

# Investigation of crayfish populations in the Middle Creek, PA watershed and the potential impact of invasive *Orconectes rusticus* on native ecosystems.



Figure 1. The native *Cambarus bartonii bartonii* was found in few areas of the Middle Creek watershed.

## Introduction

The invasive rusty crayfish (*Orconectes rusticus*) has a significant negative impact on native crayfish populations (Figure 1) and has been very successful outside of the species' native Ohio River Basin habitat (Figure 2). Rusty crayfish have spread by human introductions and are potentially having a great impact on native species, ecosystems and food webs (Reynolds and Souty-Grosset 2012; Leib, et al., 2011). *O. rusticus* has been documented in the Middle Creek watershed, though to what extent they have invaded the watershed and the extent of their impact on native populations remains generally unexamined.

## Objectives

Purpose of the study is to conduct a comprehensive assessment of current crayfish population density, composition, and distribution in the Middle Creek watershed. Populations and potential impacts of invasive *O. rusticus* will be assessed through density, length, weight, gender ratio, and diet.

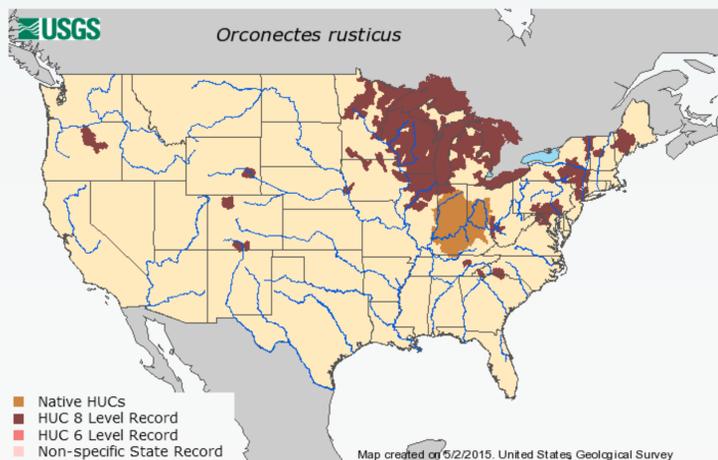


Figure 2. Area where rusty crayfish have successfully spread outside of their native Ohio River Basin.

## Methods

A 1.0 x 1.0 m<sup>2</sup> quadrat sampler, consisting of a metal frame, mesh netting, and a mesh bag, was utilized to collect crayfish from each site (Figure 3). The placing of the frame was chosen based upon representative habitat, and the crayfish were collected by first hand-netting within the frame and then raking the substrate to a depth of 20 cm. The sampling was done at 20 different locations across the watershed encompassing the main and north branches, their tributaries, and the feeder streams (Figure 4) from July to August. Resampling of 6 sites was conducted in October for comparison. All crayfish samples were identified by species and the density at each site was calculated.



Figure 3. This quadrat sampler, made of mesh and a pipe frame, was used to capture crayfish.

## Results

Species composition in the watershed

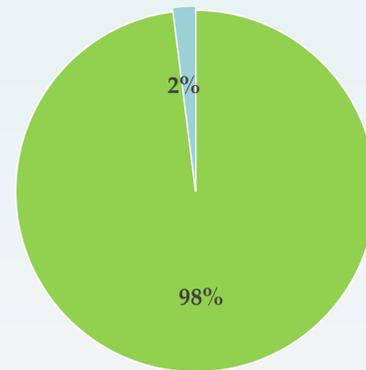


Figure 4. A total of 231 crayfish were captured, and an overwhelming 226 of these were *O. rusticus*, with the remaining 5 being *C. bartonii bartonii*.

The invasive *Orconectes rusticus* were found throughout the watershed, and populations of the native *Cambarus bartonii bartonii* were found in some areas, as well. A total of 231 crayfish were captured, and the overwhelming majority were rusty crayfish (Figure 4). A population of solely *C. bartonii bartonii* was found in a tributary to the North Branch. A mixed population of the two species was also found in one of the feeder streams (Figure 5). At both of these locations, gravid female *C. bartonii bartonii* were captured. An average density of 7.665 crayfish per frame was calculated; the highest density at a single site was 47 crayfish per frame, while the lowest was 0.2 crayfish per frame.



Figure 5. The map shows the 20 sites assessed across the watershed and the crayfish species found at each. A red mark represents *O. rusticus*, a blue mark represents *C. bartonii bartonii*, and a purple mark represents a mixed population of *O. rusticus* and *C. bartonii bartonii*.



Figure 6. The invasive *Orconectes rusticus* have spread and thrived throughout the Middle Creek watershed.

## Discussion

Rusty crayfish (Figure 6) have successfully spread across almost the entire watershed, although none were found in one tributary to the North Branch. This could be due to the nearby Walker Lake impeding crayfish migration, although more research is needed to know why. The number and density of *O. rusticus* compared to *C. bartonii bartonii* shows that the rusty crayfish are out-competing the natives. Rusty crayfish are larger and more aggressive than most species, so they would most likely tend to out-natives from their shelter (Klocker and Strayer 2004). The higher metabolic rate, faster growth rate, and more tolerant nature of *O. rusticus* could also be contributing to their success (Phillips 2010). However, the presence of gravid native females shows they are still reproducing and populations have the ability to increase. Further research is needed to determine the exact impact this has on food webs and ecosystems, but it is likely to be highly detrimental due to crayfish having an integral part as prey and predator.

## Literature Cited

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