NUTRIENT REMOVAL

The OWRB installed sediment traps during the 2012 growing season. Sediment traps were used to measure the amount of detrital accretion occurring as a result of the floating islands. Sediment traps consisted of a PVC frame which held 4 tubes for sediment collection. Each tube measured 2.5 inches in diameter (inside diameter) and 18 inches in length. In general, sediment traps should be 7 times long as the inside diameter to prevent sediment resuspension from wave action or motion. Each tube had a piece of flexible tubing attached to the end with a crimp in place. A total of six traps were installed with four placed under the floating islands and two placed in open water. The sediment traps were suspended 1.27 meters below the floating wetlands on a retrievable stainless steel cable. Initially, the traps were set at different depths ranging from 1.27 m to 2.08 m. This depth was standardized on July 9, 2012. Results showed the varying depth did not have an impact on collections, but depths were standardized to remove any unknown variability. The open water traps were suspended under buoys with one buoy placed upstream of the islands and one placed downstream. Sediment trap collections occurred every 3 weeks with the sediment from each tube decanted into a 500 ml sample preservation bottle. Samples were placed on ice and transported to the lab for analysis.

Sediment trap collection device.

Results from the open water sediment traps were subtracted from the under island traps to account for normal deposition which occurs as water moves through the lake. A total of four collection events occurred during the summer of 2012. In total, 776.98 $mg/m^2/day$ of phosphorus were collected from under the floating islands. Accretion from open water traps totaled 529.73 $mg/m^2/day$. The difference of 247.25 $mg/m^2/day$ can be attributed to the floating islands. Accretion of sediment (and the subsequent phosphorus) seemed to show an exponential curve as the summer progressed compared to the linear trend shown by the open water accretion rate (Figure 3). An exponential increase in phosphorus accumulation from under the floating islands is expected. Aquatic plants showed significant growth over summer, including root mass growth. With the increasing root mass, it is expected that the roots will entrain more material and allow for an increasing precipitation from the water column.

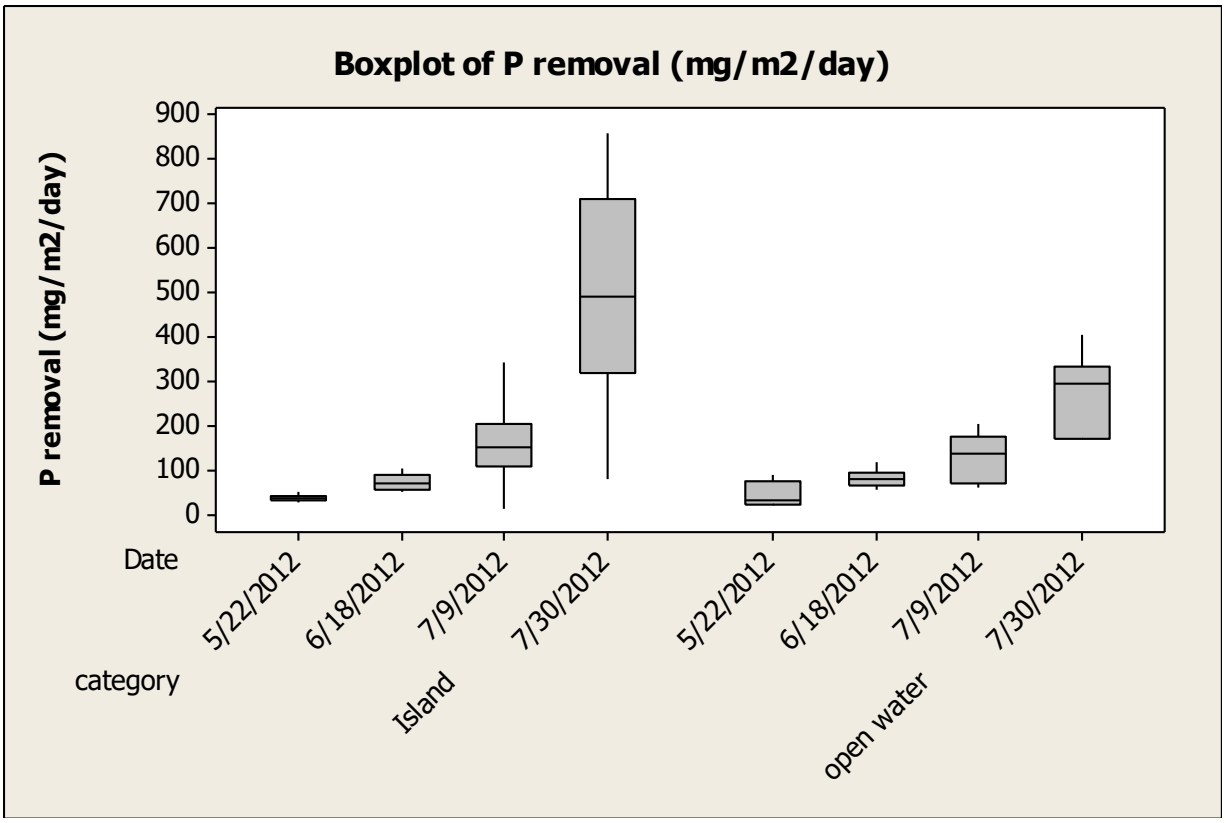

Figure 3. Phosphorus removal from sediment traps by date.

The OWRB anticipated that phosphorus removal from the wetlands would be between 51 kg/yr and 548 kg/yr. The net removal (51 kg/yr) did fall into the low range of what was expected. However, it is expected that phosphorus removal will increase over the next one to two growing seasons as the floating wetlands continued to fill in and plant growth occur. While the two southern chains did have significant growth, they still have a lot of area to fill in and grow. This above-ground growth will continue to remove phosphorus, but the larger impact will be seen from the increased root growth under the islands. Increased root growth will continue to entrain suspended material from the water column and slow the movement of water. This will allow the material to flock out and become part of the sediment layer.

Additional phosphorus removal also occurred from the plant root growth. Root growth in some instances extended to 2-3 feet below the floating wetlands. Phosphorus content of the root mass was not analyzed as they could not be accessed at the end of the growing season due to being trapped between the floating wetlands and the sediment after the lake level dropped too low for the wetlands to float.

It is important to note that although the wetlands are discussed in terms of amount of phosphorus removal, the phosphorus is still remaining in the system. The phosphorus is being shunted away from the epilimnion and deposited in the sediment layer. While it may seem that the phosphorus removal is not actually being removed, the phosphorus is being removed from

the photic zone during periods of algal growth. The phosphorus then becomes part of the sediment layer, but is not expected to become a part of the internal load. Internal load is defined as the phosphorus which is released from the sediment that reaches the epilimnion and is available to organisms to assimilate for growth. Sediment release refers to the phosphorus that is released from the sediment, but does not enter exchange with the upper water layers and therefore is not biologically available for growth. As previous studies on the Eucha/Spavinaw basin have concluded, internal load does occur in Lake Eucha, but the highest phosphorus content comes from the watershed. Current load estimates suggest that 45,313.9 kg of phosphorus enter the lake each year from the watershed (USGS 2012).