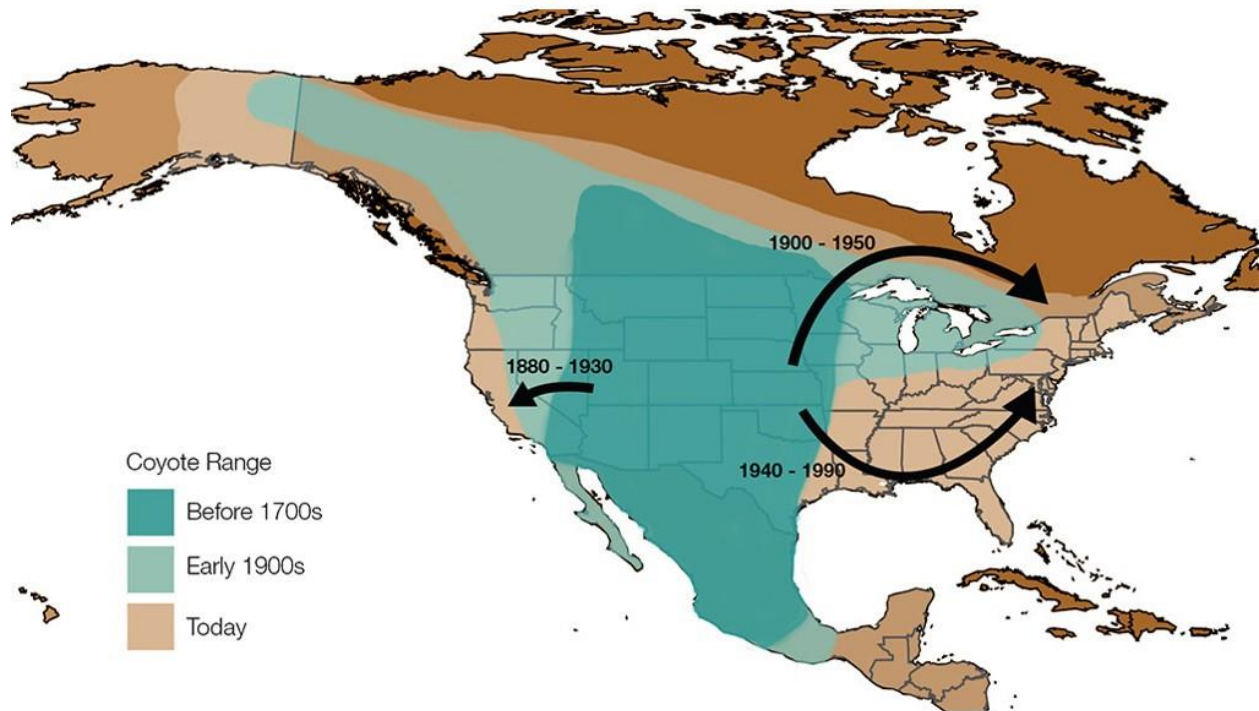


Figure 2: The Geographical Expansion of Coyotes

In the western states wolves are 100% wolves, because they don't hybridize with coyotes, they kill them. In the Great Lakes, the wolves are 85% wolf and 15% coyote DNA. In Ontario, wolves have 58% wolf DNA and 42% coyote DNA.

The best coyote studies on the deer-coyote relationship have come out of North Carolina, done by Dr. Michael Chamberlain, a biologist teaching at the University of Georgia. He is one of the foremost coyote researchers in the country. He did some work in western North Carolina, where red wolves have been released. He had his own collared coyotes and watched them being bred by red wolves on two occasions. He found that that red wolf is 24% wolf. We're spending tons of money to put an endangered species into North Carolina that's not an endangered species. It's not a red wolf; it's 76% coyote. I'm not sure that's money well spent, but it's none of my business—I'm retired. I just thought it was interesting that the red wolf is in fact three-parts coyote.

To reiterate, this wolf DNA made our coyotes larger, allowed them to hunt deer better, and allowed them to spend more time in forested areas in the east. It also allowed them to adapt and expand their range much more rapidly.

Now, here is Chamberlain’s work from three years ago. What I find most intriguing is that he has found there are two types of coyotes—resident coyotes, and transients. The transients tend to move in large, concentric circles up to 150 miles. They tend to follow interstate highways (at least, he saw this in his work in North Carolina). They also cross big bridges, like those found along the East Coast. What these transients do is move every two to six weeks, going about thirty miles in a day. If there is enough food where they have stopped, that means there is an opening—this happens if a resident coyote has died—so they move in and they become a resident.

Let’s look at some of the telemetry data Chamberlain collected.



Figure 3: The movement of a coyote in North Carolina, from east to west.

Every blue dot is a fix. I don’t know how many fixes they took per day, but it took this coyote thirty-one days to get from the right-hand side of the map to Durham, North Carolina, on the left. Notice that when he hit the interstate highway, I-40, he just followed it right into town and spent some time there. This transient coyote moved a long distance.

Figure 4 shows some of the data for another coyote in North Carolina that crossed a large bridge on Route 45. Chamberlain said that before the coyotes cross these bridges, they tend to spend four or five days in one area. This coyote did just that. They cross between two and four o’clock in the morning most of the time. What safer time to cross a big bridge like that? Even though they tend to cross when there is little traffic, a few do get killed on these bridges.

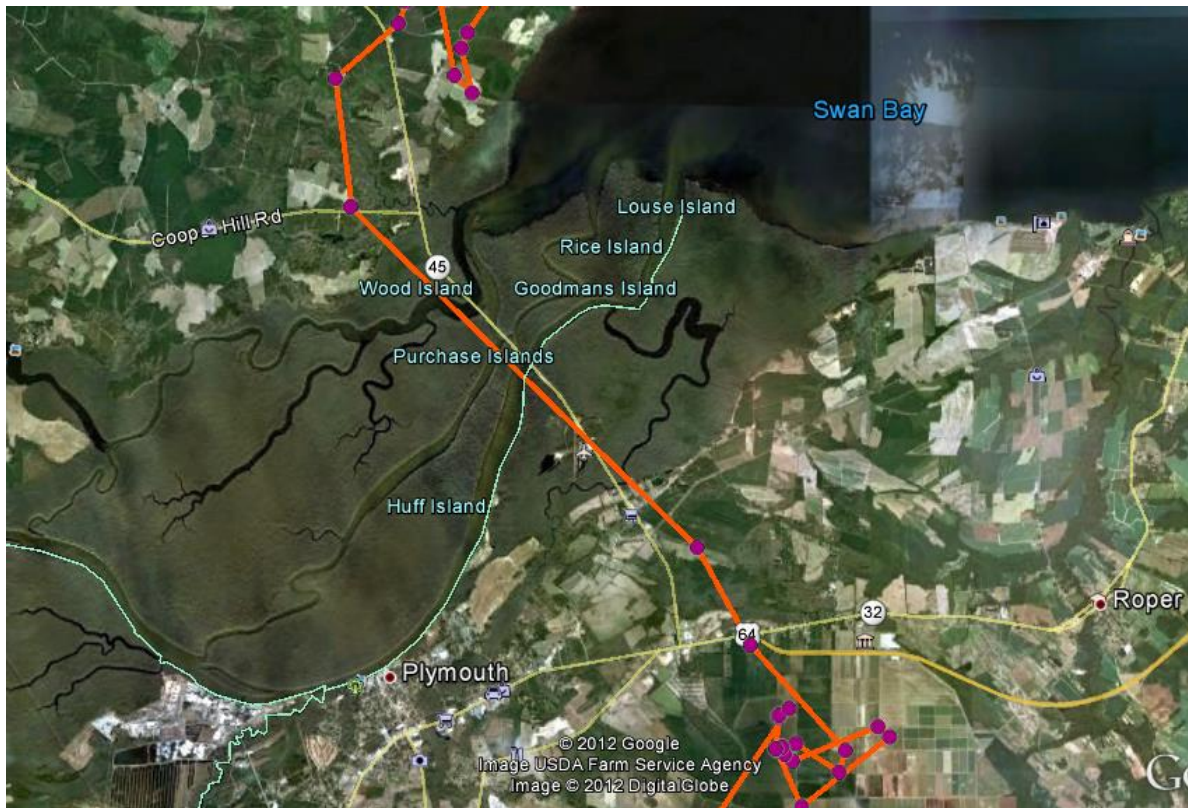


Figure 4: The movement of a coyote across a highway bridge in North Carolina.

How do we learn how coyotes can impact deer? We can look at coyote food habits and we can analyze their droppings. This method won't tell us if there's a problem, and it won't give us numbers. It just says what we find in their droppings and how often we find it, but that doesn't mean it's a problem. They could be feeding on deer that died in the winter. You can do fawn-to-doe ratios to see if the coyotes are impacting deer, but just because the ratio drops is not proof that it's caused by the coyotes. It could be habitat, drought, disease, a number of things. You can do a radio-telemetry study, and this gives you pretty good information. There is, by the way, such a deer study going on at Penn State. You can put radio collars on fawns that will register when they die through their body temperature changes. You can also do removal studies where you remove coyotes and then look for changes in deer numbers. The problem with those studies is that you can't compare them because they have used so many different techniques that it's hard to make the data comparable.

Let me back off a little bit and get back to predator-prey problems. There has been a long-standing debate about whether or not to kill animals that prey on game species. I grew up, and was a professor, at a time when that was sort of a no-no: just let nature take care of her own. We do know that if you remove a source of mortality, you will have more animals to hunt or you will have more animals survive. For example, the biggest predator on the spotted owl in California (an endangered species) is the

barred owl. Now the U.S. Fish and Wildlife Service is killing around 2,000 barred owls to save the spotted owl. As you can imagine, that is a controversial move. But there are lots of barred owls, and in removing them it seems to bring back spotted owl numbers. They used to think that cutting the old growth timber was killing the spotted owls, and maybe that did have some impact, but we now know that barred owls are big predators on spotted owls.

There are many other examples where we've killed animals to help certain species. We've gone into island situations and killed predators to save prey species and bring them back. That gets a little complex at the ecosystem level, because predator control is complex and very politically sticky. It might make ecological sense, but only in very specific circumstances.

For example, a month ago, I went to Alaska to hunt brown bear with a bow. They are now hunting brown bears over bait, which makes it more successful for the hunter. It's the only way I could do it, because a lung disability means I can't walk very far. In some areas of Alaska, such as on the Kenai where you have a lot of brown bears, there's a limit of two brown bears now. The reason is that brown bear numbers have expanded significantly in recent years. There are lots of them and they are killing caribou and moose to the extent that, in some areas of Alaska, caribou and moose reproduction is low and, in some areas, not self-sustaining. The natives of Alaska, as well as the residents of Alaska who greatly rely on wild game and fish for food, were upset about the limit. Since the natives have a lot of political power in Alaska, they raised a firestorm and various measures were taken, including allowing baiting by hunters. Eighty percent of all brown bears taken in 2015 were killed over bait. Nobody would ever have thought of hunting brown bears over bait in Alaska before. Nobody would ever have thought of having a two-bear limit, which is not going to be on the books for long, but it's going to be on the books long enough to knock them down so that the moose and the caribou come back, which is the goal.

Another example that you may have heard of, where we have done some killing of predators to save species, is around the pothole country of North Dakota and southern Canada, where foxes (and coyotes, but especially foxes) have caused major damage to waterfowl. The U.S. Fish and Wildlife Service and the Canadian Fish and Wildlife Service started a program in the last fifteen or twenty years of going in and trapping foxes around potholes where waterfowl are nesting. They've also fenced out the foxes to show that if you don't have that predator hitting those nests in the spring, your waterfowl numbers go way up. If you do have that predator hitting those nests in the spring, the waterfowl numbers can be close to zero in some situations. So they're killing foxes to increase waterfowl populations. We're shooting wolves out of airplanes in Alaska and we're killing a lot more bears in Alaska. In some of these predator control situations, science is only one aspect of the decision; politics is always a factor.

Dr. Eric Rominger, one of the researchers in this predator-prey arena, says, "When predator-affected species are in low density, like moose and caribou in parts of Alaska, or elk in parts of Idaho, we

need proactive predator control programs.” Dr. Valerius Geist, one of the top Canadian wildlife biologists out of Calgary, said, “Letting predators run down game herds will weaken the framework of wildlife conservation.” This is new language relative to predators that we didn’t hear twenty years ago. We never thought about predator-prey relationships this way. What these biologists are saying is that wildlife agencies know how to manage moose, elk, deer, etc., through hunting, but now they need to pay some attention to predator management.

Ecosystems are really out of kilter right now. There are too many elk in some western national parks, habitats are really beat up and degraded, and wolves have moved in. In the east we’ve seen many examples of where too many deer have degraded habitats. We have witnessed whitetail deer just destroying the forest habitat at the ground level. Here in Pennsylvania, when the wildlife agency increased doe harvests to save habitat, hunters complained so loudly that politicians stepped in and forced the agency to back off. That was a mistake, by the way; we really needed to kill off those does to get the habitat back. These situations are contentious and it will be a struggle for wildlife professionals to deal with the biopolitics created by predation. More and more, our wildlife decisions are being made by politicians rather than listening to our own state biologists. That’s a shame, and it is a growing problem that younger professionals will have to face.

Let’s look at some technology used to determine fawn predation. In the past, if a predator killed a fawn that you had put a radio collar on, you wouldn’t have been able to prove what the predator was. But now you can. You just take saliva from the dead fawn, analyze the DNA, and find out if it was a bobcat, coyote, black bear, mountain lion, or whatever. That’s been a big plus in finding out the extent of coyote predation on deer fawns. There are also vaginal implants that are put in does. When the doe gives birth to the fawn and you want to get a radio collar on the fawn, that implant hits the ground and you know immediately where that fawn is. Since the highest fawn mortality from predators occurs in that first week after birth, this approach gets you the most accurate information.

As for the research that has been done to show the impacts of coyotes—the new coyote as well as the old coyote—on our fawns, one of the first studies was done by Dr. Chamberlain. Of twenty-seven fawns in an area around Fort Bragg, North Carolina, he found only 18.5% of the newborn fawns survived to sixteen weeks of age. That’s barely enough to sustain the population. Of twenty-two mortalities, 68% were caused by coyotes and bobcats. Twenty-three percent starved and were abandoned, which is pretty common, and 9% died of unknown causes. Interestingly, 55% of the mortalities were fawns that died in the very first week. So there was low fawn recruitment, and all of a sudden the deer numbers were going down. When deer numbers go down, guess who gets upset? The guys paying the bills, the deer hunters. That’s where the money comes from to run state wildlife agencies, and now those hunters are being told

that they can't shoot as many does. Sometimes when hunters get upset, they get the attention of politicians to get something done.

South Carolina was the state that triggered the alarm on coyotes and deer. In South Carolina, around the year 2000, deer numbers started to go down. At the same time, coyote numbers went up considerably. Fawn survival in most areas around the country is around 50 to 60%, but when it went below 22% in South Carolina, people started to ask, "Hey, what's going on?" At Auburn University in 2004 and 2005, they found 33% fawn survival, with 63% of the mortality caused by predators, and 100% of that predator was the coyote. In another study done in Alabama in 2009-2010, they found 21% fawn survival, which is not sustainable. Eighty-six percent of the mortality was from coyotes. In Georgia, between 2007 and 2012, they found 29% fawn survival. That was very low, and 76% was caused by predators, and 69% of that was caused by coyotes.

People all over the southeast looked at this and said, "What are we going to do? We're losing our fawns to coyotes, a lot of them." The logical solution was to trap coyotes. Let's look at the biggest trap study ever done on coyotes, which was in South Carolina on three 8,000-acre tracts over a three-year period. They trapped 475 coyotes, or four coyotes per square mile, on those three 8,000-acre tracts. That's a lot of coyotes being trapped.

What was the result relative to coyotes eating fawns? Marginal, if any, positive effects. The first year, it worked. Fawn survival increased, but after that they were back to where they started, 25% survival of fawns. Now wait a minute. We killed 475 coyotes on three 8,000-acre tracts of land and we end up right where we were before, with the coyotes still hammering the deer? What's going on? A couple things worth mentioning, especially with respect to a private landowner who might attempt to do the same thing. In this study, it cost \$100-\$200 to catch each coyote, and the labor was intensive. They were setting fifty traps per night for three and one-half months over three areas for three years. Why wasn't that making a difference? Well, one reason is that when you kill a lot of coyotes, the ones that are there shift their home ranges, which means they are exposed to more fawns because they're moving around more. That's a possible answer.

The real kicker is the transient coyote. Thirty-three percent of the coyotes were (and are) transients. They move around. So when you trap a coyote in an area, a transient pops up and says, "Oh, there's more food here," and he moves right in. So in order to lower the coyote numbers in an area to improve the deer situation, you have to keep trapping all the time. You can't stop. You can't just do it one year and stop once you've killed 400, because the next year when the transients come in you'll be right back to where you were. That's what the researchers think, and I agree. Private landowners can't afford to keep killing coyotes at the rate they need to if they want to keep deer on their property.

If you can't control coyote numbers, what can you control? You can control the doe harvest. Coyotes are going to get their deer, and the hunters want their deer, and you can't solve it by killing coyotes, so you just don't let the hunters kill as many deer. When this happens, hunters will complain. That is what is happening in South Carolina right now.

If we look at other states like Ohio, we find that coyote predation on deer fawns is 19%. Not bad at all, compared to the Southeast. The coyote numbers are increasing, however, and the deer numbers are decreasing to a degree, but the game department has said, "We can't control the coyotes, but no matter what the cause of decreasing numbers of deer, we'll respond to the deer decline by reducing antler-less harvest." In 2015, Ohio decreased the number of doe permits. Last year in the area I hunted in I could kill three; this year I could kill one. Their conclusion, as of 2014, was that "increased mortality from coyotes can be addressed through reduced harvest of does."

In Pennsylvania, the number of coyotes has increased, but fawn mortality is still not high. Time will tell about any future growth of coyotes there.

There is another situation going on relative to all wildlife, and that's urbanization of the country where people live. More and more people live in cities, worldwide. In 2010 we had a crossover where more people lived in cities of over 50,000 than lived in the country. Coyotes have figured this out, too. They have moved into cities, big time. They love to eat fawns in the spring, but in the city we find that they love to eat cats and small dogs. If you live in State College or Pittsburgh and have little dogs that you keep outside, you might find some of them missing in the morning. We have coyotes running around in town, and they're pretty brazen about it because nobody bothers them. They just take up residence in town.

Here is the area around Gorman, North Carolina. Interstate 85 runs right through the area. In Figure 5, the little light grey areas are all houses. Every blue dot is a fix taken on one coyote. He (or she) obviously got what was needed in town.



Figure 5: Movement of an individual coyote in Gorman, North Carolina.

Wolves, black bears, and bobcats are spreading their ranges and are at an all-time high. This changes the whole outlook on managing predators. For decades, we ignored them. We can't ignore them now. Hunter-harvest is still the major driver of deer numbers, but predators are new to many states and there is a lot we don't know. There are 30,000 coyotes a year killed in South Carolina, and it's not impacting fawn survival. That's scary.

There is a new computer model that shows that with low deer density and high coyote numbers, you need to protect your adult does and kill lots of coyotes. Is that possible? Right now, in South Carolina, it's not, because of the transients. The future of the coyote is that he's here to stay. He likes the urban environment and he eats everything. He's got wolf DNA so he can use all kinds of habitat, and in the eastern United States he's filled what was the wolf and mountain lion niche. With no other large carnivores in the east, coyotes have become the keystone predator. We need more predator management, and more research, to know what to do. We also need to know more about this new coyote.