DYNAMICS OF GROUNDWATER INFLOWS TO THE LAMPREY RIVER, NH

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Problem and Research Objectives:

During late summer months, stream flow in the Lamprey River is largely from groundwater sources. The proposed research will investigate how the different hydrogeologic regions within the watershed control the dynamics of river baseflow during periods of reduced flow.

This research will be completed using data from the U.S. Geological Survey, New Hampshire Department of Environmental Services (NHDES), and the National Oceanic and Atmospheric Administration (NOAA), field measurements on selected study sites, and a combination of groundwater/surface water models to analyze and quantify groundwater inputs to the Lamprey River. The Lamprey River Watershed is an important component of the water resources of the seacoast region of New Hampshire and is similar in climatology and hydrogeology to many watersheds in New England. The Lamprey serves as a water supply for municipalities including Deerfield, Raymond, Epping, and Newmarket, as well as serving as an auxiliary water supply for Durham and the University of New Hampshire. Current activities within the watershed, including a proposed bottled water plant near Northwood, may result in changes to the aquifer system. Forecasting and potentially mediating late summer low flow conditions in the Lamprey (and other similar rivers in the region) are critical to effectively managing these resources.

In addition to the Lamprey's importance as a water resource, an 11.5-mile stretch of the Lamprey River from Newmarket to Lee was declared a National Wild and Scenic River. With this declaration, several restrictions were initiated, including policies against new dam and water transfers; water quality; channel alterations; new solid-waste facilities; and protected in-stream flows. These restrictions protect both the stream and surrounding ecology from future effects of population growth in the region. An important factor in protecting stream ecology is the dynamics of the river during reduced flows.

During reduced flow periods, a large percentage of surface water flow is derived from groundwater inputs (Perkins and Sophocleous, 1999; Harvey and Bencala, 1993; Cey et al., 1998). However, little research has been conducted to quantify inputs to the Lamprey River discharge from sources such as stratified drift aquifers, bedrock aquifers, and springs. Previous work on low flow systems in New England (Dingman and Lawlor, 1995; Risley, 1994; Barnes, 1986; and Kliever, 1996) have focused on the statistical methods of determining low flows rather than the source of water during these periods. The proposed research is unique in that the primary goal will be to understand and quantify sources of water during reduced flows rather than estimating the magnitude and frequency of low flow periods.