

EVALUATING WETLAND ECOSYSTEM HEALTH IN THE PRAIRIE POTHOLE REGION USING
REAL-TIME NUTRIENT DYNAMICS OF WATERFOWL

Annual Progress Report for the Kenneth F. Higgins Waterfowl Research Endowment

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The value of the Prairie Pothole Region (PPR) of the northern US and southern Canada is well established for breeding waterfowl. However, the contribution of prairie wetlands and landscapes that support them to waterfowl during spring migration is less understood. Widespread land use change occurring throughout the region to facilitate increased commodity crop production is likely to negatively affect the ability of the region to support breeding waterfowl populations and may impair the functionality of remaining wetlands in agricultural landscapes. Alternatively, prairie wetlands in agricultural landscapes may be resilient to changes in land use practices and may still contribute to annual migration of waterfowl. We are interested in understanding the impacts of agricultural intensity on prairie wetlands in the PPR of eastern South Dakota by measuring physiological and numerical responses of waterfowl to wetland conditions and by sampling aquatic invertebrate assemblages in wetland during spring.

We conducted preliminary field sampling during April and May 2012 to collect baseline data on physiological parameters of two duck species (blue-winged teal and lesser scaup) and evaluate wetland sampling methods. We identified 6 clusters of public land (U.S. Fish and Wildlife Service and South Dakota Game, Fish, and Parks properties) distributed across eastern South Dakota and in landscapes with varying degrees of agricultural intensity. We collected migrating female blue-winged teal ($n = 112$; range: 18-19/site) and lesser scaup ($n = 67$; range:



*Sean McGinn and Owen Roberts
conduct a migrating waterfowl survey
during the 2013 field season.*

7-19/site) throughout a prolonged migration period due to the warm spring. We have conducted a detailed necropsy on these individuals and evaluated concentrations of 3 lipid and 1 protein metabolites in plasma samples from each bird. Analyses are ongoing to understand how metabolite concentrations vary across the migratory and pre-breeding season within and among study areas. An undergraduate student researcher (Nicholas Markl) assisted with blue-winged teal necropsies and conducted an independent study project during the 2013 spring semester. His final report titled, "Nutrient Dynamics of Breeding and Migrating Blue-winged Teal in Eastern South Dakota"

compared measured indices of lipid and protein reserves in teal collected in different reproductive statuses. We also sampled 15 semipermanent wetlands in the 6 study areas (range 2-5/site) with 3 different sampling gears (sweep nets, benthic dredges, and stove pipes) to

understand how sampling point distribution might influence estimates of food availability and wetland quality. Laboratory sorting of these samples was recently completed and analyses are ongoing.

During April-May 2013, we conducted the first full sampling season of the research project. The study areas shifted from exclusively public land to nearly exclusively private land in 12 randomly-selected 50 km² study areas throughout eastern South Dakota. We obtained permission from landowners to access 10-12 semipermanent, permanent, and seasonal wetlands on each site and conducted waterfowl surveys, vegetation surveys, and fish and invertebrate sampling on each wetland. We also focused on randomly selected wetlands to collect migrating blue-winged teal and lesser scaup to measure metabolites, diets, and body condition. We collected 10 female blue-winged teal on each site ($n = 120$ total). Spring arrived late in 2013 and made collecting lesser scaup challenging; thus we were only able to collect 38 females (range: 0-8/site). We collected over 2,500 invertebrate samples and conducted two waterfowl surveys on each of the 124 wetlands in the study sites. Laboratory analyses are ongoing to sort invertebrate samples, conduct detailed duck necropsies, and measure metabolite concentrations in plasma samples.



Brian Evans and Neal Martorelli sample aquatic invertebrates in a seasonal wetland during the 2013 field season.

We will randomly select 12 additional study areas for spring 2014 and use the same sampling strategies on those sites as used during 2013. Additional analyses will be conducted in a GIS to understand land-use influences on waterfowl migration physiology and wetland condition.