

SPHAGNUM DOMINATED MAN-MADE WETLANDS USED FOR ACID MINE DRAINAGE ABATEMENT: PRELIMINARY PERFORMANCE EVALUATION

by

Brent E. Huntsman
Brehm Laboratory

Wright State University
Dayton, Ohio

Extended Abstract

As previously reported at this conference, man-made wetlands consisting of predominantly Sphagnum sp mosses have been proposed as a method for acid mine drainage abatement associated with coal mining. Several field-scale demonstrations have been constructed to further study the effectiveness of this treatment technique in Ohio, West Virginia, and Pennsylvania. This presentation will review the results of monthly monitoring for selected water quality parameters at three man-made wetlands. At the time of this abstract submission, much of the data is considered preliminary. Conclusions based upon this information as to the total effectiveness of the method should be viewed accordingly.

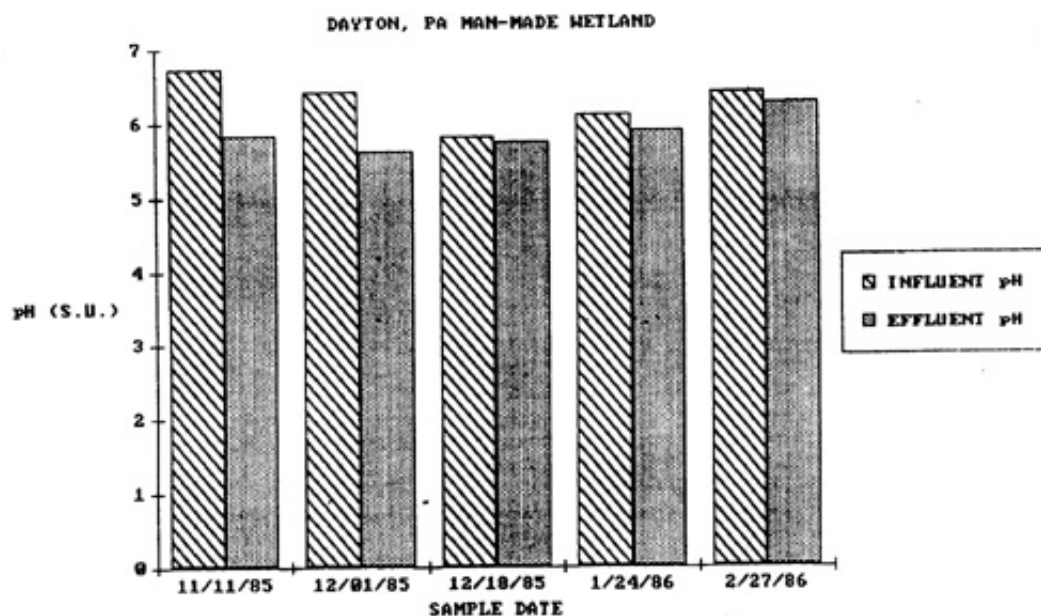
A 750 square foot man-made wetland was established at a reclaimed portion of the DLM Coal Company mining complex near Alton, West Virginia in December, 1984. A twelve to eighteen inch deep substrate of straw was placed in the bottom of the wetland, prior to the planting of approximately 500 square feet of Sphagnum recurvum moss at the water surface. Flow through this wetland averages about one to two gallons per minute. Iron and manganese concentrations typically average 60 and 70 mg/l respectively. pH at the DLM site usually range from 2.4 to 2.7 s.u. Iron and manganese removal by the wetland has been limited. Analytical results show actual increases in metal concentrations in the wetlands effluent during periods of high anaerobic conditions. Additionally, the location of the wetland at the base of a steep slope has resulted in excessive sedimentation. This factor in combination with the low pH influent has greatly reduced the effectiveness of this man-made wetland.

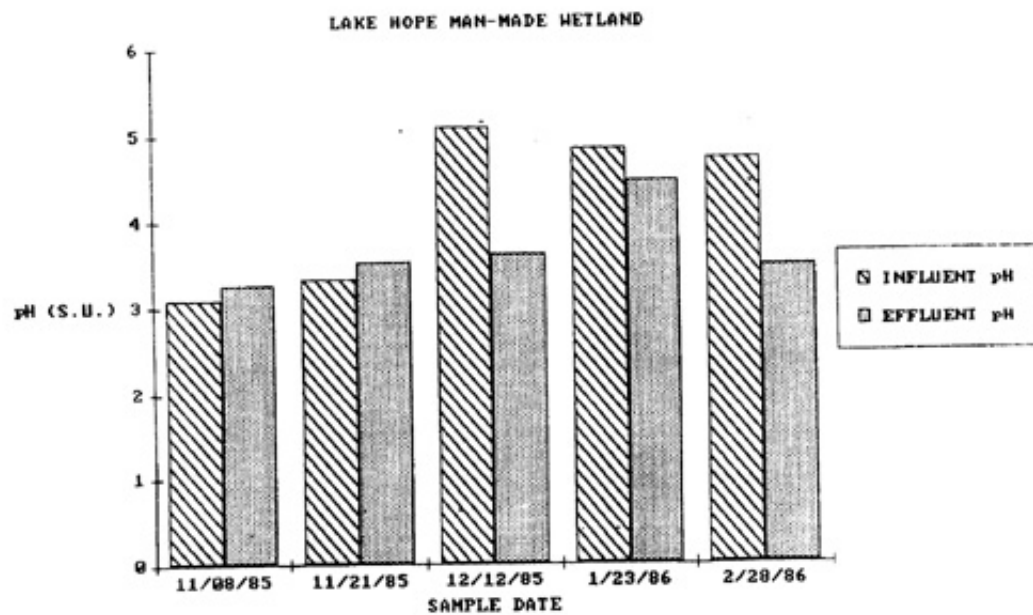
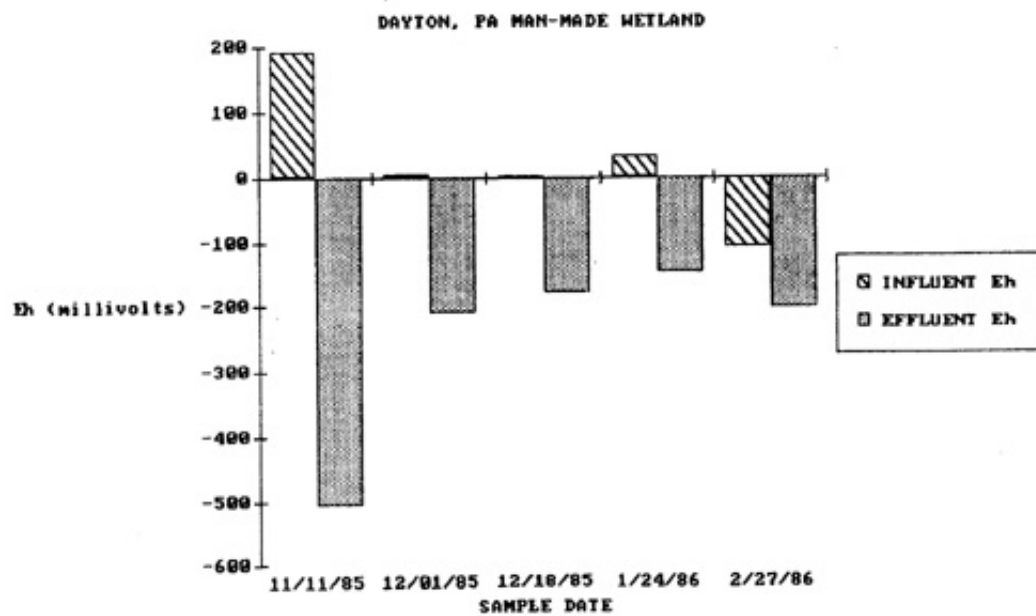
Using an up-scaled design of the DLM wetland, a 7,000 square foot man-made wetland was constructed near Dayton, Pennsylvania. Flow rates into the Sphagnum sp. bog mat was designed to be between 15 and 20 gallons-per minute. Water quality at the site, based upon limited sampling, indicated total iron concentrations of about 12 mg/l and total manganese concentrations near 25 mg/l. Average pH values range between 5.5 and 6.5 s.u. Since the time of the straw substrate and moss installation in November, 1985, the wetland has shown

approximately 50% removal for iron from analyses of influent and effluent discharges. Reduction in manganese concentrations have not be observed. Due to exceedingly high rainfall during the winter months of 1985-1986, the variations in flow to the wetland was erratic. Changes in the basic design of runon and runoff flow control structures were needed to check high hydraulic loadings.

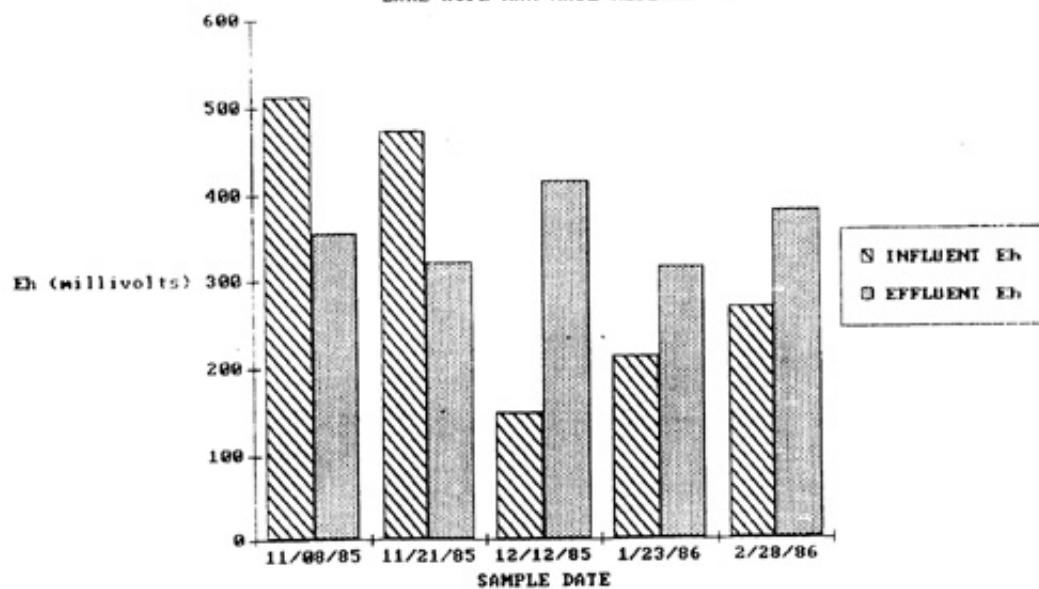
The man-made wetland installed near Lake Hope State Park in southeastern Ohio in November, 1985, was designed with little substrate for support of the moss mat. In contrast to the twelve to eighteen inch deep straw substrate at the Dayton, PA. and DLM locations, the 2000 square foot Sphagnum recurvum moss mat at this site was place upon a bed of straw of less than six inches. The purpose of this design modification was to limit the development of the anaerobic zone. Water quality at the Lake Hope wetland varies with flow since the source of the mine drainage is from abandon mines. Typical iron and manganese concentrations would be near 10 mg/l. During the winter months, pH values ranged between 3 and 5 s.u. As indicated by Eh measurements, the wetland discharge has remained aerobic. Because of problems associated with influent flow control, analytical results for various metal removal capacities could not be substantiated.

Appended to this extended abstract are several figures depicting pH, Eh and dissolved iron concentrations at the two most recent man-made wetland sites. Until a larger data base is developed, conclusions concerning such conditions as anaerobic versus aerobic environments in the bog mat and its effect upon dissolved metal removal is only conjecture.

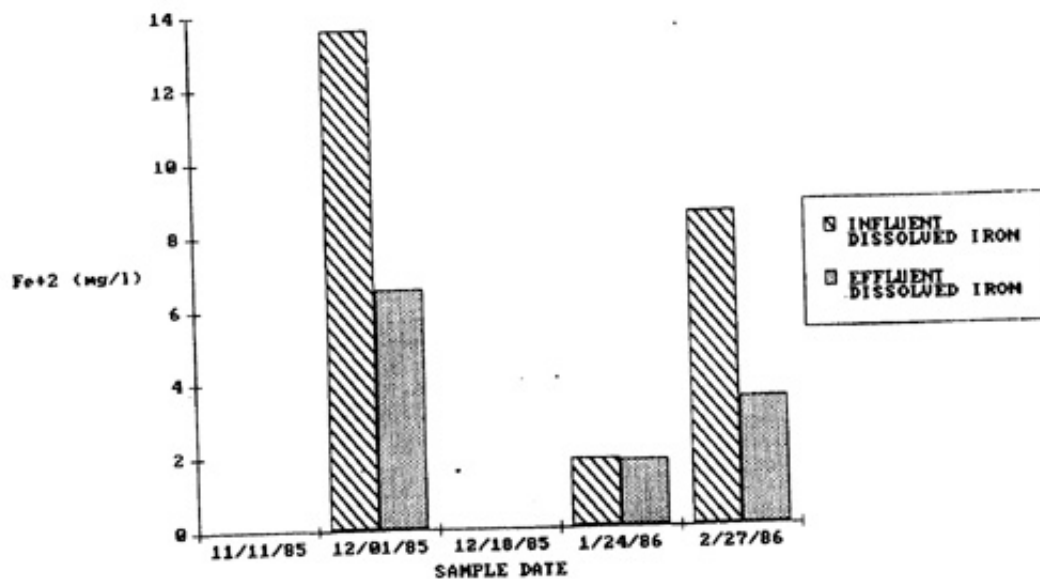




LAKE HOPE MAN-MADE WETLAND



DAYTON, PA MAN-MADE WETLAND



LAKE HOPE MAN-MADE WETLAND

