

The Crayfish Corps

By Amy Ruhe



NATIONAL PARK SERVICE

VALLEY CREEK IN VALLEY Forge National Historical Park is threatened by an invasion of rusty crayfish (*Orconectes rusticus*). The last 2 miles (3.2 km) of this creek flows through the park to its confluence with the Schuylkill River in front of General Washington's Headquarters. Historically and ecologically significant, Valley Creek is a state-designated "Exceptional Value Waterway" and Class A Cold-Water Fishery that supports a variety of species, including a naturally reproducing trout population. The rusty crayfish, native to the Ohio River drainage, is an invasive species that was first documented in Pennsylvania in the 1970s. Since its introduction, it has spread into the Delaware, Potomac, Schuylkill, and Susquehanna river watersheds, and in 2008 it found its way into Valley Creek via the Schuylkill River.

Nonnative crayfish are one of the biggest threats to crayfish diversity in North America (Butler et al. 2003), with urbanization and associated habitat destruction also posing a significant threat to Pennsylvania's native crayfish species (Lieb and Carline 1999, 2000; Butler et al. 2003). Crayfish can make up more than 50% of the invertebrate biomass in streams and rivers and are an important food source for trout and other large fish, transferring energy and nutrients up the food chain (Huryn and Wallace 1987; Momot 1995). Rusty crayfish are highly aggressive, which, combined with their larger body size and voracious appetite, gives them a competi-

tive advantage over Pennsylvania's native crayfish species. In addition to direct competition for resources, rusty crayfish displace native species from preferred habitat, making native crayfish more susceptible to predators as they move to find unoccupied spaces and diminishing food-stuffs. The thicker exoskeleton and aggressive defense posture of the rusty crayfish also make them less vulnerable to fish and other predators than native species (Garvey et al. 1994). Once established, rusty crayfish can disrupt the entire aquatic ecosystem by eliminating native crayfish species, reducing or eliminating aquatic vegetation, reducing the abundance and diversity of aquatic insect populations, and ultimately affecting predators such as trout.

A 2003 crayfish inventory did not find rusty crayfish in Valley Creek but did document two crayfish species, one of which was a previously undescribed species and a member of a species complex (*Cambarus acuminatus*) that had not been documented in Pennsylvania. Results from ongoing surveys in the area suggest that the range of the previously undescribed species is likely restricted to Valley Creek and a few nearby streams, and that it is probably native to the state (Lieb et al. 2007b). Additional research is needed to determine whether this crayfish is a new or introduced species; however, if it is a native species, it is possibly one of the most threatened aquatic species in Pennsylvania because of its limited range, proximity to

urban centers, and nearby populations of rusty crayfish (Lieb et al. 2007a). Based on recommendations from crayfish and aquatic invertebrate specialists, the park decided to manage the crayfish as a new species until additional evidence indicates that it is not native.

Managing the invasion

Following the 2008 discovery of the rusty crayfish in Valley Creek, park staff quickly assessed the extent of the invasion and determined that the initial density of this species was approximately one in every four crayfish sampled. Without quick action the population was likely to explode. Valley Forge National Historical Park is situated as the first line of defense in the 24-square-mile (62 sq km) Valley Creek watershed and, with only a small natural resource staff available to manage the invasion, the park established the Crayfish Corps in 2009 to protect aquatic biodiversity and the potentially new crayfish species. From April to October, volunteers from schools, summer camps, corporate groups, conservation organizations, families, and other park neighbors don hip waders and enter Valley Creek to catch and remove rusty crayfish using only nets and muscle (fig. 1, next page). The park investigated additional suppression methods to help control rusty crayfish in Valley Creek, including chemical treatments, electrical barriers, and trapping. These methods have the potential to control the



Figure 1. Members of the Valley Forge Crayfish Corps remove invasive rusty crayfish from Valley Creek, a state-designated “Exceptional Value Waterway.”

rusty population but are nonselective, and could significantly impact native crayfish and other nontarget aquatic species. Crayfish Corps is proving to be an effective method to selectively suppress the rusty crayfish population while minimizing impacts to other species.

The Crayfish Corps is one of three resource stewardship activities that make up Valley Forge’s Stewards of Native Diversity program, a natural resource initiative that focuses on the preservation and restoration of native biodiversity. These programs are designed to engage youth in meaningful stewardship activities and promote hands-on learning to achieve resource management goals. Under the direction of National Park Service staff, Crayfish Corps participants systematically search sections of Valley Creek, removing rusty crayfish while counting and releasing native crayfish. They learn proper search and capture techniques, how to minimize

habitat disturbance, species identification, and the impact of rusty crayfish on native diversity. In addition to hands-on learning in the field, the park created lesson plans to link field activities back to the classroom, making the program increasingly popular with local schools. Promotional brochures, buttons, and T-shirts featuring the Crayfish Corps logo (previous page, at top) help promote the program with park visitors and families and encourage long-term engagement. During the last four years, more than 6,000 volunteer hours have resulted in the removal of more than 11,000 rusty crayfish and achievement of the park’s goal of suppressing the invasive species’ population so that it remains at initial invasion levels. Focused on the creation of future park stewards and management of park biodiversity, the Crayfish Corps is now the park’s most popular volunteer program and the only one in which the majority of participants are under age 18.

In addition to contributions from volunteers, hundreds of staff hours are spent each summer supervising participants, catching crayfish, and collecting, managing, and analyzing data. To inform the resource management strategy and promote science-based decision making, park staff collect data on stream temperature, species captured, location, sex, reproductive status, volunteer efforts, and size. Subsequent analysis enables staff to evaluate changes in the relative abundance of crayfish species, determine trends, understand changes in population structure, and assess the overall efficiency and effectiveness of the program. The analysis indicates that through the Crayfish Corps the park has managed to maintain a native-to-rusty crayfish ratio of 4:1, preventing the loss of native crayfish species and helping to maintain biodiversity in the aquatic ecosystem. Additionally, the average total body length of rusty crayfish is decreasing, which indicates that the Crayfish Corps is effectively removing most of the large reproductive individuals. Interestingly, data also indicate that stream sections with cooler average water temperatures (coincidentally the sections with the most well-established riparian buffers) have fewer rusty crayfish than warmer sections, and that an old dam near Valley Creek’s confluence with the Schuylkill River may be slowing the movement of rustys into the watershed. We presented these results at the 2011 George Wright Society meeting and the Schuylkill Watershed Congress.

Continued vigilance

To help prevent the continued spread of the species, the park incorporated a “no live bait” policy into its superintendent’s compendium and regularly provides literature and educational materials about invasive species to park visitors. In 2012 a

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park internship project investigating the relative abundance and distribution of the three crayfish species in the Valley Creek watershed found, unfortunately, that the rusty crayfish has continued to advance up Valley Creek beyond the park boundary. Valley Forge National Historical Park is working with partners at Valley Forge Trout Unlimited, Stroud Water Research Center, and Cabrini College to develop a Crayfish Corps that extends into stream sections outside the park to help suppress the invasion as it moves farther up the watershed.

Valley Forge National Historical Park translated an urgent need for invasive species control into the most popular multiage volunteer program at the park. Through volunteer help and community support, a small natural resource staff are able to effectively control an immediate threat to biodiversity while engaging thousands of volunteers in hands-on lessons in the importance of stewardship. As parks face limited budgets and staff, this program can serve as a model for achieving invasive species control, citizen engagement, and biodiversity management.

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