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The effects of leaf litter type on the growth and development of gray treefrog tadpoles

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Forestry practices are implemented worldwide to manage tree populations and harvest resources. Forestry practices involve the thinning and/or intentional planting of trees which influences canopy cover and litter species. Leaf litter from different species play a role in pond ecosystems as a source of nutrients, refugia from predators, and a food source. When certain litter species are eliminated from or added to pond ecosystems, it can have diverse effects on ecosystem processes and pond communities, including amphibians, which are declining worldwide. To test the effects of litter species on ecosystem processes, water quality, and tadpole growth and development, we set up mesocosm tanks with five litter species: red oak, white oak, sugar maple, white pine, and prairie cordgrass. Phyto- and zooplankton inoculum and 40 gray treefrog hatchlings were added to each tank. A diel oxygen technique was used to measure community metabolism and primary productivity. We measured pH, dissolved oxygen, and temperature throughout the study. Size and time to metamorphosis of gray treefrogs will be measured as indicators of fitness. Preliminary results indicate differences among treatments in water quality and ecosystem processes. Water in tanks with pine and red oak had a higher pH than sugar maple and white oak, while tanks with grass were intermediate. The sugar maple and white oak treatment were consistently lower in dissolved oxygen than all other treatments. Grass and red oak had higher levels of primary productivity and community metabolism than sugar maple and white oak, with pine being intermediate in both. Differences in primary productivity could be related to concentrations of nutrients in the litter, the rate of litter decomposition, or both. Future data on decomposition and nutrients could determine which of these are more important. Preliminary observations reveal that tadpoles are smaller in white oak than in other treatments, possibly from lower primary productivity. These results indicate that forestry practices could influence water quality and ecosystem processes.