

companies together to "discuss" a substitute for phosphates in detergent. The speaker offered this as an example of administrative leadership in solving the eutrophication problem. This action was prompted by the federal report that detergent is responsible for 80% of the phosphate which causes the algal blooms in Lake Erie—"the cause of the death of Lake Erie".

Had the spokesman attended the sessions, his headline seeking announcement would not have been made. The scientists merely smiled at such a politically oriented proposal to a complex issue.

However, they did not smile at the next confidence. The speaker reported on the embarrassment suffered by Secretary Udall when a scientist in Fish and Wildlife Service had publicly indicated that not enough was known about the causes of trouble in Lake Erie and that caution should be used in making dogmatic decisions. Such a statement after the President had announced full speed ahead was considered inexcusable. However, the speaker assured the audience the federal administration was again of one mind.

That disturbed some Europeans, and one asked me the next day whether the speaker had been joking. I replied that I was afraid he wasn't. Then he asked how much American research is politically controlled. My answer was it depends on the agency making the grant, the institution in which the work is done and how hungry the researcher is.

He nodded his head and said that would explain a mystery—why the productivity in America is not proportionate to the money reported expended on water resources research.

This is not a reflection on all American research—we were in agreement on that—but the American research budget is huge when compared to other nations and the productivity is not in proportion.

The greatest deficiency in a conference such as the one on eutrophication is in the mechanics of getting conference proceedings out for interested parties. To report the "news" which this meeting generated would require several articles. Tying it together to permit understanding of all the facets which affect the end result of a particular problem would take another series of articles.

Many of the conclusions would undoubtedly be considered by some experts as material they already knew. How much they could have proved would be another matter. But at this conference, the proofs or else the assumptions and deficiencies were explored. So was the status of work underway.

Among my reactions, after listening to the experts, were these:

The federal agency's approach to solving Lake Erie's problem by setting limits on phosphorous and nitrogen is a naive exercise in futility.

Blue-green algae—the nuisance algae in Lake Erie—appear when the nitrogen concentration is zero. Blue-greens obtain nitrogen from the air. In Israel when blue-greens appeared as nuisance blooms in fish management ponds, the solution called for maintaining a nitrogen concentration in the pond.

Nutrients are important but even more so is the flow pattern and so is the physical factor of the depth of the lake. The concentration at any time is the critical factor, not the load. For example, increasing the flow to a lake will increase load to the lake but if the concentration in the flow remains the same, there will be no change in the lake. Also, the critical load-depth relationship is a straight line of about 45 degree slope. For a given load a shallow lake could be eutrophic while a deep lake would not. Therefore, if Lake Erie is considered as three lakes, not one—a shallow lake at the western end, a deeper lake in the center and a much deeper lake in the eastern basin—it becomes obvious why the problem in the western basin is not experienced in the others. It also becomes evident the controls to achieve correction in western Lake Erie must include appraisal of flow pattern—even possible diversion of flow around the western lake if adequate dispersion to reduce concentration is not possible. It should also be noted that in reality the Detroit River consists of three channels—those along each shore carry higher concentrations of nutrients and essential elements than the center channel which is essentially the same quality as in Lake Huron.

The role of sodium and potassium concentrations can be critical in algal blooms. Deliberate efforts to make a lake eutrophic by addition of large amounts of phosphates failed until adequate concentration of sodium and/or potassium was provided. Also some lakes are eutrophic when the concentration of phosphorous is below the limit proposed by the federal agency for Lake Erie (actually in a report drafted by the federal agency and adopted reluctantly by the States). What is important is that the essential elements be present in the required bal-