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Geography 920
Lab 1: Exploring Neotoma

Question 1: Devils Lake has a latitude of 43.4178 and a longitude of -89.73205. The site ID is 666.

Question 2A: Louisiana is the state east of the Rockies that had the southernmost location of *Picea* during the last glacial maximum.

Question 2B: New York is the state east of the Rockies that had the southernmost location of *Picea* over the last 1000 years.

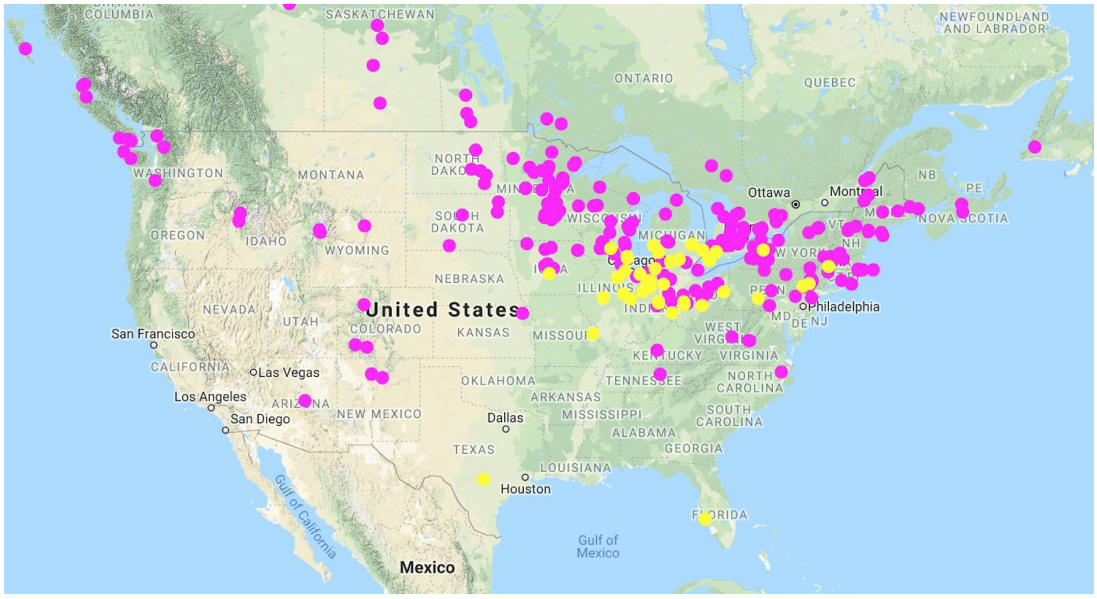
Question 3: Lou Maher has worked in Wisconsin, Iowa, Colorado, and New Mexico.

Question 4A: The search for pollen datasets across North America returned 3211 sites and 3768 datasets.

Question 4B: It took approximately 10,000 person years and 100 million dollars to generate the North American fossil pollen records now stored in Neotoma.

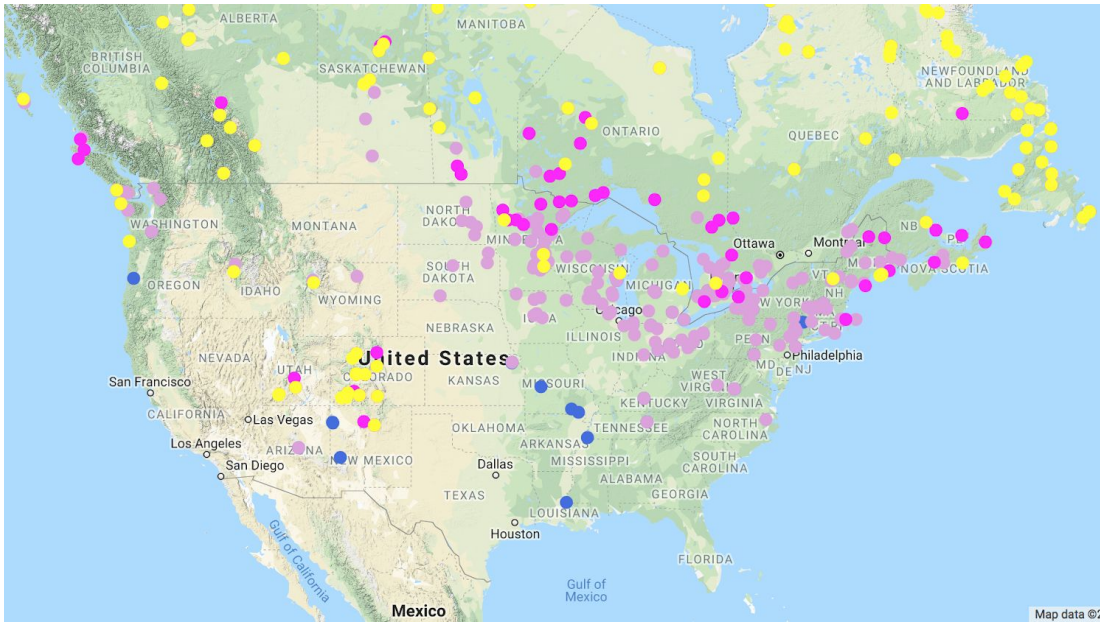
Question 5: There is such a dense network of fossil pollen records stretching from Minnesota to Nova Scotia because this region contains many lakes, which are ideal for obtaining sediment cores and producing paleoecological records. (Minnesota is the land of 10,000 lakes!)

Question 6:



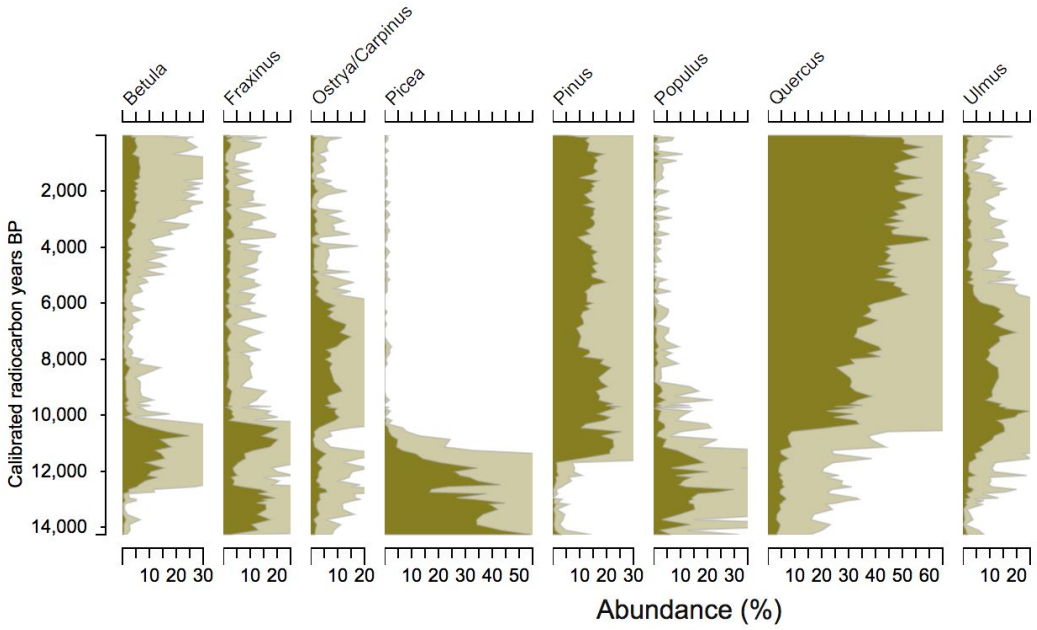
Mastodon tend to live in places with spruce. This might be because mastodons are large herbivores that fed on the needles and branches of conifers like spruce. This might also be because spruce trees thrive in cold habitats, and mastodons are cold-adapted animals that also prefer these habitats.

Question 7:



From 21,000 to 18,000 years ago, *Picea* was distributed across eastern North America, occurring as far North as Minnesota and as far South as Louisiana. Between 15,000 to 12,000 years ago, the *Picea* distribution shifted north into Canada, while Tennessee was the southernmost state containing *Picea.* From 10,000 to 7,000 years ago, *Picea* shifted even further north, with most sites containing *Picea* located in Canada, while New England and Minnesota were the only remaining regions in the U.S. with *Picea.* The distribution of *Picea* remained similar from 5,000 to 1,000 years ago, with a few additional sites showing *Picea* further south in Minnesota, Wisconsin, and Michigan. Warming across North America and the melting of the Laurentide ice sheet might explain these changes in *Picea* distributions from 21,000 to 1,000 years ago. As temperatures increased across North America, the trees likely shifted north to remain in colder habitats. Although trees are sessile organisms, wind can help trees shift their range by blowing their seeds to new locations. If seeds are blown to a region that is favorable for survival, like a colder region for *Picea,* they will grow into saplings and eventually mature into full trees.

Question 8:



The most abundant plant taxon at Devils Lake during the end of the Pleistocene was *Picea.* The most abundant plant taxon during the Holocene has been *Quercus.*

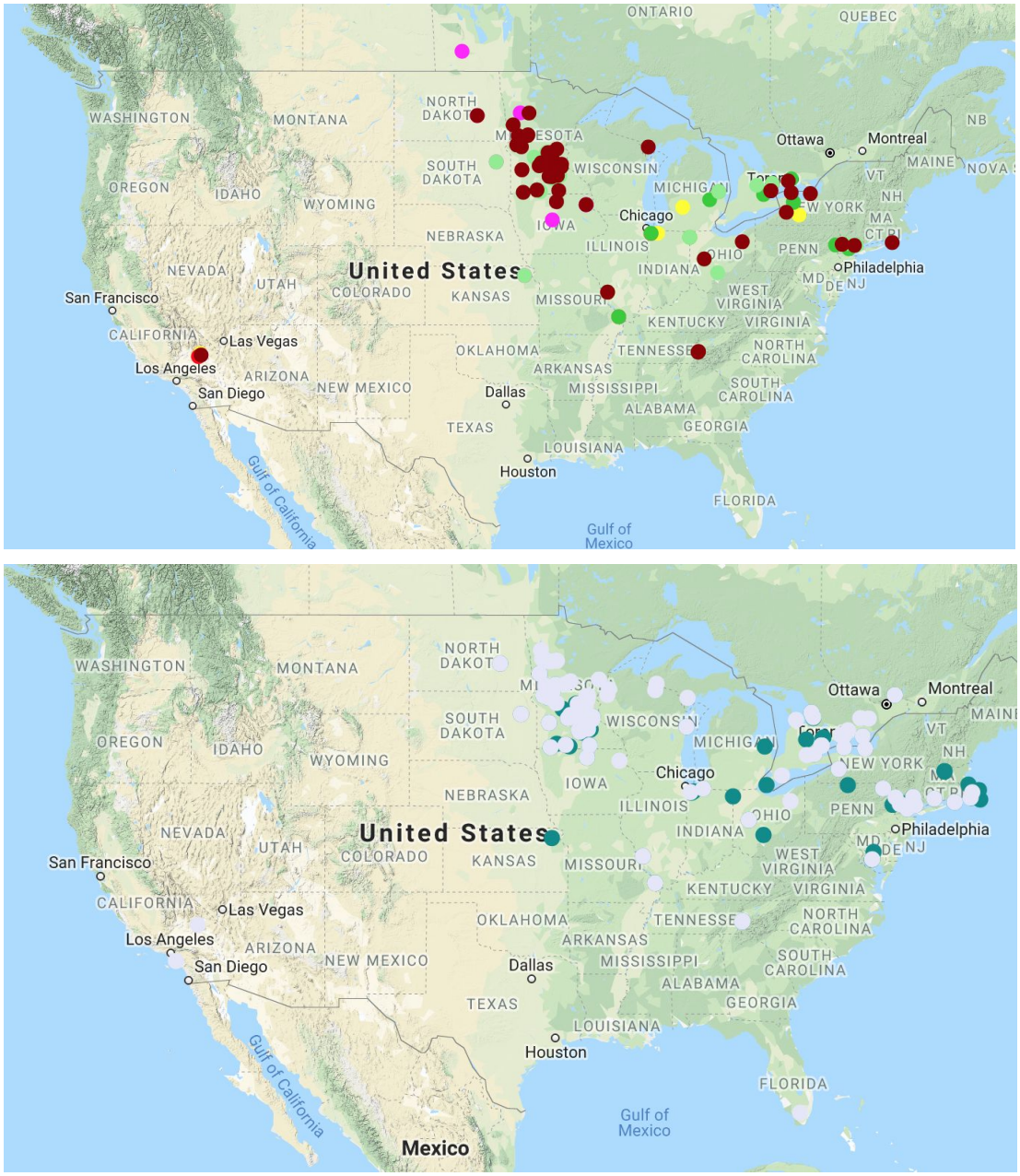
Question 9: Based on the chronology tab, there are 11 age controls stored for Devils Lake and 10 of these are radiocarbon dates.

Question 10: There are two publications listed for Devils Lake. The first is: “The palynology of Devils Lake, Sauk County, Wisconsin” by L.J. Maher (1982) and the second is: “University of Wisconsin radiocarbon dates XVII” by M.M. Bender, D.A. Baerreis, and R.A. Bryson (1980).

Question 11: *Quercus* is the most abundant taxon at a depth of 1 cm. Although the pollen was not counted at this exact depth, it was counted at 0.5 cm and 2 cm and *Quercus* was the most abundant taxon at both of these depths.

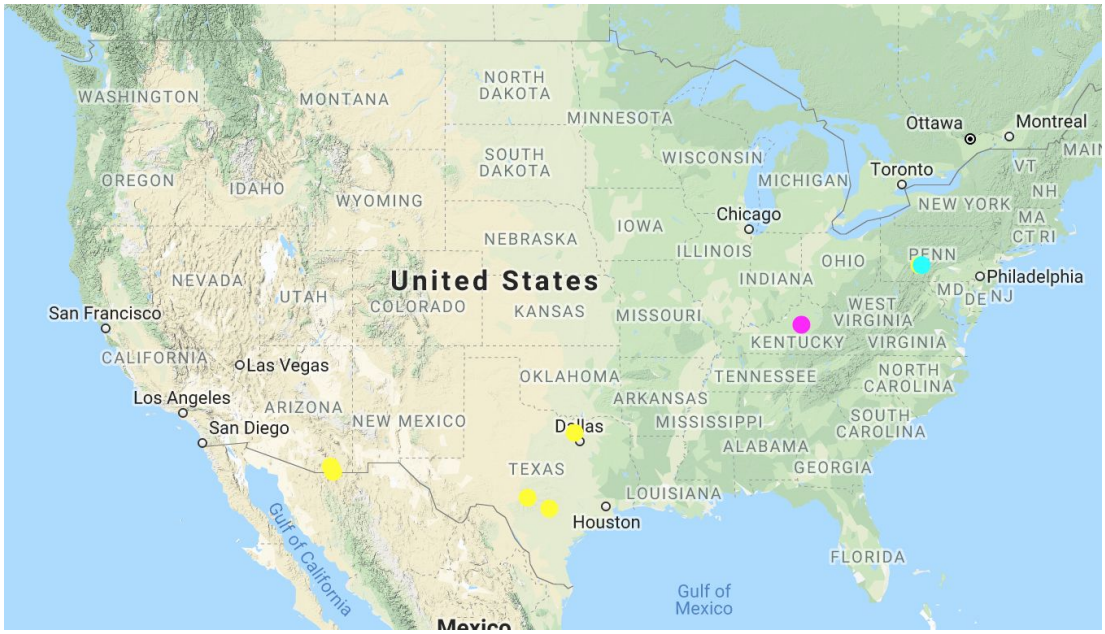
Question 12: I was curious to conduct some searches over smaller timescales, so I decided to look at the human-induced *Ambrosia* rise over the past several hundred years and see if datasets in Neotoma would portray this rise. I first searched from 8,000 to 5,000 years ago, then from 4,000 to 1,000 years ago, and found only around 10 sites with *Ambrosia* above 20%. Next I moved onto a smaller time interval and searched from 900 to 500 years ago, but there were still only 9 sites with *Ambrosia* above 20%. I decreased my time intervals even more and the results started to show an increase in the number of sites with *Ambrosia* above 20%. For example, from 100 to 50 years ago, 40 sites show *Ambrosia* above 20% and from 50 years ago to the present, more than 50 sites show *Ambrosia* above 20%. I then tried the searches again

with a lower percentage, 10%, and detected significantly more sites with *Ambrosia* -- there are about 100 sites showing *Ambrosia* at this level over the past century.



I also searched for a species of megafauna, the dire wolf, and found one cave with dire wolf fossils between 18,000 and 16,000 years ago, another cave with dire wolf fossils between 16,000 and 14,000 years ago, and 6 sites with dire wolf fossils between 14,000 and 12,000 years ago. After this, the search did not return any more sites with dire wolf, possibly indicating that the species went extinct in North America. Since the majority of the dire wolf fossils were discovered in Texas, I was curious to see what kind of vegetation covered this region while the wolves were present. I used the advanced search tab to search by geopolitical unit and found

13 sites in Texas with pollen datasets. After looking at several pollen diagrams, it became clear that *Alnus* and *Cyperaceae* were the dominant taxa in Texas while dire wolves lived in the area.



Patschke Bog (Site 1803)