Report for 2001ND681B: Physical and environmental factors influencing the periphyton communities of the Sheyenne River, North Dakota

- Conference Proceedings:
  - Jaskowiak, M. A., Phillips, K. A. and Fawley, M. W. 2001. Three possible new species of Nitzschia (Hassall) from the Sheyenne River, ND. Poster presentation at the Phycological Society of America Meeting.

Report Follows:

The Periphyton in the Sheyenne River, North Dakota

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Devils Lake in Northeastern North Dakota is presently a closed basin, but rising, lake. Its size has been increasing for more than a decade, and if the rise continues there will be an uncontrolled flow into the Sheyenne River at some time in the future. An engineered outlet is being considered in order to provide a more controlled flow and reduce physical damage and water quality degradation that would come from an uncontrolled flow. This research began as part of the environmental impact statement for the Army Corps of Engineers Devils Lake outlet project. In the first part of this study, periphytic algae were collected using artificial substrates at several sites along the Sheyenne River. The major goal of this study was to relate the periphyton communities to environmental factors that could potentially be affected by a Devils Lake outlet. The relative abundance data for species of periphytic algae and environmental data were used for the assessment. This analysis was completed using canonical correspondence analysis (CCA). The environmental variables which explained the most variance in the periphyton communities were pH, orthophosphate, hardness, arsenic, sulfate and nitrite+nitrate. This analysis included all species identified. An analysis was repeated after the species which are considered to be phytoplanktonic were removed. This evaluation showed different environmental variables which explained the most variance. These environmental variables were percent sodium, calcium, pH, arsenic, and sulfate. This analysis proved to be more statistically significant. The phytoplankton species are not really part of the periphyton community and therefore, the variation seen in these species is coincidental. Therefore, the removal of these species makes the analysis more precise. The research that has been completed also includes a comparison of the natural substrates and artificial substrates and a comparison of the use of presence/absence data versus relative abundance data in CCA. Natural substrate communities appear to be quite different than the artificial substrate communities. These differences include several species, which were not found at all on the artificial substrates. An example of these additional species is the diatom, *Navicula mutica*. For the past three years the periphyton communities in the Sheyenne river have been studied. This research not only provides baseline data for the Devils Lake outlet project, but also provides an opportunity to examine the ecology of algal communities in a river that has yet to be examined. The knowledge gained from this ecological research will contribute to both regional water quality studies and diatom ecology overall. The research provides information on several levels. First, if Lake Ashtabula produces a significant effect on the periphyton communities. Second, the new species that I am finding from the Sheyenne basin indicate that the algal communities in North Dakota are diverse and not well documented. These results will contribute to a better understanding of the algal communities and the environmental factors that affect them. This study will help guide water quality management decisions in North Dakota.