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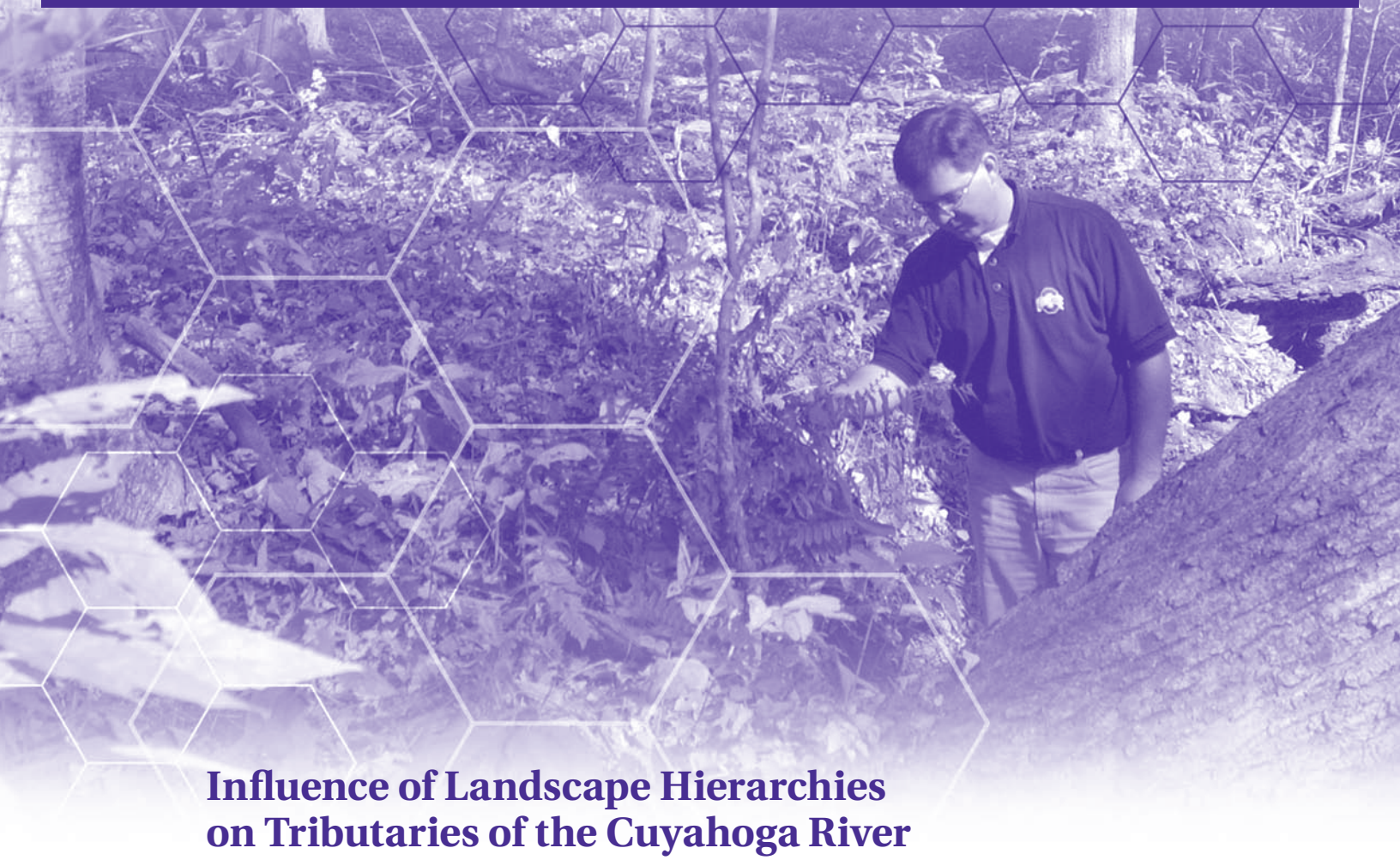

Influence of Landscape Hierarchies on Tributaries of the Cuyahoga River

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Ecological restoration of natural features such as riparian forests and headwater streams is a top priority in the Cuyahoga Valley National Park (CVNP). The park provides some of the largest tracts of mature second-growth forest in northern Ohio, and the study of these forests may lead to insights that can guide establishment of realistic restoration targets in other agricultural and urbanized watersheds in the region.

Riparian forests are important features of any landscape as they provide many critical ecosystem benefits. Not only do riparian areas regulate the flow of water, sediments, and nutrients, they also contribute organic matter in the form of leaves and wood to aquatic systems. In addition to this organic contribution, riparian areas also reduce erosion and provide important wildlife habitat.

Headwater streams, which often are forested naturally, represent approximately 80% of the streams in most watersheds. These streams are identified as critical components in efforts to reduce the environmental pollution of downstream areas. It is believed that headwater streams and their adjacent riparian areas may represent the most critical areas of a watershed for conducting ecological restoration.

OBJECTIVES

The goal of this research was to better understand how natural processes influence the composition and structure of riparian forests in the glaciated portions of the Lower Great Lakes Region. Mature riparian forests in the Cuyahoga Valley National Park were examined to understand the relationships among overstory and understory vegetation, soils, and stream valley geomorphology (valley floor landform, position in watershed). Also examined were habitat factors on aquatic food webs (macroinvertebrates, salamanders, and fish) in each of the streams associated with the riparian forests. All of the riparian forests examined in CVNP were at least 70 years old and were associated with relatively small streams.

RESULTS

The overstory of the riparian forests is characterized by 24 different tree species, with American elm, green ash, sugar maple, yellow-poplar, slippery elm, American sycamore, and Ohio buckeye being the most dominant species on the terraces. The adjacent hillslopes are dominated by sugar maple, American beech, northern red oak, yellow-poplar, and American basswood. Despite these differences in species composition, stand structures were similar.

In the understory, the terraces of the riparian forests had significantly higher total biomass than the adjacent valley walls. Furthermore, upstream terraces lacked the dense cover of woody shrubs, woody vines, and ferns commonly found on the adjacent hillslopes. These results provide a benchmark for restoring more disturbed headwater riparian systems at CVNP, especially those where active restoration plantings will be utilized.

Macroinvertebrates and salamanders in headwater streams were influenced by adjacent riparian vegetation. Macroinvertebrates also were associated with the amount of sedimentation, large wood, and other local in-stream characteristics. Salamanders were most affected by landscape-scale disturbance, specifically the amount of agricultural land in the watershed. The results of this analysis demonstrated that in order to recover full ecological function and meet EPA water-quality targets in headwater systems, reduction in silt and restoration of large wood in streams may be necessary.

The results of these studies are valuable to both managers and researchers, particularly as riparian forest restoration efforts continue across the region. The information will also guide water-quality recovery and stream-restoration efforts in the Cuyahoga Valley National Park and in other highly disturbed areas such as the Sugar Creek Watershed of northeastern Ohio.

FUTURE

The U.S. Department of the Interior's National Park Service (NPS) provided an additional $121,579 to continue research on headwater riparian forests of CVNP. Specifically, these funds will be used to examine the role of flooding on floodplain seed banks and the acquisition and retention of large wood in the streams and to develop a multi-criteria riparian restoration prioritization model.

Finally, the results from these studies have helped leverage a USDA CSREES grant totaling $590,000 to better understand the interaction between aquatic food webs and riparian characteristics in the Sugar Creek Watershed.

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