EcoSAV and GIS to Measure Aquatic Plant Habitats in Minnesota Lakes

Minnesota's 10,000 lakes (actually it's closer to 15,000) are the pride of many Minnesotans. Therefore, the MN DNR, along with other environmental agencies and interest groups, are continually working towards maintaining or improving water quality and lake habitats. Indeed, native aquatic plants are an integral component of a healthy lake ecosystem. However, increased development within watersheds and along shorelines currently poses direct and indirect threats to native aquatic plants. As a result, the DNR is currently exploring methods to monitor changes in aquatic plant communities as they relate to fish habitat. Specifically, we are exploring whether EcoSAV™ and GIS together can accomplish this goal and if so, what means of data collection ensures an accurate, robust portrayal of the vegetation biovolume (i.e., percent of the water column occupied by vegetation–most direct measure of fish habitat).

We have four specific objectives of this research: 1) determine the range of conditions that hydroacoustics can sample effectively; 2) test the accuracy and robustness of alternative interpolation models for the generation of vegetation surface maps; 3) measure sampling error associated with hydroacoustic surveys; and 4) evaluate temporal variability of submersed plant communities.

Fieldwork on five MN lakes began in summer 2002 and the data is currently being processed and analyzed. We collected the data with a Biosonics 6000DE echosounder equipped with a 430 kHz split-beam 6° transducer. Objective one was addressed with our fieldwork and we determined if this system can function effectively across a wide range of conditions, including areas where vegetation grows to the surface. Specifically, a custom adaptation to the EcoSAV software (by BioSonics) allowed us to identify which individual pings were classified as noisy (and thus disregarded in the EcoSAV summary reports). In most instances, noisy pings occurred as a result of traveling over topped-out vegetation. Echograms were used to verify whether noisy pings were actually topped-out pings and plant height was adjusted to the water depth for these pings accordingly. This adaptation greatly improves the ability of EcoSAV to more accurately quantify vegetation abundance in lakes where vegetation often grows to the surface (which occurs frequently in many lakes across the U.S.)

Objectives two and three should be addressed by spring 2003 and objective four by spring 2006. Furthermore, SCUBA surveys are planned during summer 2003 to further validate estimations by EcoSAV, as we are collecting data from depths exceeding those on which the system was tested. By the conclusion of this study we will identify appropriate interpolation techniques for the generation of surface maps, determine the minimum sampling effort to generate accurate maps, and identify whether GPS error and/or driver error significantly influences map accuracy and vegetation data summaries.

Finally, we will examine the degree that aquatic plant biovolume naturally varies within and among years. Once we have addressed these questions, our future direction regarding fish habitat monitoring and management will become more clearly defined.

Submitted by:
Ray Valley, Research Biologist
MN Department of Natural Resources, Division of Fisheries
Phone 651.793.6539
ray.valley@dnr.state.mn.us