SESSION III: WETLAND RESTORATION

DRAINAGE DESIGN AND WATER QUALITY MONITORING FOR WOODED SWAMPLAND RESTORATION

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ABSTRACT

As found in many rural areas of southern Ontario, wetlands, especially swamps, have bee drained and used for agriculture. The restoration project site described in this paper was tile-drained and cleared for a period of seven years. Natural drainage characteristics of the site were severely disturbed during this period.

The approach taken to restoring swampland characteristics relied primarily on restoring the natural ebb and flow of drainage through the site. This necessitated an understanding of seasonal precipitation as well as the hydroperiod characteristics of other local swamps. Drainage from the site was monitored along with a wide variety of water quality parameters over a period of 12 months during 1992-93. This paper describes the drainage characteristics of this pilot project as well as general water quality and the value of follow-up monitoring with similar projects.

This project undertook to restore swampland vegetative cover to approximately 3 hectares of marginal farmland that had previously been tile drained and under active agriculture for seven years.

Drainage

A low berm was installed across the lowest end of the site to effectively block surface drainage. Pre-existing 30 centimeter collector tiles were connected to standard Hickenbottom riser and standpipe hardware to provide a drainage outlet for the site. Since much of the flow into the site was groundwater from surrounding morainal deposits the head control was maintained with the above ground standpipe. This damming approach was necessary to aid in restoring hydroperiod characteristics to the site that mimic that of other local forested swamp ecotypes.

By allowing standing water to pond and slowly drain out of the site it was intended to provide conditions condusive to the development of vegetative communities as found in local swamps. It was expected that ponded water would suppress vegetative communities previously established following tile drain installation and would encourage the re-establishment of remnant vegetation as found in adjacent swamp lands. The head level of ponded water was monitored weekly for one year by means of a staff gauge at the standpipe outlet. More frequent readings were taken during selected storm events.

Hydroperiod

Fluctuations in the pond head level indicated that the site hydroperiod was buffered by continual ground water input and the absorbant capacity of a pre-existing organic mat and organic soils overlying the clay base of the site. This buffering characteristic resulted in very gradual decay of drainage and associated pond head lowering following storm events. During drier months of the year the absorptive capacity of the site frequently precluded any change in pond head following storm events. During spring and autumn, when the organic mat was saturated, moderate storm events resulted in pond head peaks within 3 to 5 hours and the resultant decay was extended for up to 36

hours afterwards.

Water Quality

A water quality monitoring program was established in the spring of 1992 to assess the effect of the project site discharge on the receiving waters of Salem Creek, a cold water stream with resident brook trout population. Samples were taken bi-weekly between March 1992 and May 1993 from ponded water in the project site, below the outlet drain and above the outlet drain in Salem Creek. These were analyzed for a total of 19 parameters through the assistance of the Ontario Ministry of Environment regional laboratories in London, Ontario.

Analytical parameters were:

Biochemical Oxygen Demand, Free Ammonia, Total Kjeldahl Nitrogen, Nitrite, Nitrate, Total Phosphorus, Dissolved Reactive Phosphorus, Dissolved Organic Carbon, Suspended Solids, Calcium, Magnesium, Hardness, Alkalinity, Chloride, pH, Conductivity, Colour, Turbidity, and Temperature.

Data was graphed and analyzed for trends prior to statistical analyses. A variance ratio test which compares data sets on the basis of internal variability and a two sample t-test which compares data set means were used to derive statistical comparisons at a 95% confidence level. The main concern was that sample stations above and below the discharge outlet show no significant difference in parameter values.

Statistical analysis indicated no significant effect of the project discharge on the receiving waters of Salem Creek. The greatest variability was found in comparing variance of macronutrients, B.O.D., and D.O.C. between the project site and both sites on Salem Creek. Clearly the project site had parameter concentration peaks which could be tied to typical wetland fluxes associated with the overwinter senescence and break down of plant material. Discharge from the project site on an annual basis was so low that the receiving waters were not adversely affected; higher runoff in the spring was diluted by correspondingly higher levels of flow in the receiving waters.

The success of this project may be used to developed a longer term program of swampland conversion of marginal wet farmland throughout the Maitland River watershed.

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TABLE OF CONTENTS