

Various effects of forest harvesting and management on stream
ecosystems in the vicinity of Fundy National Park,
New Brunswick

by

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Submitted in partial fulfillment of the requirements
for the degree of Master of Science

at

Dalhousie University
Halifax, Nova Scotia
December, 1995

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DALHOUSIE UNIVERSITY
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DATE: December 20, 1995


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TITLE: Various effects of forest harvesting and management on stream
ecosystems in the vicinity of Fundy National Park, New Brunswick.

DEPARTMENT OR SCHOOL: Biology

DEGREE: MSc CONVOCATION: Spring YEAR: 1996

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Abstract

This study examines some effects of clearcutting and road-building on streams in the vicinity of Fundy National Park, New Brunswick. Sixteen streams were selected for sampling: four were reference streams located within mature forest in the park, and twelve streams drained nearby clearcuts 4-20-years old. Streams were selected on the basis of similarities in stream order, size, and accessibility. Along each stream, sampling was centred around a 25-m reach, with at least one riffle, and with depth and width similar across streams. From May to November, 1993, each stream was sampled for temperature, dissolved oxygen, major ions, sedimentation and bedload movement, substrate type and concentration of organic carbon, channel dimensions, riparian vegetation, and invertebrates (the latter sampled using gravel-filled rockballs, placed in sampling reaches for six weeks).

Harvesting within the riparian zone reduced canopy shading, reduced cover of aquatic bryophytes, removed large trees and snags, and increased densities of shrubs (primarily *Alnus rugosa*). Riparian buffer strips reduced these effects, provided they were wide enough to ensure shading of the stream channel and feeder springs, withstand windthrow of riparian trees, and supply inputs of large woody debris. In general, with or without a riparian buffer, streams draining harvested areas had warmer water and greater temperature fluctuations, and larger nutrient concentrations and sedimentation rates than streams draining reference watersheds. Most of the highest rates of sedimentation occurred downstream of logging roads, while most of the lowest rates were recorded in reference streams. Three of the reference streams had similar properties and were fairly distinct from the cutover streams, and from the fourth reference stream, which was logged in the 1920s.

Clearcutting appeared to have a negative influence on the abundance of Chironomidae and Nymphomyiidae, and positive influences on Plecoptera, Elmidae, and Oligochaetes. The overall abundance of invertebrates colonizing rockballs was strongly correlated with age of stand, with the greatest numbers occurring in reference and older cutover streams, and the smallest numbers in the most recently cutover streams. The numbers of invertebrates colonizing rockballs in the older cutover streams were similar to those of undisturbed streams. This occurred despite the slower recovery of stream energetic processes in the older cutovers, as indicated by a principal components analysis of physical, chemical, and biological variables.

Acknowledgements

I would like to thank all those who have helped me with the various stages of this thesis; in particular, my supervisor, Bill Freedman, and the members of my committee, Nelson Watson, Bob Rutherford, and David Patriquin. I will never forget my field assistant, Meg Jones, who had an admirable notion that field work is fun and glamorous. Lots of thanks to those whose patience and support have kept me inspired.