

EXECUTIVE SUMMARY

This Technical Report of the Big Payette Lake Water Quality Council (Council) is the first of two Council reports. By December of 1997 the second report, the Lake Management Plan, will define water quality in Big Payette Lake (Lake) and its watershed. These documents will constitute the Council's report to the Governor and the Legislature in accordance with the Big Payette Lake Water Quality Act, House Bill 153.

The Council's study has been a collaborative effort involving interested municipal, county, state and federal agencies and included private sector input. The Idaho Division of Environmental Quality has coordinated the study and assembled the multi-authored report. Lake studies were performed by the U.S. Geological Survey. All studies have been conducted with oversight by the Council's Technical Advisory Committee. Through its bi-monthly meetings the Council has also monitored progress and directed policy, consistent with its legislative authority.

The results of the Technical Report confirm that the water quality in the Lake has progressively deteriorated because eutrophication (the process by which nutrients pollute a lake) has commenced, especially in its southwest basin. Much of these nutrients flow into the Lake from tributaries, but some come from development along and behind the shoreline including marinas, docks and watercraft. The nutrient buildup has been large enough to create dissolved oxygen deficits (anoxia) in 1995 and 1996, a serious condition that may take years to reverse. These deficits have resulted from buildups over time of nutrients and oxygen demanding substances in the Lake's lakebed sediments.

The Technical Report findings point toward several categories of action that can preserve and enhance water quality and arrest the eutrophication of the Lake. These include:

- Storm water runoff controls on lands surrounding the Lake.
- Prudent Best Management Practices (BMPs) covering forest practices and road construction in the watershed.
- Criteria governing marinas, docks, watercraft, and pumpout stations.
- Rules controlling the development and management of campsites fronting on the Lake or a tributary.
- Citizen education of voluntary "stewardship ethics" to be practiced by parties recreating at the Lake and in the watershed.

At the request of the Council, the report initially identifies three Lake watershed specific water

quality objectives which are defined by the following:

- Dissolved Oxygen - The dissolved oxygen objectives shall include the hypolimnion of Big Payette Lake and shall be measured in the lake's southwest basin at the following coordinates: 44 degrees 55 minutes 50 seconds North, 116 degrees 05 minutes 50 seconds West. Dissolved oxygen concentrations during June through September shall be equal to or greater than 6 milligrams per liter between the lake's surface and the 200 foot depth. Below the 200 foot depth and above 3 feet of the lakebed, the overall average dissolved oxygen concentration from June through September shall be greater than or equal to 3 milligrams per liter.
- Total Phosphorus - The median value of total phosphorus (TP) measured in the euphotic zone from May through September shall not exceed 6 milligrams per cubic meter.
- Chlorophyll-a - The median value of chlorophyll-a measured in the euphotic zone from May through September shall not exceed 3.0 milligrams per cubic meter.

The Council's recommendations to achieve these objectives will be set forth in the Lake Management Plan. It is the intent of the Council that these objectives will be achieved over time through recognition of their importance and prudent action by the community's economic interest including municipal, commercial, recreation, resource management, local residents and land owners. To establish these objectives the Technical Report has focused on evaluating the potential sources of nutrient pollution throughout the watershed of the Lake and the changes in water quality of the Lake itself. The watershed is approximately 75 percent U.S. Forest Land; 16 percent Idaho Endowment land; 3 percent private land; 1 percent City of McCall land, and; 5 percent Big Payette Lake.

The Lake is a favorite recreation spot for many Idaho residents as well as out-of-state visitors. Boating and fishing dominate recreational boats on the Lake - moored, docked or in active use (exclusive of jet skis). From May 1995 through June 1996, Anglers spent an estimated 11,489 hours fishing for lake, rainbow, and cutthroat trout as well as for kokanee, the most abundant fish in the Lake. Ponderosa State Park is a major camping, outdoor facility occupying the peninsula separating the southeast and southwest basins of the Lake. Camping at unimproved sites along watershed streams and lakes generates some nutrient and bacterial contamination.

Beneficial uses of the Lake include Domestic Water Supply, Agricultural Use, Cold Water Biota, Fish Habitat, and Recreation. The City of McCall and over 300 lake-side homes draw their entire domestic water supply from the Lake. The Lake Reservoir Company represents a group of irrigators holding 31,000 acre feet of water storage rights in the Lake. The Lake Reservoir Company regulates the Lake level in accordance with an agreement executed in 1924.

The quantity and quality of runoff from the watershed retained in the Lake was studied during 1995 and 1996. Historical sediment accumulation rates within the Lake and the Upper Payette Lake were

assessed. Supplemental gaging facilities were installed to provide additional data. Wildfires during the late summer and fall of 1994 burned about half of the entire watershed. Above normal runoffs in 1995 and 1996 (126 percent and 166 percent of normal), coupled with the accumulation of ash and disturbed soils in the burned areas, resulted in higher than usual transport of phosphorus and nitrogen nutrients as well as soil sediments.

Watershed Assessment: The technical study showed that estimates of phosphorus loading from the watershed in the post-burn 1995 runoff was much higher than the pre-burn loading, and dropped to near the pre-burn estimates during the 1996 runoff. Nitrogen loadings exceeded pre-burn levels by a factor of 2 to 3 during the 1995 and 1996 runoff. Sediment loadings also increased during these water years.

Sources of sediment entering streams were identified which included naturally high levels of sediment input from landslides and from erosion of forest soils. Roads were also identified as an important contributor of sediments to streams which in turn influence Upper and Big Payette Lakes. Road segments were identified where these inputs could be mitigated by changes in management or maintenance.

The habitats of twelve streams within the watershed were studied to assess habitat condition and quality. Data were compared with standards considered desirable for mountain streams. In general, this evaluation indicated a greater amount of fine sediments present in streams than desirable; acceptable levels of dissolved oxygen; somewhat higher water temperatures and stream width to depth ratios than desirable.

The study further disclosed relatively high concentrations of nutrients and bacterial pollutants in stormwater runoff from urban/residential areas around the Lake, particularly in the City of McCall. When compared to natural streams, concentrations of phosphorus in stormwater runoff were 10 to 100 times greater. Similarly, nitrogen concentrations in stormwater runoff were 10 to 15 times greater and contained suspended sediments that were 40 to 250 times greater than natural streams.

Upper Payette Lake was identified as an important collector of nutrients and sediments that could otherwise migrate through the North Fork Payette River into Big Payette Lake. This phenomenon indicates the importance of evaluating the quality and other characteristics of the upper lake, including the development of criteria for managed releases to protect both lakes and the intervening North Fork Payette River.

Payette Lake Assessment: Lake studies focused on monitoring and evaluating phosphorus and nitrogen inputs to the lake. Aquatic plant development along the shore was also studied together with an analysis of the nearshore water quality that may be influenced by lakeside development. Payette Lake is comprised of four major segments; the deepest northeast basin segment (North Beach to Lucks Point); the southeast basin segment (Lucks Point to Pilgrim Cove), the smallest central basin (Cougar Island and narrows); and the largest southwest basin segment (the narrows to the dam outlet).

The water quality of a healthy mountain lake is manifested by a suitable level of dissolved oxygen; the scarcity of nutrients that feed algae and other aquatic plant life; and water temperature sufficiently low to deter rapid aquatic plant growth while providing a desirable environment for fish species.

The study results indicate that, overall, the Lake was oligotrophic (low in nutrients and biological production) in 1995 and 1996, similar to previous assessments conducted in the mid 1970's. Despite this finding, however, the Lake has recently developed an absence of oxygen (anoxia) in the lower water column of the southwest basin that has not been previously documented. This condition was observed during about four months of summer and autumn each study year. Earlier data indicates that this condition is not directly related to the 1994 fire. The study suggests that this anoxic condition has been developing progressively over the years as nutrient loads have increased.

Phosphorus loading into the Lake during the study, estimated at about 6 tons per year after adjustment for the fire affects, was input primarily (58 percent) through inflows from the North Fork Payette River. The remainder comes almost equally from smaller streams flowing directly into the Lake; surface runoff from undeveloped land around the Lake (woodlands); and stormwater runoff from urban/residential development around the Lake. Comparisons with an earlier study of nutrient sources reveal that the relative magnitude of phosphorus input from the North Fork has decreased from 71 percent in 1982 to 58 percent in the current study. This indicates an increasing trend in nutrient inputs from near shore development and small tributaries draining into the Lake.

The observed oxygen deficit at depth in the southwest basin is larger than general nutrient conditions in the Lake would indicate. Some factors contributing to this condition are: local streams and the concentration of lake shore development around the southwest basin provide additional inputs of organic and other materials that accumulate on the lakebed and deplete oxygen; the basins considerable depth (some 200 feet) retards natural recirculation; the oxygen supply of the basin is finite in that oxygen levels are greatest when waters are well mixed in spring after ice-off and oxygen is not replenished during summertime thermal stratification.

A very significant finding of the near shore study was the suspected discovery of Eurasian Milfoil, a noxious aquatic weed, near the old mill site and the municipal boat ramp adjacent to the Sports Marina. Because of implications to the Lake and downstream interests, this condition warrants a prompt, ad hoc mitigation program.