

# Time To Mate?

The amazing strategies mammals have devised for determining when to reproduce. **By Kerry R. Foresman**



**NOT TONIGHT** Large mammals such as moose, which have pregnancies lasting eight to nine months, don't mate in spring because calves would be born during the brutal conditions of midwinter rather than in warm, fertile springtime. That's why the moose, elk, and deer rut is in early fall. Other mammals also adjust their mating seasons to ensure that young are born when food and temperatures are optimal.

Imagine you are a cow moose and want to have a calf. It's spring-time, and all around you birds and small mammals have begun

their yearly ritual of courtship and mating. Within a few weeks or months, their young will be born to take advantage of the lush vegetation and other foods. The problem is that you're a big mammal, and big female mammals are pregnant for eight to nine months. That means if you mate with a bull moose now, you would give birth in midwinter—not a good time for you, and especially not for your newborn calf.

So what do you do? Like all other large ungulates, you don't mate now but wait until fall. That way, your calf is born in spring, when food is abundant and the weather is warmer.

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This is known as a reproductive strategy.

The reproductive strategy for all mammal species is to breed successfully, carry their young to birth, and provide as much initial help as possible to ensure the offspring can grow rapidly and fend for themselves. For this to happen, animals have evolved all types of strategies to time both breeding season and birth to coincide with the best possible environmental conditions.

A big factor in reproductive timing is an animal's body size. Smaller species grow more quickly, age more rapidly, and have shorter lifespans than larger species. The same is true for gestation: Smaller mammals have far shorter pregnancies than larger ones. For instance, tiny shrews give birth after a gestation period of just 21 days, compared to the 248 days, on average, for elk.

Larger species such as elk and deer, because of their size, can afford to breed in fall, when food for the breeding adults is still abundant. After the rut, gestation extends throughout winter, the birth perfectly timed to the spring renewal of new plant growth. The young of these large mammals enter the world as temperatures are warming and their mothers have abundant food to support the "energetic costs"—calories used—of milk production. Ample time is available for young to grow up through summer so

that, as fall and winter approach, they have built up fat reserves and grown a winter coat.

For this reproductive strategy to work, large mammals need to breed at the right time. Mate too early in fall, and their young will be born when environmental conditions are still too harsh for the baby animal and its mother to survive. Breed too late, and the young is born too far along in summer to have enough time to grow large and strong enough to withstand the following winter.

To ensure they mate at just the right time, mammals have evolved to breed during specific photoperiods, or day lengths, for their species and environment.

#### 17-HOUR WINDOW

For instance, consider the reproductive biology of elk. The male's testes, which had shrunk at the end of the previous breeding season, start growing again in midsummer, responding to decreasing day length. Studies conducted at the National Bison Range showed that bulls become reproductively active in mid- to late September, a period known as "the rut." That's also when cow elk enter estrus and become receptive to the males. Females cycle through estrus approximately every 21 days during fall. Within this 21-day cycle, females are only in heat, allowing males to breed, during a 17-hour window. If



**TIMING IS EVERYTHING** Above left: Elk mate in late September and early October decreasing day length triggers hormonal changes. Birth (above) comes 248 days later, usually a week or two before or after June 1. Raccoons, a much smaller mammal, can mate in late January or early February because their gestation length is just 63 days.

the female is bred, the pregnancy continues unabated for eight months and she will produce a calf in the spring. If the cow does not successfully conceive, she will cycle again and have another 17-hour breeding opportunity midway during the following 21 days.

This pattern will repeat itself until mid-December. Around the time of the winter solstice, day lengths start to increase, triggering in elk a change in hormonal pattern that causes males' testes to regress and females to enter a nonreproductive state until the following fall.

If a female is unable to conceive until mid-November or early December, her offspring will not be born until the following August or September and then not be weaned until November or December. These offspring rarely survive.

Such late pregnancies are quite rare, however. Elk work hard to reproduce, and most breeding is finished by early October. Not only do bulls seek cows, as everyone knows, but cows also seek bulls. In fact, a cow selects which bull's harem to belong to, and she sometimes "harem shops" to pick the best bull to be the father of her calf. Females size up males based on scent, aggressiveness, and antler size. In Montana, almost all calves are born within a week or two of the historic birth peak of June 1.

While fall breeding works perfectly for large animals like elk, it would be disastrous for smaller species. For instance, if striped skunks bred in fall, their short gestation period would mean the young would arrive in midwinter. Smaller animals have instead evolved to breed in late winter or early spring

so that lactation occurs during the warmer, lush months. Species such as shrews, rabbits, hares, and lynx have developed this reproductive strategy to great success.

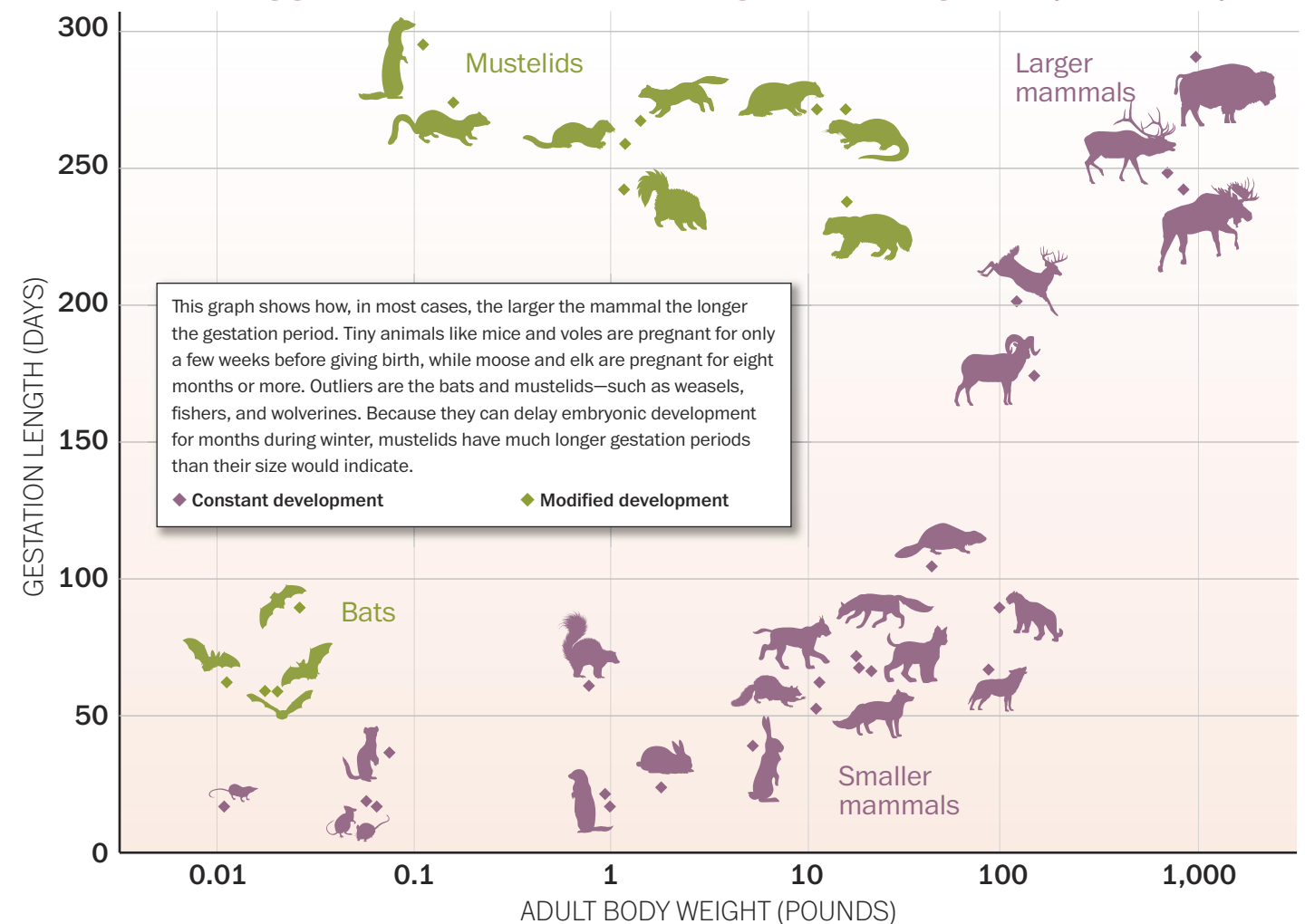
Montana's raccoons, for instance, have a gestation length of 63 days, so they begin breeding in late January to early February. That allows the young to be born as early as March, when temperatures become tolerable for the newborn kits and food becomes more abundant for the lactating mother.

If raccoons mated any later, the young would not be born in time to grow large and strong enough to face the upcoming winter.

#### DELAYS AHEAD

For most mammals, gestation continues unabated once conception occurs. But there are notable exceptions, mostly among the

### The Bigger the Animal, the Longer the Pregnancy (Usually)



LEFT TO RIGHT: TIM CHRISTIE; MEG SOMMERS; MASLOWSKI WILDLIFE PRODUCTIONS

mammal family known as the mustelids.

Montana's mustelids include the wolverine, northern river otter, fisher, pine marten, mink, black-footed ferret, and three weasel species. Many of these mammals have evolved to suspend gestation during the pregnancy by what's known as "delayed implantation." Here's how it works: After the egg has been fertilized, it reaches the blastocyst (embryonic) stage, becoming a tiny hollow ball of several thousand cells. Rather than implanting in the uterus, as normally occurs in pregnant mammals, the embryo floats freely in the uterine space for many months, increasing only slightly in size. Finally, the embryo attaches to the uterus and proceeds with normal fetal development.

For example, the long-tailed weasel breeds in July, when weather is warm and prey is abundant, but the blastocyst arrests its development shortly after forming, six to eight days after conception, floating in the uterus for roughly eight months until March. Then implantation occurs and development rapidly proceeds. The young are born in April, after a nine-month gestation. Though

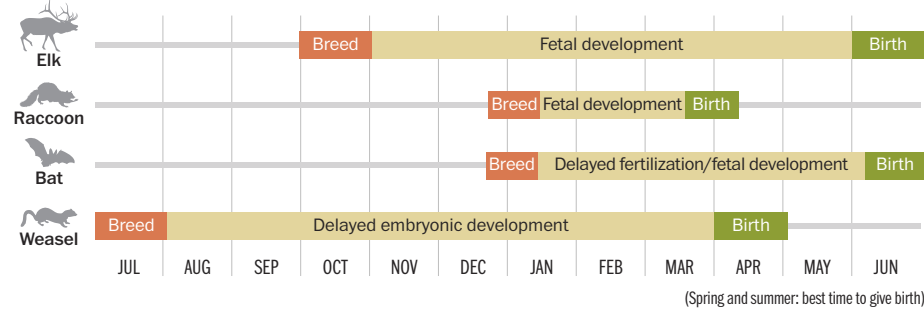


Western spotted skunk

### Reproductive research uncovers new skunk species

Until the 1960s, all of the spotted skunks found across the United States were considered to be the same species. Then Rodney Mead, a graduate student at the University of Montana, began looking at their reproductive biology and discovered something startling. Populations living in the western United States exhibited delayed implantation, breeding in late September and delaying their pregnancies so they could give birth in May. Yet spotted skunks found in states east of the Continental Divide bred in March, exhibited no delay, and gave birth in June. Thus, the eastern and western populations were reproductively isolated. With this information, Mead classified two species: *Spilogale gracilis* in the west and *S. putorius* in the east.

## Four Reproductive Strategies



**SPRINGTIME BIRTHDAYS** Most mammals want to bear young in the warm, fertile conditions of spring and summer. Because larger animals have longer gestation periods, they can't mate in early spring but must wait until fall. Other species, like weasels, delay embryonic development so they can both breed and bear young when prey is abundant.

the female is pregnant this entire period, her embryos are so tiny during most of the pregnancy that she doesn't need to expend much energy growing them.

Why do mustelids delay pregnancy and not breed in spring like other similar-sized mammals? For instance, you'd think that a long-tailed weasel, small as it is, could complete its entire reproductive cycle in one spring, as does the similar-sized Columbian ground squirrel. But young weasels need the extra month or two that delayed implantation provides in order to develop their hunting skills—something other small mammals, most of them herbivores, don't need to do.

Bears also undergo delayed implantation, though for years scientists weren't certain of

this. In 1983, I showed that black bears underwent this biological reproductive process by measuring the reproductive hormone progesterone in the blood of pregnant hibernating female bears. I learned that embryonic implantation occurs in late November while a bear is in its den, and that the young are born two months later, in late January. During the total gestation of roughly 225 days, delayed implantation takes place for 145 to 165 days. Other research worldwide has since shown that grizzlies and all other bear species follow the same pattern.

### STILL TOO COOL

Bats are another family of mammals with odd reproductive strategies. Several species in Montana breed in fall, or even winter as



**LACTATION STATION** Otter kits nurse for up to five months, requiring the mother to find abundant fish and other prey in spring and summer to support her milk production.

they enter hibernation, but then the female stores the sperm in her reproductive tract for several months without ovulating. She is able to warehouse sperm in this manner until determining when fertilization will occur and the pregnancy will begin. The female bat then simply ovulates, the sperm she has stored inside her fertilizes the egg, and a fetus begins to grow. Now things get really interesting.

Females of some species, like the Townsend's big-eared bat, slow down or speed up the rate of fetal development by adjusting their body temperature. At the cooler environmental temperatures of around 40 degrees F. in the abandoned mine or cave where the female hibernates during winter, development proceeds very slowly. As spring approaches, she raises her body temperature and exits the hibernation site to sample the environment.

If it's warming and flying insects are about, she'll return to the hibernation site and raise her body temperature further to quicken fetal development. But if the outside temperature is still cool, such as during a late spring, she'll lower her body temperature to reenter hibernation and slow down fetal development.

The female bat continues to regularly test the environment until deciding that spring has arrived and food is available. For Townsend's big-eared bats, this ability to delay development allows a female to vary her length of gestation from 56 to over 100 days, thus fine-tuning her pregnancy to meet a changing environment.

Why such a complicated reproductive strategy? We're still not sure. Bats are some of Montana's smallest mammals, they hibernate, and they require considerable energy (from eating insects) to support lactation. By adjusting fetal development, it appears that the female can reduce her energy demands while bearing her young at a time when insects are more abundant for her and the kits have time to mature before winter.

The need to reproduce is common among all mammals. But how each species goes about that process varies widely. These different reproductive strategies reveal amazing behaviors and adaptations that demonstrate the remarkable lengths Montana's wildlife will go to survive and thrive. 🐾



**RIGHT ON SCHEDULE** By breeding in fall, a cow moose can begin growing the fetus while her fat reserves are ample, then give birth in spring when vegetation is abundant to meet the "energetic costs" of lactation during the months when her calf is nursing.