

## **Aeration for Waterford Lakes**

### **Benefits of Aeration**

**Reduction in phosphorous concentrations in the water:** Under oxygen rich (aerobic) conditions phosphorous tends to remain bound in the upper layers of the sediment. Iron present in the sediment can facilitate this. In oxygen depleted (anaerobic) waters, phosphorous goes in to solution. In deeper stratified lakes, low oxygen levels in the deep waters can lead to higher phosphorous concentrations, and when the lake turns over in the fall the phosphorous moves to the top of the lake, providing nutrients for algae. This is why algae blooms occur on some lakes in the fall.

Note that under aerobic conditions the phosphorous is only immobilized, it does not go away, and if anaerobic conditions return the phosphorous can go back into solution. Case studies on various lakes where aeration has been implemented often times show a decrease in phosphorous but the improvements have generally not lasted long after aeration is terminated.

**Reduction in Sediment:** Microbes will break down organic material much faster in an aerobic environment than in an anaerobic environment. So, an increase in oxygen can lead to a significant increase in the rate of breakdown of organic material and a reduction in the thickness of the sediments. As the organic material breaks down, the remaining materials will be less amenable to further decomposition and the rate of sediment reduction will slow down. Additionally, sediments can be a mixture of organic and inorganic material. The inorganic material is largely unaffected by the biological activity, so the overall effectiveness of aeration in reducing the amount of sediment will depend on the amount of un-decomposed organic material in the sediment.

**Reduction in Odors:** The by-product of aerobic decomposition is primarily odorless CO<sub>2</sub>. The by-products of anaerobic decomposition can include ammonia and hydrogen sulfide. Based on this, aeration can lead to a reduction in odors.

The increased oxygen can also improve fish habitat.

### **Application to the Waterford Impoundment**

Aeration would likely not be effective in reducing sediment thickness in the main channels of the river because there is less organic material in these areas and there is likely already adequate oxygen. In Tichigan Lake, aeration could improve fish habitat and could lead to a reduction in sediment thickness; however, the greatest impact in sediment thickness could be in the deepest areas of the lake where it would be least noticeable.

In Buena and Waterford Lakes, aeration has the potential to reduce the thickness of the sediments and its effectiveness will depend on the amount of organic material present in the sediments, the extent of decomposition, and the existing levels of Dissolved Oxygen (DO). Cooler water can hold more oxygen than warm water, so adequate oxygen may be available in the spring and late fall, especially in the shallow waters where there is boat traffic. In the summer, DO levels could drop significantly, especially during hot spells in calm bays, and in these areas aeration may be helpful.

Some next steps to evaluate feasibility:

- Check the SEWRPC reports for DO data and/or collect DO readings throughout the year in the proposed treatment areas. DO can be measured using a simple hand-held meter.
- Consult the WDNR and SEWRPC both in regard to permitting requirements, experience in implementation for sediment reduction, and recommendations for further evaluation.