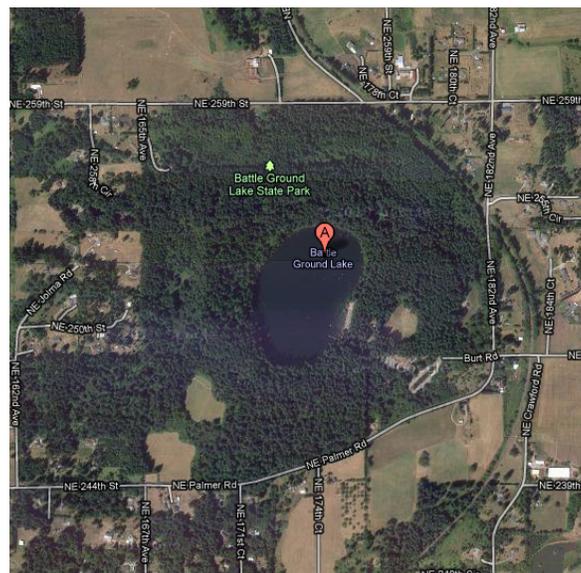
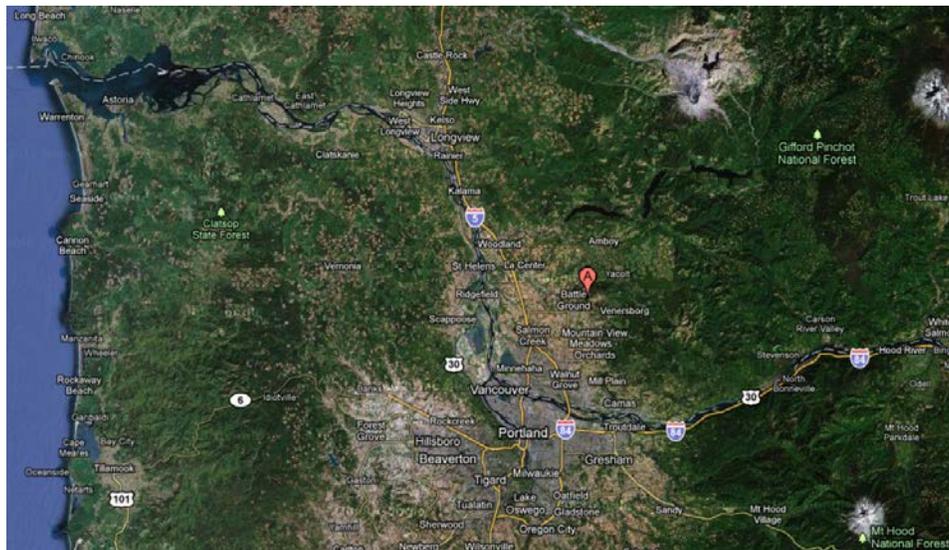


The Paleoclimate of Battle Ground Lake, Southern Puget Trough, Washington State

The research site is located 30 km north of the Columbia River, in Clark County Washington, near the town of Battle Ground.

The lake has been in existence for at least the last 20,000 years and has continuously accumulated sediments through most of that time. Trapped in the sediments are pollen grains from the plants that grew in the general vicinity of the lake at the time the sediments were deposited. By examining the pollen in different layers of sediment from the bottom layer to the top, we can reconstruct the vegetation changes that have occurred in the area during the lake's existence. Because we know something about the climatic conditions that the plants needed to survive, we can use the vegetation data to reconstruct the past climate in the area for the entire 20,000-year period.

Many layers have been identified by paleoclimatologists. For the sake of simplicity, we will combine these into five major layers. The age of each layer has been established by radiocarbon dating and by reference to volcanic ash layers of known age from Mt. St. Helens and from the explosion of Mt. Mazama (now Crater Lake in Oregon).



Layer	Time Period	Description
#1	4,500 years before present (ybp) - Present	A cooler and moister period than the previous one. The dry-land vegetation is replaced by the extensive closed coniferous forests seen today, with hemlock and western red cedar dominating the areas of forest undisturbed by logging.
#2	9,500 - 4,500 ybp	The climate continues to warm with mild, moist winters and warm, dry summers predominating. The forests of the previous period (which needed cooler, moister conditions) disappear to be replaced by more drought-adapted mixed oak, Douglas fir, and a dry meadowland community. Today, such vegetation is typical of areas of the Willamette Valley of Oregon that have escaped cultivation.
#3	11,200 - 9,500 ybp	The warming continues and the first occurrence of "modern," temperate coniferous forest is found in this period as Douglas fir, alder, and grand fir dominate in forests not unlike those that occur today. The climate is similar to today's climate as well.
#4	15,000 - 11,200 ybp	Glaciers have begun to recede as the climate starts a warming trend. Although still cold in comparison to the present climate, the warming has progressed enough to allow more extensive forests of lodgepole pine, Engelmann spruce, and grand fir to replace the tundra vegetation in an open woodland setting. Further north in the northern and central Puget Lowland, the glacial recession has opened up many new areas to plant colonization, and lodgepole pine has invaded these new areas.
#5	20,000 - 15,000 ybp	Glacial maximum, with nearly a vertical mile of ice over the site of Seattle, and the continental glaciers extending south of the present site of Olympia. An alpine glacier from Mt. St. Helens extended down the Lewis River Valley to within 30 km of the lake site. The lake area climate was cold, with a short growing season. The landscape resembled an arctic/alpine tundra, with alpine grasses/sedges, low woody shrubs, and scattered tree islands of cold-tolerant Engelmann spruce and lodgepole pine dominating the meadows.

Reference: Barnosky, C. W., 1985. Late quaternary vegetation near Battle Ground Lake, southern Puget Trough, Washington. *Geological Society of America Bull.*, **96**, 263 - 271.