



Ice Age Fossils

in Pleistocene deposits of the Northeast



see *Glaciers*, p.57

One Maryland cave contained Pleistocene remains of vertebrates from a spectrum of climates:

Pleistocene mammals representing **northern climates** included wolverine, lemming, long-tailed shrew, mink, red squirrel, muskrat, porcupine, jumping mouse, pika, hare, and elk.

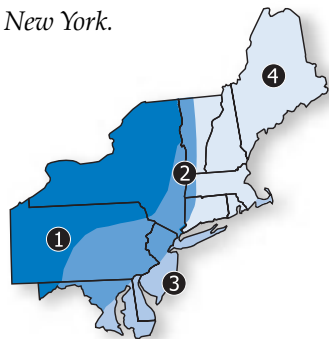
Pleistocene animals representing **southern climates** included bats, peccaries, tapirs, crocodiles.

Pleistocene animals representing an **intermediate climate** included: horses, coyotes, badgers, several species of bears, otters, pumas, beavers, smaller rodents, mastodons, and deers.



see *Glaciers*, p.61, for more on ice-margin deposits.

Over 100 mastodons have been recovered from Orange County, NY, which sits on the west side of the **Hudson** in southeastern New York.



Pleistocene deposits are like frosting over the rest of the geological layer cake. They follow mostly from Pleistocene climate and topography, so are in general less tightly controlled by bedrock than some other phenomena. Most terrestrial fossil remains are found either in ponds dating from the receding of previous glaciers or isolated teeth or bone fragments in glacial till. Some important faunas, however, are preserved in Pleistocene caves.

Terrestrial and Lake Fossils

Caves are an example in which the underlying geology, generally limestone, influences the Pleistocene record. Cave faunas are not terribly common in the Northeast, but are very important in some other areas of the country where caves are numerous. Important examples in the Northeast include a cave in Montgomery County, southeast PA, which produced a large number of glacial age mammals, described by Edward Drinker Cope (more famous for his dinosaur descriptions), including a species saber tooth cat, a small species of black bear, and the sloth *Megalonyx*. Another Pleistocene cave formed from Devonian limestone in Allegheny County, Maryland, included a wide range of mammals representing both **northern** and **southern climates**, as well as those of more **intermediate climates**, suggesting a biogeographic transitional zone in which the climate had fluctuated.

Important and extensive freshwater and terrestrial remains occur in the innumerable pond sediments (not in the least lithified into rocks) left behind after retreat of the last glaciers. These ponds are well known from areas that were covered with ice and glacial sediment, especially kettles that formed along moraines and other **ice-margin deposits**. The ponds with large vertebrate remains are not randomly distributed, but can be clustered around well-known drainage systems, such as along the **Hudson** River Valley. Since such pond sediments are not surface outcrops, and since there is no foolproof technology for searching for bones under the sediment, most skeletons turn up during construction or pond alteration rather than through systematic searches for remains. Large vertebrate remains include mastodons, mammoths, giant beavers, peccaries, tapirs, foxes, bears, seals, deer, caribou, bison, and horses.





Nearly all glacial-age ponds contain a rich fossil record beyond vertebrates. In a typical pond, the first sediment to fill up the pond is fine-grained clays, followed later by organic-rich clays due to sedimentation of plant fragments as plant communities started to colonize the area after the glaciers had retreated. These clays often have plentiful late Pleistocene small freshwater mollusks, small pieces of fossil wood, and pollen, increasing as the plant community increased. The topmost sediment is often very late Pleistocene or Holocene peat, essentially pure plant matter made of innumerable tiny sticks and larger branches, leaves, cones, and other plant material. Since pollen shapes are indicative of the kinds of plants they come from, the pollen record can give a rather detailed account of how vegetation moved into the area as climate changed.

MASTODONS & MAMMOTHS

Among the most common Pleistocene vertebrate fossils in the Northeast are those of mastodons and mammoths. People frequently confuse these two kinds of ancient elephants (or, more technically, proboscideans). Both were common in the Northeast in the Pleistocene, but they had different ecological preferences and are usually found separately; mastodons (Figure 4.32) are by far the more common of the two in most areas of the Northeast. Mammoths are from the same line of proboscideans that gave rise to African and Asian elephants; mastodons are from a separate line of proboscideans that branched off from the modern elephant line in the Miocene. In body proportions mastodons have a shorter, stockier build and longer body; mammoths are taller and thinner, with a rather high “domed” skull. In skeletal details, the quickest way to tell the difference is with the teeth: mastodons have teeth with conical ridges, a bit like the bottom of an egg carton; mammoths, in contrast, have teeth with numerous parallel rows of ridges. The teeth are indicative of the ecological differences: Mastodons preferred to bite off twigs of brush and trees, for example from spruce trees, while mammoths preferred tough siliceous grasses, thus mastodon teeth are more suitable for cutting, while mammoth teeth are more suitable for grinding (Figure 4.33).



Figure 4.33: A mastodon tooth, suited for cutting twigs of spruce trees.

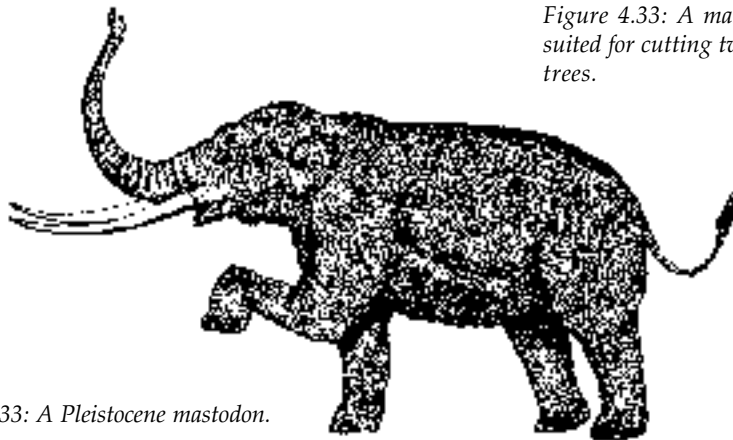
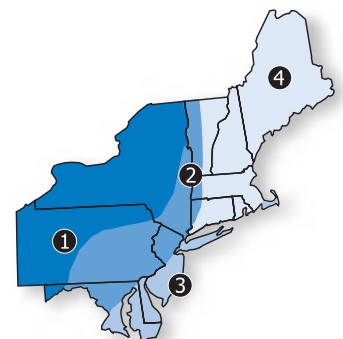


Figure 4.33: A Pleistocene mastodon.

One of the most complete and best preserved **mastodons** recovered to date in the Northeast was excavated by the Paleontological Research Institution in late summer, 2000. It was found when a family in a suburban neighborhood, in Hyde Park near Poughkeepsie, NY, was deepening their backyard (glacial-age) pond. Other mastodons have been found near Rochester, Buffalo, and Albany, New York, and Amherst and Cambridge, Massachusetts (just to name a few.)





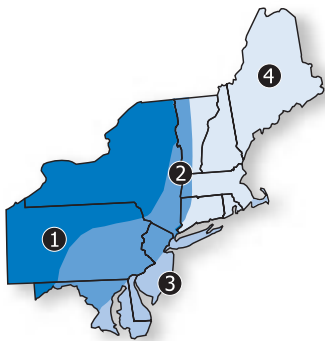
Fossils



see *Glaciers*, p.65,
for more on
rebounding crust.

The **Charlotte beluga whale** can be seen in the University of Vermont's Perkins Museum of Geology. Today about 500 beluga whales live in the Gulf of the St. Lawrence.

Other common fossils in the **Champlain Sea** include marine clams that today can be found living in cool Atlantic and Arctic Ocean waters. Other invertebrates include barnacles, gastropods, and sponges. A number of species of marine fish have been found as fossils, such as the Atlantic cod, which on the whole are most similar to fish in the southern coast of Labrador today. Several species of seals that breed on sea ice have been found, such as the harp seal, bearded seal, and ringed seal.



Marine Fossils

One can visit places in the Northeast where sea level rise outpaced the rebounding continental crust after meltback of the glaciers, flooding lowlands such as areas of Massachusetts and along the St. Lawrence Seaway. The Champlain Sea refers to an ocean bay that filled most of the Ottawa-St. Lawrence-Lake Champlain basin about 11,000 to 8,000 years ago. The fossils from these sediments are so recent that most or all are represented by living populations today, but mostly in more northerly, cooler locations. Lowland areas of the coastline in southern Maine are covered with glacial marine clay dating to about 11,000 years ago that also contain marine bivalves and other marine invertebrates.

The most celebrated fossil from the **Champlain Sea** deposits has been the '**Charlotte whale**,' a specimen of the modern beluga whale, found in Chittendon County, Vermont in 1849 by workers digging a railroad. Though initially shocked to find whale remains so far inland, it eventually became apparent that the whale had come down the St. Lawrence Seaway at a time that this area had been flooded with sea water. The Champlain Sea extended into New York, where a fossil beluga whale was also discovered in 1987. Other whale remains found have included the harbor porpoise, humpback whale, finback whale, and bowhead whale.

How old does it have to be?

Fossils are any evidence of ancient life, whether shell, its imprint, or the trace made by a moving animal. Dictionary definitions often suggest that fossils are such remains greater than 10,000 years old. Popular conception holds that some process, such as permineralization (infilling of cavities and replacement by minerals), must occur for an object to be considered a fossil. The latter is not true — Pleistocene shells and bone materials are frequently nearly indistinguishable from modern material, except in some cases through color changes, such as by leaching of color or staining from tannins and iron in the sediment. The former (10,000 years) may be true by definition, but is only a practical guideline. Those studying successions of plant or animal remains since the last glaciation, from 20,000 years ago to the present, would not recognize any sudden change in the material at 10,000 years, and would typically refer to all material buried in sediments as fossil material. A compromise is to call younger material "subfossils," especially if they are in sediment that is still prone to movement by currents and burrowing organisms (as in surface sediment in shallow aquatic environments).

