

Department of Natural Resources SCI-MIC Supported Research Projects 2014 Progress Reports

Diving Duck Project Update

We have completed 53 aerial surveys of Lake St. Clair, western Lake Erie, and the Detroit River since the autumn of 2010 for a project aimed at (1) developing novel survey techniques for estimating diving duck abundance and (2) achieving a greater understanding of environmental and human-induced factors limiting diving duck and other waterfowl distribution on the study area. This research was developed to answer 2 fundamental management questions: (1) How many ducks use the study area and (2) What areas of the Lake St. Clair and western Lake Erie do the birds prefer and why?

Although there is much work yet to be completed, with the help of SCI's Michigan Involvement Committee's purchase of video and conventional camera equipment we have made substantial progress; project personnel have given over a dozen presentations at national/international conferences, and have produced five publications. Brendan Shirkey's presentation on development of distance sampling techniques for diving ducks was awarded best student paper at the International Ecology and Management of North American Waterfowl Conference held in Memphis, TN in January, 2013.

Estimating Diving Duck Abundance—Lake St. Clair and western Lake Erie are continentally important migration staging areas for diving ducks including canvasbacks (*Aythya valisineria*), redheads (*A. americana*), and lesser and greater scaup (*A. affinis* and *A. marila*). Starting in 1983, the Michigan Department of Natural Resources (MDNR) attempted to census diving ducks on the United States portion of Lake St. Clair throughout autumn migration; however, in 2010 the MDNR expanded the traditionally surveyed area to include all of Lake St. Clair and a portion of western Lake Erie. The idea of achieving a census over the expanded study area was unrealistic, and instead distance sampling techniques were adopted in an effort to generate statistically valid estimates of detection probabilities and abundances for diving ducks during spring and autumn migration. Distance sampling techniques provide a viable option for estimating diving duck abundance as long as flock size is accounted for as a covariate affecting the detection function. Diving ducks were generally more abundant on our study area during autumn migration with a mean of 306,327 ducks/survey (SE = 40,729) compared to an average spring abundance of 91,053 ducks/survey (SE = 19,175). Peak abundance occurred on 20 November 2012 with an estimated 596,335 diving ducks on Lake St. Clair and western Lake Erie.

Camera equipment provided by SCI has been essential in accurately estimating abundance of large diving duck flocks that can cover as much as 12 square miles of water surface. Ultimately, this work establishes a long-term and consistently collected data set that will be used for conservation planning purposes in the dynamic landscape of the Great Lakes.

Spatial Modeling of Diving Duck Distribution—Despite the ecological significance of the region to waterfowl, Lake St. Clair still faces a host of ecosystem threats due in large part to the highly developed landscape of the lower Great Lakes. The main objective of this research is to identify environmental and anthropogenic variables that influence diving duck distribution on Lake St. Clair through the development of predictive, hierarchical spatial models. We found submerged aquatic plant diversity is a strong positive predictor of diving duck occurrence throughout the study and we found presence of recreational boats to be a strong predictor of diving duck absence during both spring and autumn migration. Furthermore, we found diving ducks to be consistently associated with shallower water during both spring migration and on our single nocturnal survey, suggesting diving ducks might prefer shallow foraging areas with high aquatic plant diversity when those areas are disturbance free. These findings indicate disturbance plays a major role in diving duck distribution on Lake St. Clair, especially during autumn migration, and we hope this work can be used for conservation planning purposes in the lower Great Lakes given recent interest in off-shore wind turbine development and ever-growing human demand for Great Lakes resources.

We have applied for additional grant monies to expand our research in FY2016 to include Saginaw Bay and to further investigate nocturnal distribution of ducks. We also have a large collection of aerial photos taken with MIC-purchased equipment available for viewing and use.