Poster; Travel Scholarship and/or Presentation Award

Aquatic Macroinvertebrates in Hardwood Bottomlands in the Mississippi Alluvial Valley

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Extended Abstract: Historically, most of the Mississippi Alluvial Valley (MAV; 10 million ha) was covered by bottomland hardwood (BLHW) forests; however, <25% of this vast lowland forest remains. These forests are important for many species of wildlife, especially waterfowl wherein they forage on hard and soft mast and aquatic macroinvertebrates. Invertebrates provide protein and other essential nutrients for waterfowl, as they prepare for spring migration and female ducks undergo prebasic molt (Heitmeyer 2006).

Ecologists have assessed use of green-tree reservoirs (GTR) and naturally flooded forests (NFF) for waterfowl wintering in the MAV (Heitmeyer 2006). GTRs are hardwood bottomlands typically surrounded partially by levees and artificially flooded in autumn to provide habitat for ducks. Implicitly, NFF are similar bottomlands that flood typically from natural hydrological events.

No information exists concerning abundance and community structure of invertebrates in BLHWs at the scale of the MAV. Our objectives are to (1) estimate precisely (CV <15%) and compare abundance of aquatic invertebrates (kg/ha, dry mass) in GTRs and NFFs during winter in the MAV and relate results to previous local studies (e.g., Batema et al. 2005), (2) quantify community composition of aquatic invertebrates during winter and compare data between GTRs and NFFs, (3) model influences of local variables (e.g., flooding regime, water depth and temperature, forest type, litter abundance) on abundance and community composition of aquatic invertebrates in GTRs and NFFS, and (4) estimate potential duck-existence days (DEDs) attributable to aquatic invertebrates in GTRs and NFFs.

We will estimate abundance (kg/ha) of aquatic invertebrates in GTRs and NFFs during winters 2008-2010 at Noxubee National Wildlife Refuge (NNWR) and Delta National Forest (DNF) in the eastern Flatwoods and western MAV regions of Mississippi, respectively. We will expand our study to additional sites in the MAV in 2009-2010 (Fig. 1).

Figure 1. *Study sites where aquatic macroinvertebrates were sampled during winter 2008-2009 (stars) and future sites during 2009-2010 (circles) in the Mississippi Alluvial Valley (shaded region).*

We initiated invertebrate sampling in winter 2008-2009. At both study areas, we sampled a GTR and the nearest (≤25 km) NFF with similar forest type. We established 20, 0.2-ha circular sampling areas within each GTR and NFF using a generalized random tessellation stratified spatial design. We used a rectangular sweep net (23 x 45 cm) to collect invertebrates between the substrate upward through the water column (Wehrle et al. 1995). We collected 4 randomly located sweep-net samples within each plot along cardinal directional transects unless plots were incompletely inundated; then, we collected samples (2-3) along the flooded transects within the plot (n = 236). We placed each sample in a plastic bag and froze them for subsequent processing.

To detach invertebrates from leaves and other detritus, we added a super-saturated sugar-water, salt-water, or water-only solution to 16 Samples and agitated each for 30 seconds. We performed the multi-solution experiment to test if the sugar-water or salt-water solutions or water alone differentially detached invertebrates from detritus. We hand-picked invertebrates with surgical tweezers to determine total abundance. We will determine taxon of invertebrates (e.g., Family) and dry them to a constant mass to calculate kg/ha and carrying capacity (DEDs).

To examine the possible relationship between tree species litter and invertebrate abundance and diversity, we identified and enumerated to species 20-30 randomly selected leaves from each sample. We also dried and weighed all leaves in samples to estimate amount of leaf litter at each sampling site to relate total litter mass to invertebrate abundance and diversity.

Our results indicated no difference in mean number of recovered invertebrates among the three water treatments (F = 0.165, P = 0.840; Fig. 2). Mean recovery rate of invertebrates across treatments was 81.5% (CV = 3.1%, n = 16). We will perform additional analyses of dry masses of invertebrates to investigate possible taxon- and size-specific biases among water treatments and ultimately develop a dry mass correction value(s).

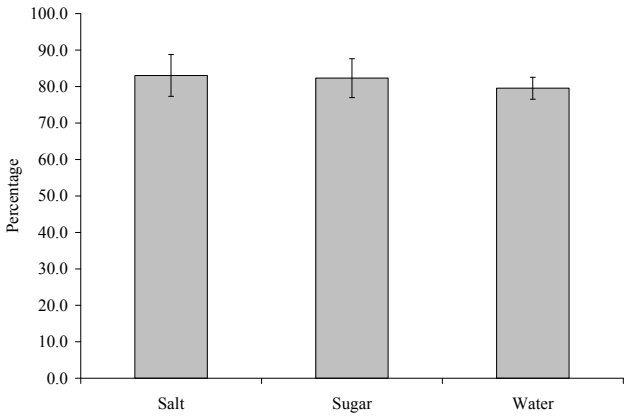

Figure 2. *Mean (SE) recovery rate of aquatic macroinvertebrates from samples collected in hardwood bottomlands in Delta National Forest and Noxubee National Wildlife Refuge, Mississippi, winter 2008-2009.*

Our results will provide contemporary and reliable estimates of invertebrate abundance and biomass in BLHW forests in the MAV, allowing waterfowl mangers to estimate foraging carrying capacity of these habitats for waterfowl and other wildlife based on estimates of both invertebrates and red oak (*Quercus* spp.) acorns from our concurrent studies.

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