

An overview of mammal phenology

What is phenology?

"Phenology" is derived from the Greek word *phaino*, meaning to show or appear. Phenology refers to recurring, seasonal, plant and animal life cycle stages, such as leafing and flowering, maturation of agricultural plants, emergence of insects, and migration of birds. It is also the study of these plant and animal life cycle stages, especially their timing and relationships with weather and climate. Naturalists, farmers and gardeners, herbalists and hunters have always been attuned to these seasonal changes, and so there is much country lore about annual cycles and co-occurrences. In some European countries, the national weather service collects citizen reports on phenological data about common species, and these data are used in advising farmers about when to plant and harvest. Records of these data have provided important evidence about changes in climate in New England and around the world, and have other scientific value, as well. This Brief provides basic background about key seasonal changes that are studied ("phenophases") in mammals; other Briefs detail specific methods for data collection. For more on mammal phenophases, see the USA National Phenology Network's guide to phenophases.¹

Mammal phenophases

Note that for mammals, much of their behavior, including seasonal behavior, is detectable by tracks and signs, rather than direct observation. There are several good guides to mammal tracks and signs available, including those by Mark Elbroch and Donald and Lillian Stokes.

Individuals active. The data for this may be direct sighting, or fresh? tracks, or scat, or hair/fur left on vegetation or the ground. There may be evidence of predation – partially eaten animals, chewed or gnawed plant material, etc.

Arrival of migrating individuals. In New England, the main migrants that can be observed are whales.

Calling.

Courting or mating.

Young visible.

Seasonal changes in appearance. Some mammals change their coat with the seasons – e.g. snowshoe hare, weasel. Antlers – over the course of the year, male deer and moose grow antlers, first covered with "velvet", then

¹ USA-NPN National Coordinating Office. 2012. *USA-NPN Plant and animal phenophase definitions*. USA-NPN Technical Series 2012-004. www.usanpn.org.

uncovered and "bony." After the mating season, the antlers are discarded, and may be found in the woods.

What does it mean? How does phenology tell us about climate?

Phenological events are triggered by environmental cues taking place during the year. Thus, one year's observations are interesting, but don't tell us about trends. If, however, a phenophase takes place earlier and earlier (or later and later) than reported in the past, it suggests that the organisms are reflecting a real trend or shift.

Beyond that, there are some species that are able to adjust their behavior to match the change in climate, and some that cannot. This means that seasonal events like bird migration and insect emergence will start to fall out of synchrony with flowering and fruiting. This causes problems for the animals that don't have food when they expect it, but also for plants that may not get pollinated, or may not have their seeds dispersed. Changes in seasonal temperatures can also lead to draining effort put into reproduction at the wrong time, reducing the ability of the organism to reproduce later in the year when success is more likely.

Very little research has been published so far on mammals' phenological responses to climate change (there is some more data available on species' extending or contracting their ranges). So there is much still to learn!