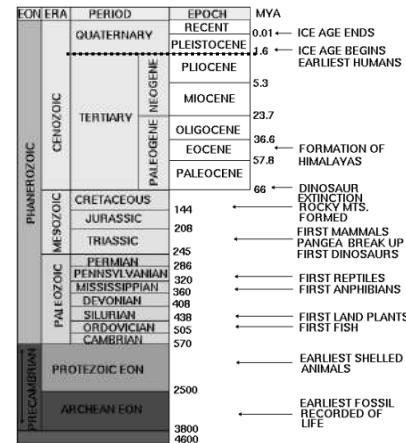


Pleistocene - the Ice Ages



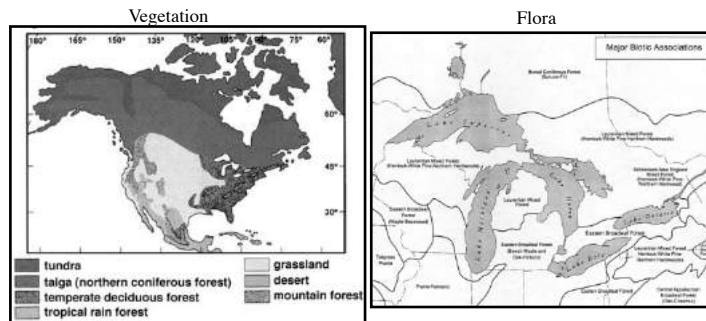
Sleeping Bear Dunes National Lakeshore

Pleistocene - the Ice Ages



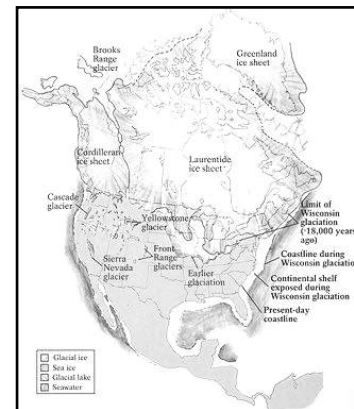
- Stage is now set to understand the nature of flora and vegetation of North America and Great Lakes
- Pliocene (end of Tertiary) - most genera had already originated (in palynofloras)
- Flora was in place
- Vegetation units (biomes) already derived

Pleistocene - the Ice Ages

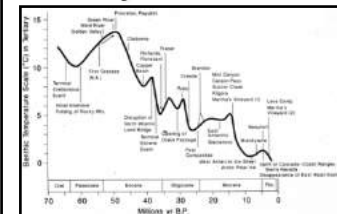


The vegetation and flora as we see it now (Holocene) was dramatically affected by Pleistocene events

Pleistocene - the Ice Ages



- In the Pleistocene, earth experienced intensification towards climatic cooling
- Culminated with a series of glacial-interglacial cycles
- North American flora and vegetation profoundly influenced by these "ice-age" events



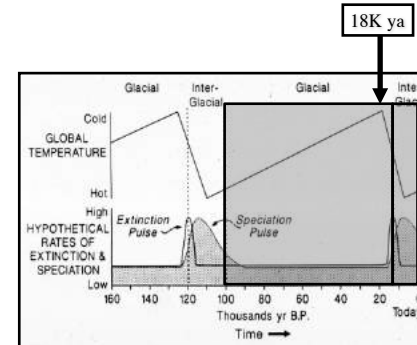
Pleistocene - the Ice Ages



- In the Pleistocene, earth experienced intensification towards climatic cooling
- Culminated with a series of glacial-interglacial cycles
- North American flora and vegetation profoundly influenced by these “ice-age” events
- Wisconsin glacialiation (last epoch) most important
- Assembly of flora and vegetation of most Great Lakes was during the late Pleistocene and Holocene - (18,000 years ago to present)

Pleistocene - the Ice Ages

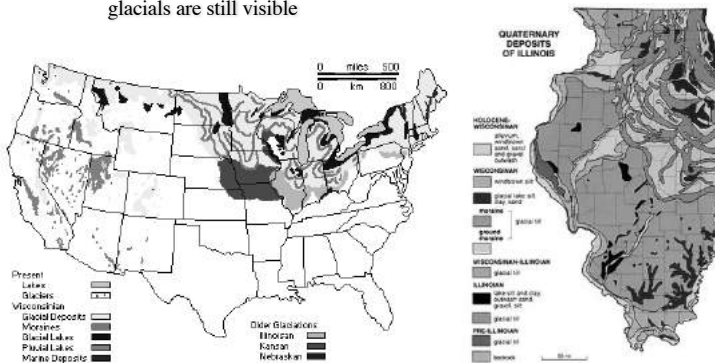
What happened in the Pleistocene?



- Holocene (Recent) - the present interglacial started ~10,000 ya
- Wisconsin - the last glacial (Würm in Europe) occurred between 115,000 ya - 10,000 ya
- Height of Wisconsin glacial activity (most intense) was 18,000 ya - most intense towards the end of the glacial period

Pleistocene - the Ice Ages

Prior to the Wisconsin glacialiation, the evidence for three other glacials are still visible



Pleistocene - the Ice Ages

What happened in the Pleistocene?

Maximum extent of Wisconsin glacial activity at 18,000 ya

- 2-3 mile thick ice causing downwarping on crust
- Northern Canada has risen 300 meters in rebound since end of Wisconsin
- Hudson Bay should eventually disappear before next glaciation as rebounding still occurring



Pleistocene - the Ice Ages

What happened in the Pleistocene?

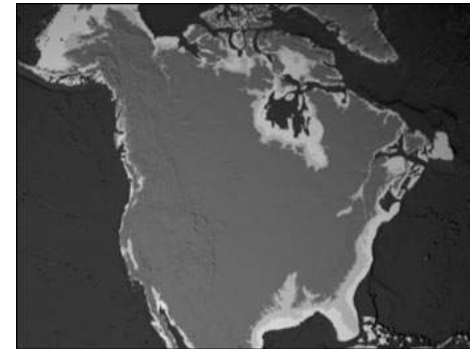
- slower earth rebound than ice melt
- St. Lawrence Seaway had major invasion of salt water almost into Great Lakes
- allow for coastal maritime species entry into Great Lakes?



Pleistocene - the Ice Ages

What happened in the Pleistocene?

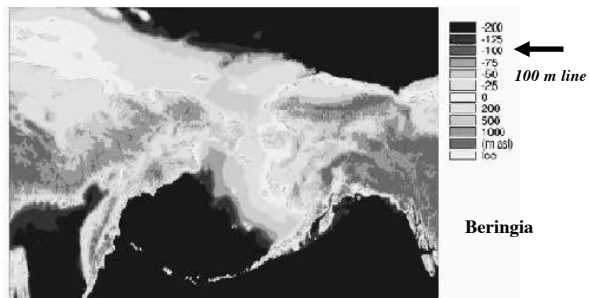
- up to 100 meter drop in sea level worldwide
- coastal plains become extensive



Pleistocene - the Ice Ages

What happened in the Pleistocene?

- up to 100 meter drop in sea level worldwide
- coastal plains become extensive
- continental islands disappeared and land bridges exposed

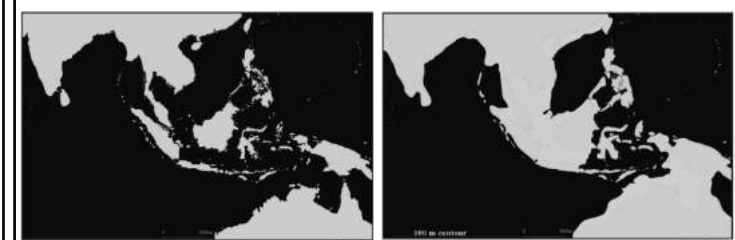


Pleistocene - the Ice Ages

What happened in the Pleistocene?

- up to 100 meter drop in sea level worldwide
- coastal plains become extensive
- continental islands disappeared and land bridges exposed

Malaysia to Asia & New Guinea and New Caledonia to Australia



Present Level

100 m Level

Pleistocene - the Ice Ages

What happened in the Pleistocene?

- up to 100 meter drop in sea level worldwide
- coastal plains become extensive
- continental islands disappeared and land bridges exposed

Great Britain to Europe



Pre-Pleistocene connection



Late Pleistocene English Channel formation

Pleistocene - the Ice Ages

What happened in the Pleistocene?

Ice-free Areas in North America

- North America south of glaciers
- Beringia, much of Alaska, Siberia
- Coastal plains, steep coastlines of Pacific northwest
- Wisconsin Driftless Area - never completely surrounded by ice



Historical composite of all glacial advances in the Pleistocene epoch. The Driftless Area was never completely surrounded by ice at any one time.

Pleistocene - the Ice Ages

What happened in the Pleistocene?

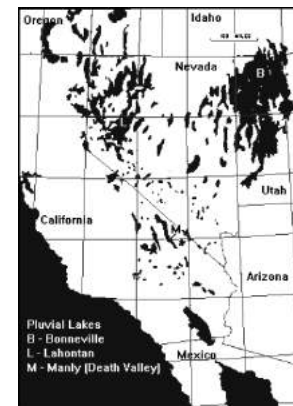
Maximum extent of Wisconsin glacial activity at 18,000 ya

What was happening south of the glacial maxima?



Maximum extent of glaciation in the most recent or Wisconsin stage (Pleistocene epoch).

Pleistocene - the Ice Ages



- Jet stream (and moisture) deflected south of glaciers
- Large Pluvial Lakes formed - later disappeared and formed salt flats or deserts

- Lake Bonneville (300 m deep)
- Lake Lahontan
- Lake Manly

Pleistocene - the Ice Ages



Lake Bonneville is now the Great Salt Lake in part

- Jet stream (and moisture) deflected south of glaciers
- Large Pluvial Lakes formed - later disappeared and formed salt flats or deserts
 - Lake Bonneville (300 m deep)
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Pleistocene - the Ice Ages



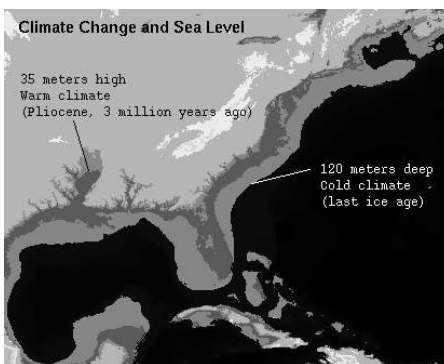
Oxystylis lutea
Capparaceae



- Jet stream (and moisture) deflected south of glaciers
- Large Pluvial Lakes formed - later disappeared and formed salt flats or deserts
 - Lake Bonneville (300 m deep)
 - Lake Lahontan
 - Lake Manly

Lake Manly is now Death Valley
- are the **generic** endemics to Death Valley of recent origin?

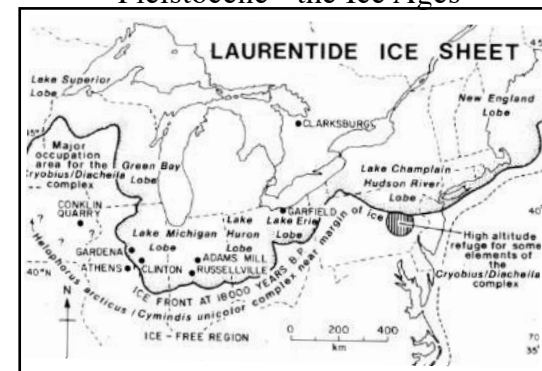
Pleistocene - the Ice Ages



What was happening south of the glacial maxima?

- Coastal plain (extensive) emerges on continental shelf with sea water drop

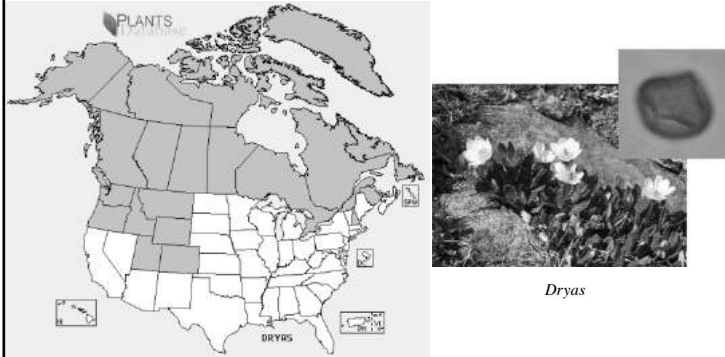
Pleistocene - the Ice Ages



Wisconsin glaciation reached a climax at 18,000 years ago

Tundra conditions existed at the margins of ice lobes. *Dryas* (Rosaceae), *Helophorus arcticus* (water scavenger beetle), *Cymindis unicolor* (alpine ground beetle)

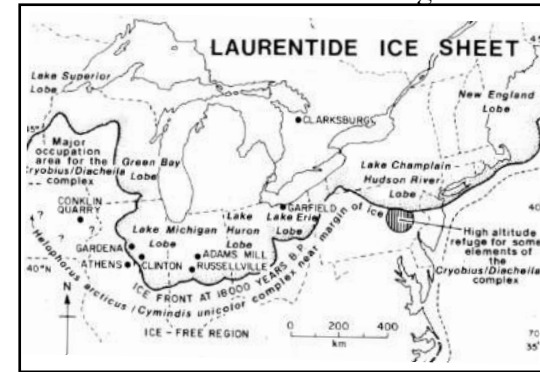
Pleistocene - the Ice Ages



Dryas

Tundra conditions existed at the margins of ice lobes. *Dryas* (Rosaceae), *Helophorus arcticus* (water scavenger beetle), *Cymindis unicolor* (alpine ground beetle)

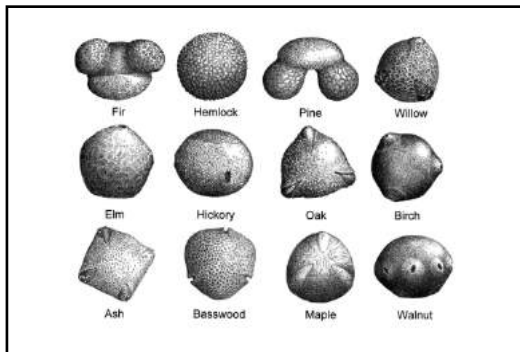
Pleistocene - the Ice Ages



Wisconsin glaciation reached a climax at 18,000 years ago

Tundra conditions existed at the margins of ice lobes. How do we know what vegetation/flora existed south of the glacial maxima?

Pleistocene - the Ice Ages



Paleobotanists have been aided by the record of plant remains in lakes and bogs. Pollen (especially from trees) is the single most important record that has been used to identify vegetation/flora at a site and track vegetation changes following ice retreat.

Pleistocene - the Ice Ages



Yearly deposits accumulate in lake bottoms to be covered by silt in layers, or in bog peat strata

