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Amphibian Occupancy, Habitat Use, and Reproductive Success in a System of Restored Wetlands

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Overview
• Amphibian populations are declining at alarming rates worldwide. In the Midwest and Indiana especially, habitat loss due to agriculture is a major threat to local populations.
• Wetland restoration can potentially mitigate aspects of habitat loss, but effective sampling techniques and suitable analytical approaches are needed to accurately measure the quality and functionality of the restored habitat.
• Eagle Marsh Nature Preserve in Fort Wayne is a 716 acre wetland system that began the restoration process from an agricultural field to a natural wetland in 2006.

Study Background
• This is the first study to measure occupancy and habitat use in the broader amphibian community in Eagle Marsh Nature Preserve and surrounding wetlands.
• Occupancy probability, psi(\(\psi\)), is the probability that a site will be occupied by the species of interest. It can also be interpreted as the proportion of area occupied.
• We hypothesized that covariates such as wetland area, hydroporid (permanent or vernal), habitat type (restored or established), depth, or amount of vegetation may influence occupancy for different species.
• We listened to frogs calling and caught tadpoles multiple times at 29 wetlands in Eagle Marsh Nature Preserve and surrounding wetlands.

Methods
Left: Eagle Marsh Nature Preserve, with Fox Island County Park to the south. Above: Using dipnets to catch tadpoles in Eagle Marsh.

Comparing Occupancy between Survey Methods
• With the exception of the American Bullfrog, occupancy estimates of calling males did not accurately predict occupancy of successful reproduction.

Results

Call Surveys 2013-2014
• Occupancy estimates of calling male American Bullfrogs and Gray Tree Frogs declined in 2014.
• Treefrogs (family Hylidae) had the highest occupancy rates among calling anurans in 2014. The lowest rates were seen in the Blanchard’s Cricket Frog and Fowler’s Toad.

Tadpole Surveys 2013-2014
• The Northern Leopard Frog was the only species where larval occupancy increased in 2014. Blanchard’s Cricket Frog tadpoles were only found at one site in 2013.
• Occupancy of the Northern Leopard Frog was the highest among larval amphibians caught in 2014.

Comparison between American Bullfrog and Green Frog

Conclusions
• The two species of special concern, the Northern Leopard Frog and the Blanchard’s Cricket Frog, had opposite trends in occupancy. Tadpole occupancy of leopard frogs was the highest among all species, while cricket frogs had the lowest estimates.
• Hydroporid influenced occupancy of American Bullfrogs, both for calling males and tadpoles. Bullfrog tadpoles need two years to metamorphose, and it appears that adults are selective in choosing wetlands that retain water year round.
• Larval occupancy was strongly associated with habitat type in two salamanders, the Small-mouthed Salamander and Unisexual LIT Salamander. Salamanders are primarily woodland species, and only breed in forested, established wetlands.
• Occupancy probabilities were different among the two survey methods. This finding has important management and conservation implications. Many studies base management decisions on wetlands where species are heard calling, but it may be more suitable to focus on protecting habitat where species are breeding successfully.

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