

**BYBEE LAKE**  
Multnomah County  
Willamette/Sandy Basin

**LOCATION**

Area 250 acres (101.2 hect) Elevation 9 feet (2.7 meters)  
Type natural lake Use waterfowl habitat, limited recreation  
Location between NW city limits and Columbia River  
Access via Columbia Slough  
USGS Quad. Portland, Ore-Wash (7.5 min.)  
Coordinates 45 deg, 36 min, 57 sec N; 122 deg, 44 min, 31 sec W  
USPLSS township 2N, range 1W, section 25

**DRAINAGE BASIN CHARACTERISTICS**

Area indeterminate Relief low Precip. 38 in (97 cm)  
Land use by Forest Range Water Irr. Ag. Non Irr. Ag. Urban Other  
type (%)  
Notes wetlands and urban/industrial land uses

**LAKE MORPHOMETRY**

Area 250 acres (101.2 hect) Depth - Maximum Average  
Ave/Max Depth Ratio - Volume 250 acre ft (.31 cu hm) 1 ft (.3 m)  
Shoal Area 100% Volume Factor 1.15 Shape Factor 2.6  
Length of Shoreline 5.9 mi (9.5 km) Retention Time indet.  
Notes data at low water level from USGS bathymetric map, 9/10/74

**WATER QUALITY DATA**

Sample Date 6/22/82 Temp. 69.8 F (21 C) pH 8.4  
Transparency 3.6 ft (1.1 m) Phosp. (mg/l) 0.030 Chlorophyll a (ug/l) -  
Alkalinity (mg/l) 65 Conductivity (umhos/cm) 147 Diss. Oxygen (mg/l) 12.0  
Major ions Na K Ca Mg Cl SO4  
(mg/l) - - - - - 804  
Trophic Status eutrophic - high nutrient concentrations



Source: Oregon National Guard, 1981-82. View looking northwest.

Smith and Bybee Lakes are located in the northwest corner of the city of Portland, and sit in the midst of an industrial area near a sewage treatment plant, a sanitary landfill, and fill material from past dredging activities in the Columbia River. Very little recreational use is made of the lakes, in part because access is very difficult. Most of the surrounding land is privately owned. Easiest access is by boat from the Columbia Slough, and small boats can be put into the slough from several rights-of-way off North Portland Road. There is some warm water fishing in Bybee Lake, but to date no attempt has been made to develop a fishery.

The lakes are considered to be part of the Columbia Slough hydrologic system. Bybee Lake is connected to the Willamette River via the slough, and a narrow channel connects Smith Lake to Bybee Lake. Water levels in the shallow lakes are controlled by the level of the Columbia River and to a lesser extent (shorter durations in the winter) by the Willamette River. The average tidal-modified river fluctuations in Columbia Slough are estimated to be three feet and a significant amount of tidal flushing occurs in Bybee Lake, but not in Smith Lake. In late summer, Bybee Lake drains almost entirely during low tide and may reach a depth of more than four feet at high tide. In winter the lakes receive water from precipitation and Willamette River floods, although high Columbia River flows occasionally pulse in. These sporadic peak flows may cause the lakes to reflood temporarily. They fill during the May to July freshet on the Columbia River, then slowly drop as tides permit. After the month of June, water losses from Smith Lake are primarily by evaporation, and it typically has no standing water by the end of August, unlike Bybee Lake which is influenced by daily tides.

Hydrologic modifications of Smith and Bybee Lakes have been numerous in the last few decades (Corps of Engineers 1982b). Until about 1940 the lakes were totally open to Columbia River influence. Tidegates and weirs were then installed at the outlets of both lakes, and in 1956 they were individually blocked by culverted earthen plugs. The Bybee Lake plug was removed in 1967 and in the next year the Smith Lake plug was relocated about 250 feet farther upstream in North Slough. In 1973 the Smith Lake plug was partially removed and a four-foot wide ditch was excavated to connect a swale near the upper end of North Slough with Bybee Lake when the Columbia River stage is greater than seven feet. On 8/31/82 a potentially significant change was effected on the hydrology of the two lakes. A water control structure was placed on the Columbia Slough near Bybee Lake by the Port of Portland at the request of the U. S. Fish and Wildlife Service. When in operation, tidal flushing of Bybee Lake on a daily basis would be eliminated, and regular annual winter and late spring flooding would be reduced. Water fluctuations in both Smith and Bybee Lakes would be controlled and approximately 1100 acres of year-round lake surface would be formed, to be filled by rain water unless high water tops the banks of North Slough or the plug. A primary purpose of this modification is to avert epidemics of avian botulism, which have occurred in ducks around the lakes. Some game officials fear a spread of the disease to Sauvie Island (Corps of Engineers 1982b).

No management plan for fish and wildlife or for recreation has been formulated to accompany the hydrologic modifications, although The Nature Conservancy has identified the lakes as a critical fish and wildlife habitat, unique because it is within an urban area. Approximately 160 species of birds and waterfowl use the area or would use it with some improvement. According to The Nature Conservancy the habitat would be improved by dredging channels and making islands, and then chemically treating the lakes to kill trash fish and stocking with game fish. Compatible uses include fishing, bird-watching, photography, canoeing, boating, and nature education. One constraint on management is that much of the surrounding land is privately owned and would require purchase, another is that the state's largest landfill is located nearby.



**SMITH LAKE**  
Multnomah County  
Willamette/Sandy Basin

**LOCATION**

Area 600 acres (242.8 hect) Elevation 9 feet (2.7 meters)  
Type natural lake Use waterfowl habitat, limited recreation  
Location between NW Portland city limits and Columbia River  
Access private, access by permission only  
USGS Quad. Portland, Ore-Wash (7.5 min.)  
Coordinates 45 deg, 36 min, 53 sec N; 122 deg, 44 min, 05 sec W  
USPLSS township 2N, range 1E, section 31

**DRAINAGE BASIN CHARACTERISTICS**

Area indeterminate Relief low Precip. 38 in (97 cm)  
Land use by Forest Range Water Irr. Ag. Non Irr. Ag. Urban Other  
type (%)  
Notes wetlands and urban/industrial land uses

**LAKE MORPHOMETRY**

Area 600 acres (242.8 hect) Depth - Maximum Average  
Ave/Max Depth Ratio - Volume 600 acre ft (.74 cu hm) 1 ft (.3 m)  
Shoal Area 100% Volume Factor - Shape Factor 2  
Length of Shoreline 6.9 mi (11.1 km) Retention Time indet.  
Notes Data from USGS bathymetric map at low water level, 9/9/74.

**WATER QUALITY DATA**

Sample Date 6/22/82 Temp. 73.4 F (23 C) pH 8.4  
Transparency 2.6 ft (.8 m) Phosp. (mg/l) 0.050 Chlorophyll a (ug/l) -  
Alkalinity (mg/l) 69 Conductivity (umhos/cm) 152 Diss. Oxygen (mg/l) 10.4  
Major ions Na K Ca Mg Cl SO4  
(mg/l) - - - - - 804  
Trophic Status eutrophic - high nutrient concentrations

The limnological character of these two lakes is also dominated by their hydrology. During the summer, water temperatures vary sharply from day to day depending on the pattern of flow to and from the lakes. Because the lakes are very shallow, there is no seasonal temperature stratification. Oxygen concentration also varies sharply; changes from 70 percent to 140 percent saturation on succeeding days have been observed. There is a distinct diurnal pattern to these variations. In early morning, a deficit develops due to biologic respiration during the night; by late afternoon, the phytoplankton add much dissolved oxygen so that the lakes are supersaturated (Clifton 1983). The bottom sediments contain significant concentrations of nitrogen and phosphorus, and nutrient concentrations in the water are high. Total phosphorus samples ranged from 50 to 130 ppb in Smith Lake and from 30 to 100 ppb in Bybee Lake during the summer of 1982 as reported by the U. S. Geological Survey (Clifton 1983). The same study also revealed very high organic nitrogen concentrations. Abundant waterfowl contribute much of the nutrients to the lakes. Water transparency is limited.

Much of the area around the lakes is overgrown with dense stands of emergent vegetation. Reed canary grass, wapato, spate rushes, and willows are common. The phytoplankton in both lakes is usually dominated by species of diatoms, but on occasion green algae are also very abundant. Cyanophytes sometimes appear but have not been observed in high population densities. Several of the species of diatoms observed in these two lakes are also common in the Columbia River and probably originate from inflow rather than growth in lakes. The population densities and the dominant species (*Sphaerocystis Schroeteri*, *Oocystis pusilla*, *Melosira ambigua*, *Stephanodiscus astrea*, *Fragilaria construens*) indicate eutrophic conditions. Fecal coliform and other bacteria are common in the lakes; there may be contamination from the nearby landfill. Smith and Bybee Lakes are strongly eutrophic due to their shallowness and the rich supply of nutrients.

Phytoplankton Surveys (Clifton 1983):

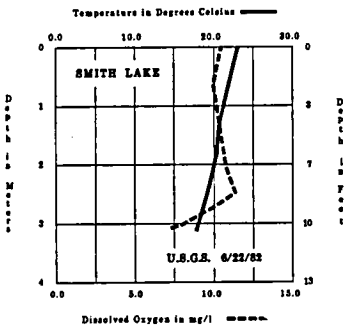
Smith Lake  
7/20/82

| Alga                            | #/ml | %     |
|---------------------------------|------|-------|
| <i>Sphaerocystis schroeteri</i> | 229  | 21.0  |
| <i>Oocystis pusilla</i>         | 152  | 14.0  |
| <i>Melosira distans</i>         | 131  | 12.0  |
| <i>Chrysococcus rufescens</i>   | 87   | 8.0   |
| <i>Fragilaria construens</i>    | 76   | 7.0   |
| others (20)                     | 413  | 38.0  |
| Total                           | 1088 | 100.0 |

Bybee Lake  
7/20/82

| Alga                                  | #/ml | %     |
|---------------------------------------|------|-------|
| <i>Stephanodiscus astrea minutula</i> | 469  | 14.4  |
| <i>Asterionella formosa</i>           | 382  | 11.7  |
| <i>Cyclotella glomerata</i>           | 323  | 9.9   |
| <i>Melosira ambigua</i>               | 323  | 9.9   |
| <i>Stephanodiscus hantzschii</i>      | 264  | 8.1   |
| others (28)                           | 1498 | 46.0  |
| Total                                 | 3259 | 100.0 |

TEMPERATURE AND OXYGEN



DRAINAGE BASIN  
Boundary Indeterminate

● Sampling Site

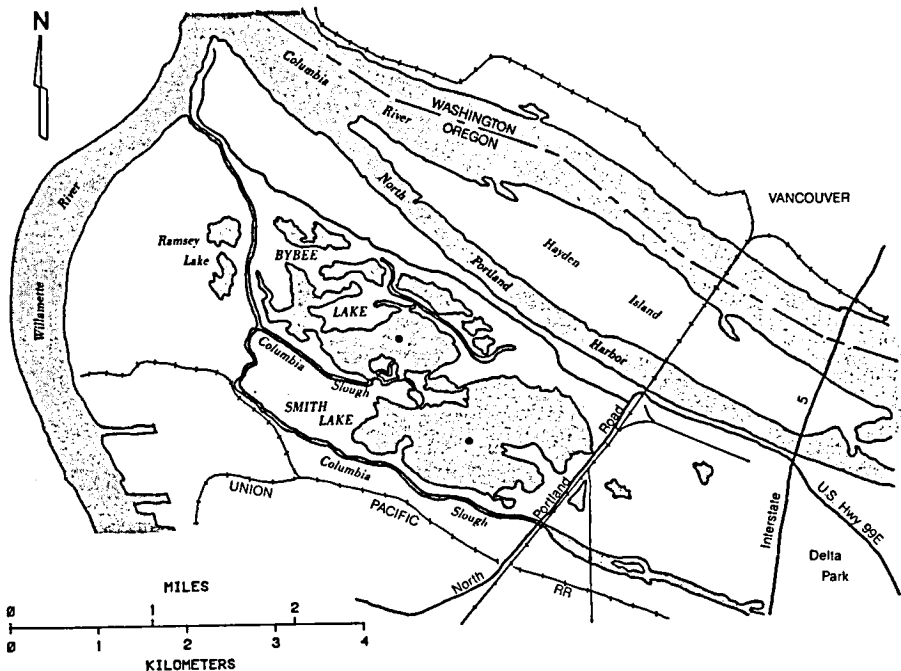


Photo Captions

1. Bybee Lake
2. Smith Lake
3. Columbia Slough
4. North Portland Rd.
5. Burlington Northern R.R.
6. Union Pacific R.R.
7. St. Johns (town)
8. Sanitary landfill
9. Sand filled areas
10. Warehouses

Source: NASA, 1980. Vertical photograph.

TEMPERATURE AND OXYGEN

