New Life for Dying Lakes

Robert T. Lackey*

*Department of Fisheries and Wildlife
Oregon State University
Corvallis, Oregon 97331

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Email: Robert.Lackey@oregonstate.edu
Phone: (541) 737-0569
Web: http://fw.oregonstate.edu/content/robert-lackey

An "aeration" study at Parvin Lake may give life to other lakes and result in more fish for more fishermen

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By ROBERT T. LACKEY

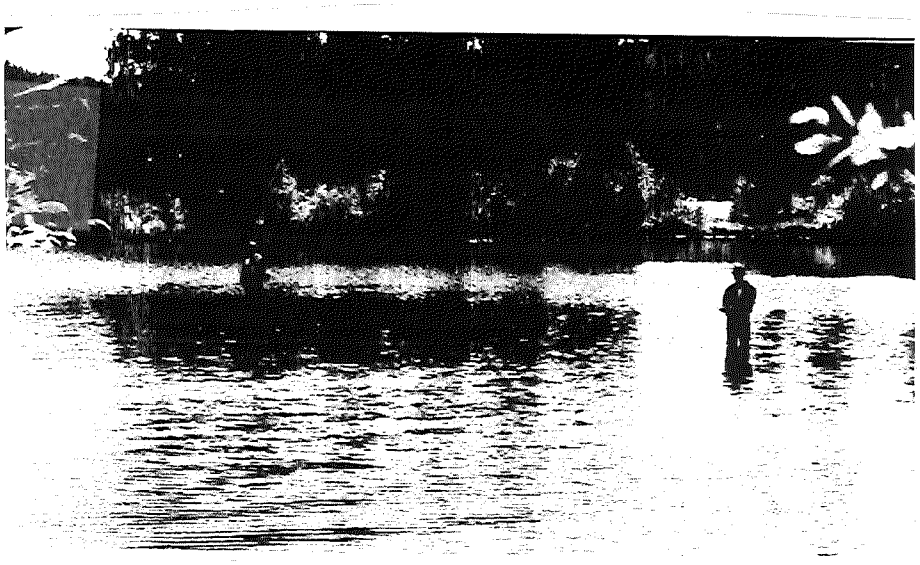
PHOTOS BY THE AUTHOR

LAKES and reservoirs grow a little older each day. Normally this aging process is slow and of little importance to the public. However, pollution in the form of nutrients from man's activities can speed up the aging process and cause problems that affect anglers, swimmers, boaters and other recreationists.

Periodic unpleasant scums formed by plankton blooms are the first outward sign of excessive nutrient addition. Blooms become worse each year if pollution continues and eventually become the *permanent* condition.

The fishery also undergoes changes.

The author conducted the Parvin Lake Aeration Project for the Division while with the Department of Fishery and Wildlife Biology, Colorado State University. He is currently with the Division of Forestry and Wildlife, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.



Trout gradually lose out to warmwater species, and perhaps suckers may take over. By this time the lake is so choked with weeds and decomposing organic matter that sportsmen wouldn't fish even if desirable fish could survive.

This process of rapid lake aging is called *cultural eutrophication*. As human population expands, byproducts of man's activities find their way into more and more streams, lakes and reservoirs. The basic cause of cultural eutrophication is abnormally high nutrient input, especially phosphates and nitrates. We are unintentionally fertilizing our lakes much the same way a farmer fertilizes his land to improve plant production. In the case of lakes, however, this fertilization is not an improvement.

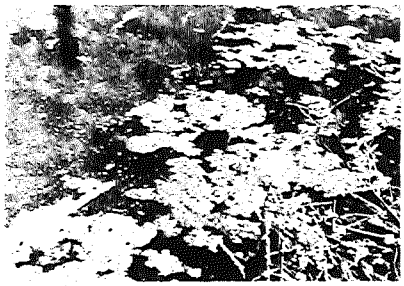
SOLUTIONS

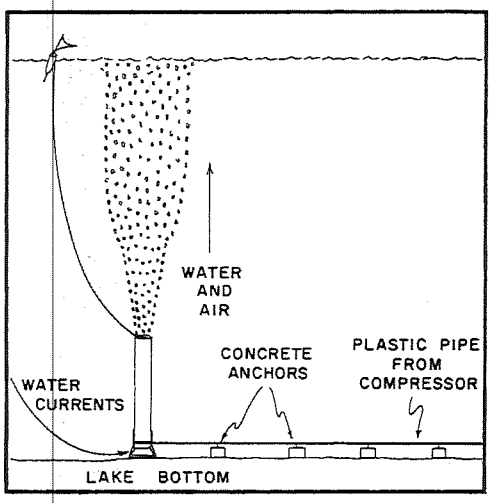
Ultimately eutrophication and other pollution problems will be solved only when man reduces his numbers and alters life styles to be compatible with environmental capabilities. Unfortunately this is not likely to occur in the immediate future. In the meantime, temporary solutions will have to be employed.

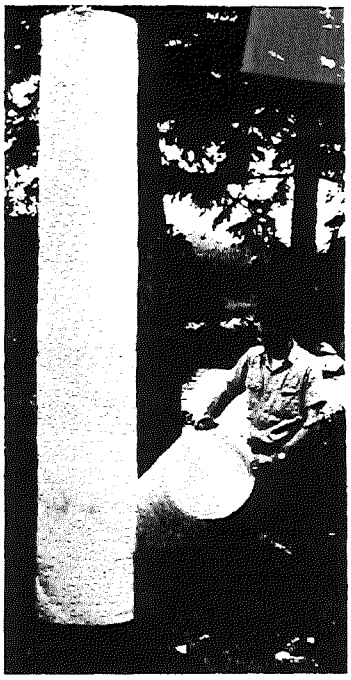
Eutrophication problems could be solved by eliminating excess nutrient input to lakes and reservoirs. From a practical standpoint this is almost impossible. Phosphate- and nitrate-free detergents, better sewer treatment plants, and careful crop fertilization all help, but at best, these and similar efforts merely slow eutrophication.

Another fairly short-term solution and one that looks promising is increasing a lake's ability to use nutrient input without adverse side effects. If lake water is kept well circulated and oxygenated, buildups of nutrients would decrease. Plankton would not be able to stay near the surface in sunlight, where they grow most prolifically, because of constant water circulation. Entering nutrients would be held in lake water and most would leave with outflow water.

One problem with this idea is the distinct possibility that plankton blooms might increase as accumulated bottom nutrients were circulated throughout the lake. If this happened, plankton







Plankton blooms can be caused by pollution; they lessen the recreational potential of many lakes and reservoirs. The aerators were placed on the bottom of Parvin Lake and were operated 24 hours per day in order to maintain high levels of dissolved oxygen. A stream of air creates currents which draw bottom water to surface.

growth would soon decline as accumulated nutrients were used up.

Before trying out this management tool on a large lake or reservoir, it was decided to conduct a trial run on an experimental lake.

PARVIN LAKE

As a Colorado Division of Game, Fish and Parks experimental station, Parvin Lake is well suited for testing aeration as a lake management tool. Located at 8,200 ft. elevation in the Red Feather Lakes region of northern Colorado, it covers 62 acres.

Plankton blooms in Parvin are common in summer months. Scum forms on the lake surface and collects along the shore. Needless to say this detracts from general aesthetic appeal. Parvin supports an excellent fishery, and except for excessive plankton growth, is in reasonably good health.

Figuring out a way to keep the lake

well-aerated and in constant circulation was the next problem. Pumping water from the lake bottom to the top was one possibility, but proved too expensive to be practical.

Compressed air was studied next. Aerators have been used for many years in efforts to maintain high dissolved oxygen levels for winterkill prevention and in sewer treatment ponds. With this approach, air would be released at the lake bottom through an aerator. Water currents would be formed as the bottom water was drawn through the aerator toward the lake surface.

Aerators purchased consisted of a 9-ft polyethylene tube, 18 inches in diameter, with an elongated internal coil. Air is released at the bottom and rises in two streams through the coil. Bottom water is drawn up the tube with the air and moved toward the surface.

Two of these aerators were placed on the bottom of Parvin Lake in 1969. A compressor was installed on shore and plastic pipe connected each aerator to the compressor. Aeration was started on November 1, 1969, and continued for 12 months. Various chemical and biological samples were taken each month.

EFFECTS

The normal annual water temperature cycle was completely altered. Winter water temperature was lower and summer temperature was higher. Although this may seem like an insignificant change, it did affect hatches of various insects. For example, midge flies which were common before aeration were drastically reduced during aeration. Many other biological and chemical changes were caused by this alteration of annual temperature cycle.

Dissolved oxygen is necessary for the general health of a lake. When not in adequate amounts, there may be fish die-offs. Aeration, as was expected, maintained very high oxygen levels throughout the year. This technique may be economically feasible in preventing winterkill and summerkill in important sport fishing lakes.

Plankton in a lake are very important in water quality and fish production. Increases or decreases in plankton can affect bottom animals like midges, since plankton is important as their food. Fish in turn eat these bottom animals. However, excessive plankton growth causes poor living conditions for fish, and under severe conditions, may result in summerkill.

Plankton were affected in a variety of ways. Most species decreased or remained about the same in abundance. The single group that did increase, however, was the one that typically forms obnoxious scum in lakes. Increase of this group is suspected to be only a temporary effect of aeration and the blooms would decrease as the supply of accumulated nutrients was used up.

Many other more subtle changes took place, but how these will ultimately affect the fishery, future work will reveal.

FISHING

Fishing at Parvin was greatly improved the season following aeration. Whether this improvement was totally due to aeration can be only conjectured, but analysis of creel census data from past years indicates positive changes in the fishery.

The apparatus used to aerate Parvin Lake has now been installed at Road Canyon Reservoir in southern Colorado for another test run. Since we now know from Parvin that it is feasible to aerate lakes, the emphasis here will be more on fish and how aeration affects their habits.

When the Road Canyon test is completed and Parvin Lake results are fully evaluated, we will have a better idea of where aeration will be beneficial and what changes will take place in an aerated lake or reservoir.