The Natural Resource Conservation Service implemented the Migratory Bird Habitat Initiative (MBHI) in summer 2010 to mitigate potential loss of wetland habitat caused by the Deepwater Horizon oil spill. The goal of the MBHI was to improve wetland habitats on private farmlands, catfish ponds, and Wetland Reserve Program (WRP) easements in the Lower Mississippi Alluvial Valley (LMAV) to provide additional habitats for wintering and migrating waterbirds. Improving habitat on WRP easements is particularly important, given that landowners are not required to provide additional management after initial enrollment and restoration. Priorities for WRP wetlands enrolled in the MBHI included addressing waterbird food habitats, providing habitat structure, and additional management activities such as planting and/or disking on seasonal wetlands. Although WRP sites have been designated as critical wildlife habitat, little research has been conducted to evaluate management on WRP easements or quantify effect on wildlife use and wetland habitats in the LMAV. My main objectives were to evaluate factors influencing waterbird density and species richness by making relative comparisons between MBHI wetlands and reference wetlands with differing management activities, food biomass, and surrounding landscapes.

I conducted bi-weekly waterbird surveys and collected seed and invertebrate samples on randomly selected conservation easement lands enrolled in the MBHI (n=13), traditional WRP sites (n=12), and intensively managed publicly owned wetlands (n=7) in the LMAV of Arkansas and Missouri to quantify food availability and habitat use from August-September 2011 and November 2011-February 2012 by fall migrating shorebirds (Charadriiformes) and wintering dabbling ducks (Anatinae). Additionally, I quantified habitat surrounding each study wetland in terms of proximity to, percent area and interspersion of WRP easements within different spatial scales, based the distance shorebirds (1.5km) and dabbling ducks (3.5km, 10km) fly between wetlands within stopover or wintering areas.

Shorebird densities were influenced by vegetative conditions, with greater densities at sites with lower percent cover and shorter vegetation height, and most shorebirds using wetlands with mean vegetation height < 30 cm. Dabbling duck densities at MBHI wetlands were 2.1 times greater than at WRP wetlands; but did not differ from densities at public wetlands. Regardless of wetland type, dabbling duck densities were approximately 2.6 times greater at private wetlands (MBHI and WRP) that were actively inundated compared to sites that were not inundated. Additionally, wetlands that were planted with moist-soil seeds had dabbling duck densities 1.8 times greater than sites where moist-soil seeds were not planted. However, dabbling duck densities were influenced by percent vegetative cover, with the greatest densities occurring at sites with approximately 50% cover. Dabbling duck densities were 1.8 times greater at wetlands with hunting activities, compared to sites with no hunting activity. Inability to survey all sites at times when waterbirds were most likely to be present may have confounded my ability to detect a relationship between food availability and waterbird use metrics.

During autumn, invertebrate biomass estimates from soil core samples were over 4 times greater than sweep samples. Conversely, sweep sample familial richness was 50% greater than core sample estimates. Sweep production estimates were also 60% greater than benthic core production estimates, regardless of wetland type. Wetland invertebrate studies should consider objectives carefully when determining sampling methods. Failure to sample both nektonic and benthic invertebrates in seasonal wetlands may cause studies to underestimate common aquatic invertebrate metrics. Although invertebrate biomass was not affected by mowing, active inundation, and site age, invertebrate production at wetlands that were mowed...
was approximately 4 times greater compared to wetlands that were not mowed. Mowing of vegetation can increase detritus in seasonal wetlands and may be an important tool for providing food for invertebrates. During winter, invertebrate production at WRP wetlands and MBHI wetlands was greater than production at public wetlands. However, invertebrate production did not differ between WRP and MBHI wetlands. Drought conditions on private lands may have increased decomposition and productivity of aquatic plants, also increasing detritus for invertebrates during winter. I also tested for an effect of sampling frequency on invertebrate biomass during winter and found no difference between monthly and bi-weekly sampling, indicating that sampling frequency may be reduced if secondary production is not a variable of interest. Management activities at each site did not adequately explain variation in waterbird densities; therefore I created a set of a priori models to test the hypothesis that a combination of landscape and local variables would explain a greater amount of variability in bird use metrics than landscape or local predictors individually. The best approximating models for both shorebird abundance and species richness contained only wetland area (null models) and accounted for 39% and 41% of the model weights, respectively. Shorebirds have distinct foraging strategies and habitat requirements, and including all species may have obscured of some habitat variables in predicting shorebird use. Juxtaposition of WRP within 1.5km of study sites was another top variable in competing shorebird models and accounted for 34% of the model weights for abundance and 29% for species richness. Landscapes with lower juxtaposition (i.e. large continuous tracts of WRP wetlands) were likely more successful at retaining water and shorebird habitat, thus attracting more shorebirds.

Local food abundance, including invertebrate biomass, seed biomass and percent seed depletion, as well as percent vegetative cover, and cropland juxtaposition within 10km were all components in the dabbling duck abundance model that accounted for 62% of the model weights. Dabbling ducks used seasonal wetlands that contained abundant local wetland foods (at least moist-soil seeds) that had several agricultural fields nearby, indicating a reliance on natural and anthropogenic food sources. However, invertebrate biomass may be a poor predictor of habitat use by all dabbling ducks due to inter- and intra-specific variation in the relative importance of invertebrates as a dietary component during winter. There were ten models that were best fit as predictors of dabbling duck species richness, including the null model. These models contained the variables percent cover, cropland area within 10km, WRP area within 10km, and cropland juxtaposition within 10km. The associations between these variables and dabbling duck species richness were primarily negative, providing counterintuitive and confounding results and may be a consequence of species-specific dabbling duck responses to broad-scale habitat patterns. Conservation of wetland complexes may be paramount to ensuring adequate stopover and wintering resources are consistently present within landscapes that are continuously being altered through anthropogenic activities. Semi-permanent wetlands, which can remain inundated for a few years at a time, and other persistent aquatic habitats likely provide an important alternative to seasonal wetlands for shorebirds in times with limited wetland availability. In agriculture-dominated landscapes such as the LMAV, conservation programs that promote winter flooding of croplands adjacent to important wetland habitats may be an efficient method of providing additional habitats for dabbling ducks. Management at broader spatial scales will likely require private landowner support and a fundamental understanding of how individual wetlands are incorporated into complexes to provide sufficient habitat for migratory waterbirds.