Wood frog tadpoles (*Lithobates sylvaticus)* significantly contribute to nutrient cycling and enhance litter breakdown in wetland ecosystems

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Animals play a pivotal role in the structuring and functioning of ecosystems. For instance, animal waste can contribute substantially to nutrient cycling and ecosystem productivity in lotic environments. However, little is known of the biogeochemical impact of animal excretion in wetland environments. Here we investigate the effects of wood frog (*Lithobates sylvaticus*) tadpole aggregations on nutrient recycling, microbial metabolism, and carbon cycling in geographically isolated wetlands. We used a paired mesocosm and field study approach that utilized measurements of tadpole excretion rates, microbial extracellular enzyme activities, and litter degradation. Tadpoles displayed a strong relationship between development and nutrient excretion demonstrating that ontological changes impact tadpole mediated nutrient cycling in wetland habitats. Further, the interplay between per capita excretion rates and hydrologic conditions in wetlands increased ambient nutrient concentrations in wetlands through time. Within our mesocosm study tadpole derived nitrogen elicited a strong microbial response, decreasing extracellular enzyme activities associated with nitrogen acquisition by a factor of 5. In addition to microbial metabolic response, tadpole presence enhanced litter breakdown in both mesocosms and wetlands by 7% and 12%, respectively, in comparison to reference conditions. These results provide evidence for the functional and biogeochemical role of tadpole aggregations in wetland habitats, with important implications for ecosystem processes, biodiversity conservation, and ecosystem management.