This research is part of a three-year grant focused on Maine watersheds and the interactions between landforms, rivers, and the Gulf of Maine coastal waters. Four rivers were the focus of this study: the Saint John, Penobscot, Kennebec, and Androscoggin. Sampling sites were on tributaries leading up to the major rivers and on the main stems. Beginning in 2011, monthly samples were collected at ten to thirty sampling stations per river from April to November. My component this summer focused on looking at inorganic nutrient concentrations in the four rivers: nitrate, ammonium, phosphate, and silicate. The goal was to quantify spatial and temporal patterns of nutrient loads within the individual rivers and between river systems. This would help reveal sources of nutrients (i.e., which tributaries) and sinks of nutrients (i.e., phytoplankton consumption) to eventually calculate fluxes to coastal waters. Nutrient concentrations and ratios were quantified seasonally in monthly averages and spatially in station averages. Chlorophyll a, analyzed in the lab, provides a reliable proxy for phytoplankton concentrations. Multispectral chlorophyll fluorescence readings, measured in situ at each station, qualitatively distinguished pigment-based phytoplankton taxonomy (Proctor and Roesler, 2010). Diatoms, dinoflagellates, and cyanobacteria were specifically targeted due to their different utilization of nutrients. Silicate is a significant nutrient necessary for supporting diatoms (Townsend et al., 2010), while excess phosphate has been shown to trigger cyanobacteria blooms. With a decrease in silicate, blooms may become more dinoflagellate-based. Understanding nutrient utilization by phytoplankton is important to conceptualizing what nutrients are making their way to the Gulf of Maine from these rivers. Overall, nitrate and silicate were the most variable inorganic nutrients across stations, with the Saint John having the highest values of both nitrate and silicate. Silicate also shows the most seasonal variability across all four rivers. River discharge rates were obtained from USGS gage sites and were used to compute nutrient fluxes into the Gulf of Maine using the equation: Flux (mg/d) = Discharge (m³/d) * concentration (mg/m³).