

ENV Report 1 - *Flume Study Investigation of the Direct Impacts of Navigation - Generated Waves on Submersed Aquatic Macrophytes in the Upper Mississippi River* by Robert M. Stewart, Dwilette G. McFarland, Donald L. Ward, Sandra K. Martin, and John W. Barko

ABSTRACT

In an effort to evaluate the impacts of waves and currents generated by navigation traffic on direct damage to submersed macrophyte communities in the Upper Mississippi River (UMR) system, a study was conducted in a two-dimensional flume facility at the U.S. Army Engineer Waterways Experiment Station. The submersed species, *Vallisneria americana* Michx. and *Myriophyllum spicatum* L., were exposed to 18 treatment combinations of current velocity (0.00, 0.10, and 0.25 m/set), wave height (0.1, 0.2, and 0.3 m), and wave period (3 and 5 set). Both 4-week-old greenhouse-cultured plants were exposed to each treatment combination for 25 min. Main response variables were numbers of fragments and total fragment biomass. Results showed that the level of direct damage was affected by interactions between treatment conditions and the species and size of the plants. At current velocities of 0.25/sec, damage was more related to exposure time than to wave height, as this current velocity forced the shoots downward in the water column and prevented them from being exposed to maximum wave forces. At lower current velocities, plant damage increased with wave height and plant size, and *M. spicatum* was more heavily damaged than *V. americana*. Visual observations indicated that the increased damage was related to plant entanglement resulting from current reversals in the passing wave series. Though no treatments generated biomass losses greater than 30 percent of exposed plant biomass, repeated daily exposures to secondary waves from current levels of navigation traffic may be partially responsible for the paucity of submersed macrophytes along the main channel border area of the UMR system.