

Judice, Elyse (2010). “Stable Isotope Analysis of *Fundulus heteroclitus* and the Effectiveness of Ditch Plug Restoration at the Sprague River Salt Marsh, Phippsburg, Maine”. Standard Theses.

The Sprague River Marsh is a back-barrier spit adjacent to Seawall Beach in Phippsburg, Maine. The Sprague River Marsh has undergone significant modification by humans over the past 300 years with evidence of three different episodes of ditching documented. In an effort to restore sections of the marsh by creating pools habitat, the U.S. Fish and Wildlife Service plugged several of the ditches in the southern end of the marsh between 2002 and 2006. The purpose of this study was to evaluate the efficacy of the restoration method by comparing food web dynamics and water quality in pool recently created by ditch-plug restoration versus pools that have been on the marsh for a longer period of time. Stable carbon and nitrogen isotopes from muscle tissue and liver from *Fundulus heteroclitus*, particulate organic matter (POM), and surface sediment were examined in three pools to the east and west of a large ditch-plug has severely restricted tidal exchange with the pools to the east of the plug. Water quality parameters, including pH, temperature, dissolved oxygen, and specific conductivity were also measured at these and 209 other pools throughout the marsh. Our results show that livers are consistently depleted in  $^{13}\text{C}$  relative to muscle tissue likely reflecting the presence of more lipids in liver relative to muscle. Additionally, *F. heteroclitus* tissues and POM from the eastern pools are significantly more depleted in  $^{13}\text{C}$  than tissues from the western pools. Because *F. heteroclitus* in pools from Sprague Marsh relies primarily on aquatic vegetation (i.e. phytoplankton, macroalgae) as a food source, the spatial differences in  $\delta^{13}\text{C}$  are likely due to differences in isotopic composition of the dominant aquatic vegetation at each site. We suspect that this varies with salinity and degree and duration of water saturation of the pool. Our results suggest that nutrient dynamics in pool behind at least one of the ditch-plugs at Sprague Marsh have been altered to a significant degree. More work is needed to determine the extent to which these alterations may appear in other restored areas of the marsh, and the degree to which they may affect the function of salt marsh pools.