

## **Fish Community Patterns Upstream and Downstream of Pulp and Paper Mill Discharges on Four U.S. Receiving Waters.**

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### **Biographical Sketches of Authors**

Jill Thomas is a senior research biologist in the Northwest Aquatic Biology Facility (NABF) of the National Council for Air and Stream Improvement (NCASI). Since 2000 she has been involved with the NCASI Long-Term Receiving Water Study (LTRWS), a 10 to 20 year study to assess possible effluent effects on aquatic communities in four U.S. receiving waters. Her current activities are focused on analysis and interpretation of the data generated by this study.

Tim Hall is project manager at the NCASI NABF in Anacortes, WA. He has been with the NCASI for 25 years, studying multiple aspects of aquatic biology, including experimental streams, mesocosms and field studies. Mr. Hall was instrumental in the creation and implementation of the LTRWS during the 1990s and continues as project supervisor for the study.

### **Abstract**

This study compares spatial and temporal patterns of fish communities in four rivers that include pulp and paper mill effluent point source discharges. This project covers the initial three years (1998 to 2001) of a larger long-term study being conducted on Codorus Creek, PA; the Leaf River, MS; and the McKenzie and the Willamette Rivers, OR. The four receiving waters represent a diversity of geographic, mill process, and river conditions. Collection methodologies varied between rivers due to size and site accessibility; however, river to river comparisons are made on the assumption that sample collection methods were all designed to allow for capture of a representative fish population. Codorus Creek, with 38% effluent at the edge of the mixing zone, had a significant gradient in communities. The pattern was weakly correlated with the three water quality variables. There was no significant temporal pattern for seasons or years. The Leaf River, 4% effluent, demonstrated no significant pattern between sites; however, there was a significant temporal difference. The McKenzie River, 0.6% effluent, demonstrated a significant but weak difference between two upstream sites and two sites immediately downstream of the mill. The largest river, the Willamette, 0.2% effluent, had no apparent fish community gradient. Diversity indices showed no significant differences between sites for any of the four rivers. This study showed a pattern of relative response in receiving waters and demonstrated that multivariate analysis of assemblages provides the ability to identify community patterns and their associations with water quality.

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