Terwilliger, Sarah (2000). “Impact of Tidal Restriction on the Sulfur Dynamics of a Maine Salt Marsh: Sprague River Marsh Phippsburg, Maine”. Standard Theses.

At one time salt marshes existed in greater abundance along the east coast of the United States. However, as a result of both their value for agriculture and an ideal coastal building areas, many of them have been destroyed or significantly altered from their original state. A tidal restriction is a structure that acts to cut-off or reduce range of tidal flow through the marsh, causing the marsh to lose the functional connection between the tidal marsh and the surrounding body of marine water (Barrett and Neiring, 1993).

Portnoy laid out a model that describes a natural salt marsh as being high in sulfide and alkalinity as well as being high in mineral and organic accretion. There are two types of restriction that can occur. The first is a drained marsh, which is characterized by increased decomposition and subsidence as well as decreased alkalinity and sulfide, which results in a decline in the salt marsh plant Genus *Spartina*. The oxidation of previously anoxic sediments can lead to an acidification event, in which the marsh is overwhelmed by toxic acid. The second type of restriction is the result of diking which results in increased freshwater influence in the marsh and decrease saltwater influence. The result of diking is a decrease in mineral accretion, a decrease in sulfide and alkalinity, and a decline in *Spartina*. It was expected that Sprague River Marsh would show characteristics similar to Portnoy's second restriction scenario, low sulfide and alkalinity, and a decline in *Spartina*.

The purpose of the study was to determine the impact of the tidal restriction on the sulfur dynamics of the marsh.

This study was performed at the Sprague River Marsh in Phippsburg, Maine. Phippsburg is located in mid-coast Maine, south of Bath, Maine. There is a causeway, approximately 150m long and 30m wide with a 25m bridge at the end. Water flow under the bridge is the only mechanism for water exchange between the restricted and unrestricted marsh.

Six study plots were established through the marsh. There were two in the restricted marsh, two immediately south of the restriction, and two near the mouth of the marsh. Four types of water samples were collected: porewater, main channel, pans, and ditches. Each of those water samples was analyzed for DO, alkalinity, pH, sulfate, and sulfide.

It was concluded that the tidal restriction at Sprague River Marsh did not have a significant impact on the sulfur dynamics of the salt marsh. However, there was significant variation in the sulfur dynamics from north to south in the marsh. There was a larger proportion of sulfate being reduced to sulfide in the north end of the marsh. This trend is likely due to differences in sediment characteristics between the north and south end of the marsh. At the north end of the marsh the sediment is finer and has a lower hydraulic conductivity. These differences drive differences in groundwater flow patterns through the marsh, which results in differences in the sulfur dynamics at the north and south ends of the marsh.