



Paleoclimates and Pollen

Student Activity Sheet 1 – Battle Ground Lake, Washington

DIRECTIONS ► Follow the steps below to learn about past climates by counting pollen grains in sediment samples from a lake.

1. Empty the contents of your sediment layer sample into the pie pan.
2. Sift through the sample to separate out the pollen from the sediment.
3. Determine from the pollen key (Table 1) what species of plants are represented in your sediment layer sample.
4. Determine what percentage of the total pollen comes from each species in your sediment layer and record in the data collection worksheet.
5. If there is time, examine another sample so that each sediment layer is examined by at least two groups.
6. Get together with another group that analyzed the same layer(s) as your group and come to a consensus on what plants you found and the relative abundances. The worksheet can be used to keep track of the percentage of plants found in each layer.

Use the key (Table 1) to come to a consensus on what the climate must have been like at the time of deposition.

When you are finished, please replace the pollen samples in the sample bags with the sediment material so that the samples can be used again!



Table 1: Pollen Key and Climatic Characteristics of the Vegetation for Battle Ground Lake, Washington

Color or Shape Code	Plant Species	Climatic Characteristics
A	western hemlock	Principal dominant tree of many lowland, temperate sites. Requires very moist, temperate conditions for growth.
B	Douglas fir	Broadly distributed throughout the Pacific Northwest from moderately cool to warm sites. Grows best under temperate, somewhat moist conditions.
C	grasses & sedges	These grasses and sedges are typically found in very cool alpine/subalpine meadow sites characterized by very cool summers, harsh winters, and short growing seasons.
D	alder	Widespread throughout the Pacific Northwest, often colonizing gravel bars or other poor soils, prefers abundant water and can grow in cool climates.
E	grand fir	Found at mid-elevations in the Cascade mountains. Grows in cool climates, but not as cold tolerant as trees found at higher altitudes.
F	Engelmann spruce	Found in cold, usually sub-alpine sites.
G	western cedar	Found only in temperate, very moist climates.
H	lodgepole pine	Found in areas of very cool climates typically growing on poor soils, often at high altitudes (above 3,500 feet) under the present climate.
I	mixed meadow species	This pollen is typical of a mixture of herbaceous plants common to warm - temperate meadowlands, such as the Willamette Valley in Oregon. Typically, these species grow in areas of warm summer temperatures and summer drought.
J	oak	Found in warm - temperate sites characterized by dry, warm summers such as Oregon's Willamette Valley south into California.
K	alpine sagebrush	Woody, low-growing shrub related to the sagebrush of eastern Washington and Oregon. Found only at high-altitude, cold sites.



Data Collection Worksheet: Plant Species by Sediment Layer for Battle Ground Lake, Washington

Plant Species	Sediment Layer				
	1	2	3	4	5
western hemlock					
Douglas fir					
grasses & sedges					
alder					
grand fir					
Engelmann spruce					
western cedar					
lodgepole pine					
mixed meadow species					
oak					
alpine sagebrush					



Paleoclimates and Pollen

Student Activity Sheet 2 – Black Hawk, Colorado

Directions: Follow the steps below to learn about past climates by counting pollen grains in sediment samples from a lake.

1. Empty the contents of your sediment layer sample into the pie pan.
2. Sift through the sample to separate out the pollen from the sediment.
3. Determine from the pollen key (Table 2) what species of plants are represented in your sediment layer sample.
4. Determine what percentage of the total pollen comes from each species in your sediment layer and record in the data collection worksheet.
5. If there is time, examine another sample so that each sediment layer is examined by at least two groups.
6. Get together with another group that analyzed the same layer(s) as your group and come to a consensus on what plants you found and the relative abundances. The worksheet can be used to keep track of the percentage of plants found in each layer.

Use the key (Table 2) to come to a consensus on what the climate must have been like at the time of deposition.

When you are finished, please replace the pollen samples in the sample bags with the sediment material so that the samples can be used again!



Table 2: Pollen Key and Climatic Characteristics of the Vegetation for Black Hawk, Colorado

Color or Shape Code	Plant Species	Climatic Characteristics
A	ponderosa pine	Long-needled pines, ponderosas occupy warm, dry slopes. It is the dominant forest tree of the western North American montane zone.
B	meadow grasses and wildflowers	Growing in warm summer temperatures and summer drought, this pollen is a mixture of herbaceous plants common to warm - temperate meadowlands.
C	aspen	The most widely distributed tree in North America. It lives in many soil types and is a pioneer tree after forest fires. Short-lived, it is replaced by conifers. Aspens can live in riparian areas (water present), but cannot withstand the damage from deep snow pack.
D	Engelmann spruce	Found in cold, usually sub-alpine sites. It is an important timberline species in the Rocky Mountains.
E	limber pine	Enduring the harshest of climates, these pines live high on ridge tops, where extremes in weather are the norm - strong winds, cold temperatures, drought, and poor soils.
F	lodgepole pine	Found in areas of very cool climates typically growing in poor soils, often at high altitudes under the present climate.
G	bristlecone pine	Growing close to and in association with the lodgepole pine, these trees survive the harshest of temperatures and climates.
H	Douglas fir	Sharing a montane (mountain side forest) habitat with the south facing ponderosa open pine forests, the Douglas fir is usually found on the north slope. It prefers moderately cool to warm sites, growing best under temperate moist conditions.
I	sedges and mosses	The pollen from these low growing plants is often found in very cool alpine/subalpine meadow sites, characterized by very cool summers, harsh winters, and short growing seasons.
J	alpine grasses and daisies	These low growing plants are typically found in cool, moist, short summers and cold winters. They are usually found in higher altitudes.
K	willows	Often found in the broad glaciated areas of the subalpine and montane zones, willows grow avidly in wetland or riparian areas. Their habitat is one of transition, often being replaced by the spruce-fir forests.
L	alpine sage	A woody, low-growing shrub, related to the sagebrush on our prairies, this plant is found only at high-altitude, cold sites.



Data Collection Worksheet: Plant Species by Sediment Layer for Black Hawk, Colorado

Plant Species	Sediment Layer					
	1	2	3	4	5	6
meadow grasses & wildflowers						
aspen						
limber pine						
lodgepole pine						
sedges & mosses						
ponderosa pine						
Engelmann spruce						
bristlecone pine						
Douglas fir						
willows						
alpine grasses and daisies						
alpine sage						