

Assessment of Stonefly Abundance and Body-Length Based on Rainbow Trout Population in Burch Creek, Ogden Utah



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Introduction

Rainbow trout (*Oncorhynchus mykiss*) are one of the most widely introduced species in the western United States and are often used to promote sport fishing (Weigel, et al. 2003). A primary food source for rainbow trout is stoneflies (Insect Order Plecoptera); representing over 30% of trout diets where populations permit (Metcalf, et al. 1997). Both trout and stoneflies are present in Burch Creek, near Ogden, Utah. It is likely these two species interact in a variety of ways. Feltmate and Williams (1989) found that not only is stonefly density affected by rainbow trout predation, but stoneflies may also evacuate certain habitats to avoid the perceived threat of trout predation. While stoneflies of some families are a food source for rainbow trout, others may compete with trout in places where their shared insect prey are scarce. For example, large stoneflies of the family Perlidae appear to compete with rainbow trout for prey, whereas smaller perlotid stoneflies do not (Harvey 1993). In order to better understand how stoneflies interact with trout, we compared trout abundance with abundance and size of stoneflies from three different families: Chloroperlidae, Perlidae, and Perlodidae (Figure 1).

Study Objective

Compare the results of our study with the findings from Harvey's (1993) study of local creeks along the Wasatch Front. He found that the perlotid stonefly numbers increased in the presence of trout, whereas perlid stoneflies decreased. He also found that perlid stoneflies increased in length in the absence of trout. We wanted to see if the abundance and size of stoneflies were affected by the presence of trout.



Figure 1. Images of Chloroperlidae, Perlidae, and Perlodidae from top to bottom respectively. Photos courtesy of Troutnet.com nwnature.net 02/10/2011

Methods and Analyses

Burch Creek is located in the Wasatch Mountains of northern Utah and flows west through Burch Creek Canyon toward the city of Ogden, Utah (Figure 2). As the stream arrives at the eastern edge of Ogden City limits it discharges into a concrete canal and the confined water continues westward to the Weber River. Before entering the canal, the stream passes through a metal grate that limits the fauna that can proceed to the lower reaches. Above the grate the stream is characterized by low flow rates, a high gradient, and a relatively rocky substrate. The canyon flora is composed primarily of birch, willow and aspen. Burch Creek supports a sizeable community of non-native rainbow trout, as well as a wide variety of invertebrates.

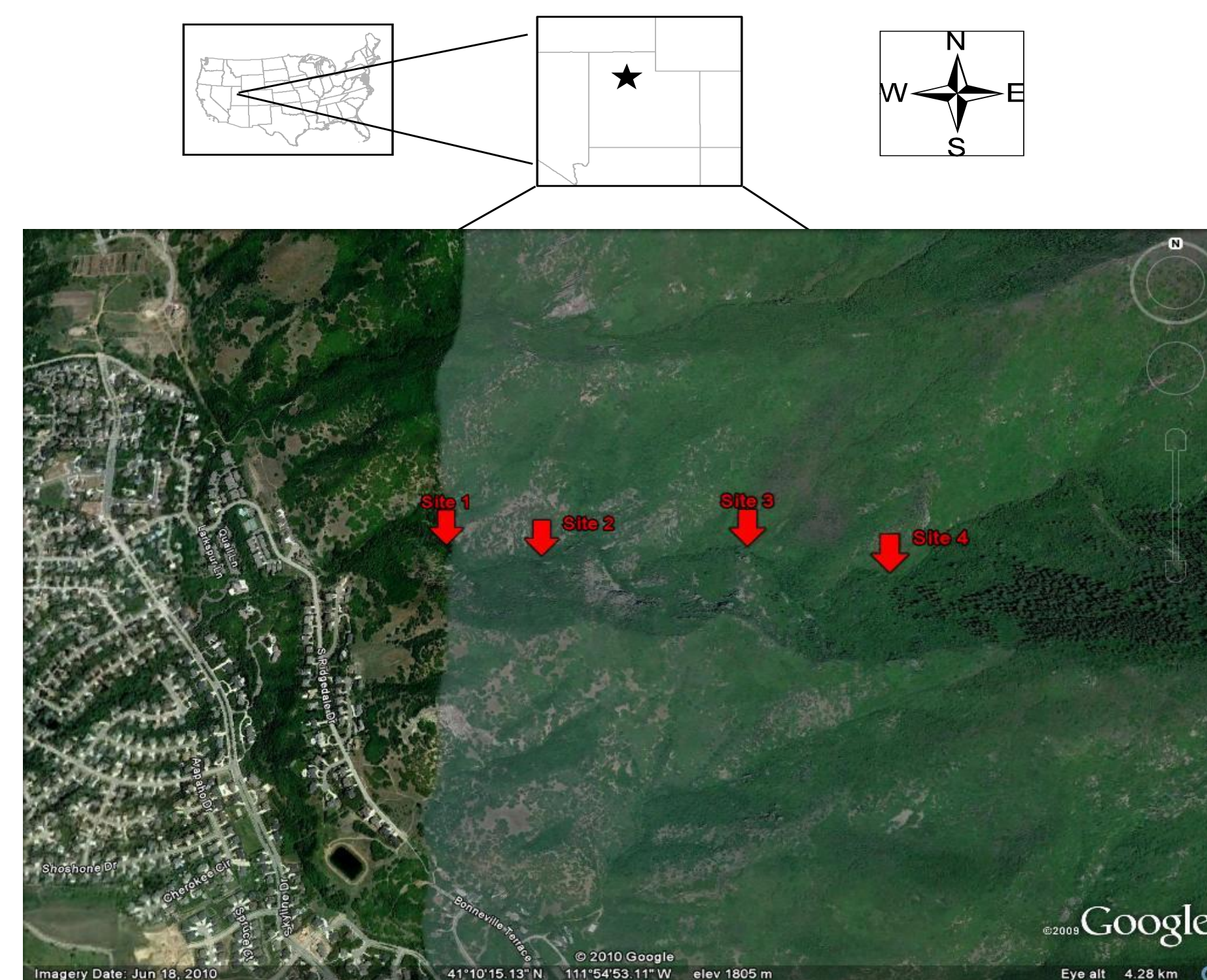


Figure 2. Map of Burch Creek, Ogden Utah and selected sample sites

We estimated rainbow trout abundance and stonefly size and abundance in four sites along Burch Creek during fall 2010. Site elevations were 1570 m, 1660 m, 1775 m, and 1850 m. We collected trout with a backpack electrofisher (Figure 6) and measured the length of each trout to the nearest millimeter. We collected stoneflies in 10 evenly spaced locations along the creek using a 1-ft² Surber sampler (Figure 3). Stoneflies were identified to family and stonefly length (excluding cerci) was measured to the nearest 0.1 mm with calipers. We compared abundance of rainbow trout to the abundance and length of stonefly families.



Figure 3. Collecting invertebrates using a Surber Sampler. Photo courtesy of Also.org 02/10/2011

Results

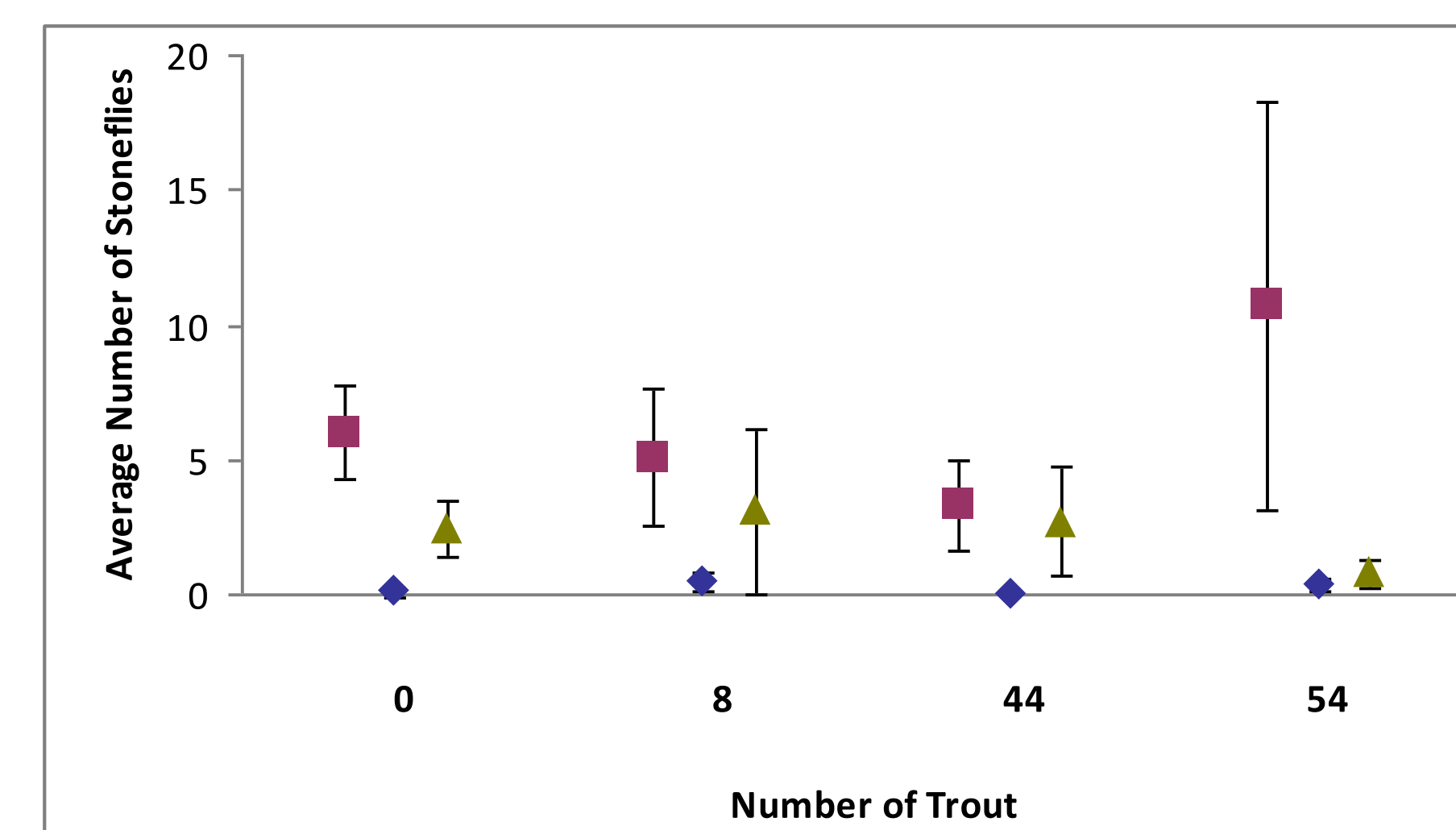


Figure 4. Comparison of rainbow trout abundance among sites and stonefly abundance within families Chloroperlidae (purple), Perlodidae (green), and Perlidae (blue).

The abundance and size of stoneflies within each of the three families was relatively consistent regardless of the abundance of trout (Figures 4 and 5). Stoneflies of family Chloroperlidae were most abundant and perlid stoneflies were least. Chloroperlid and perlotid stoneflies were relatively small, whereas perlid stoneflies were more variable in size but included very large individuals.

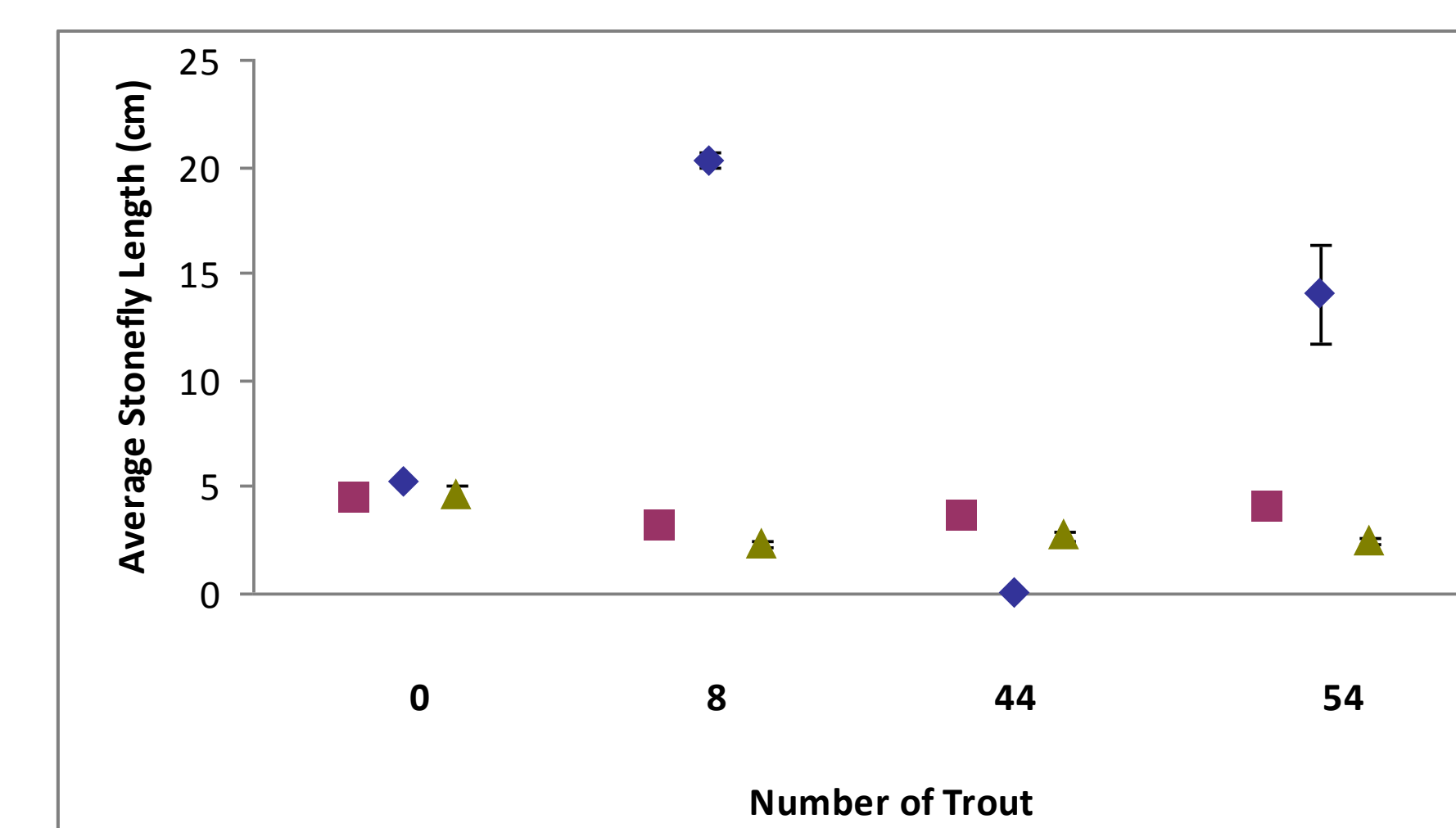


Figure 5. Comparison of rainbow trout abundance and stonefly body length within families Chloroperlidae (purple), Perlodidae (green), and Perlidae (blue).



Figure 6. Electrofishing on Burch Creek, Ogden, Utah Fall of 2010.

Discussion

Our study showed populations of the stonefly family Perlodidae were lowest at the site having the highest density of rainbow trout, which contradicted Harvey's (1993) findings. Also, the average body size of perlotid stoneflies was similar among sites, regardless of trout abundance.

Perlidae also showed no general trends relative to the abundance of trout, being rare at all sites, perhaps due to competition with trout. However, their rarity at locations with few or no trout suggests habitat was unsuitable. Highly variable average size of perlid stoneflies among sites was due to the small number of individuals at each site.

Harvey (1993) did not study stoneflies of family Chloroperlidae, but in our study, they were the most abundant. Chloroperlid numbers decreased in the presence of trout, with the exception the site with the most trout. However, exceptionally high abundance at this site was due to a single sample from a shallow habitat that was likely a refuge from trout. As with perlotid stoneflies, chloroperlid stoneflies were similar in average size regardless of trout abundance.

In summary, we could neither fully support nor contradict Harvey's (1993) findings. Rainbow trout did appear to influence abundance of smaller stoneflies, which suggests Harvey's findings do not hold in all streams along the Wasatch Front. Abundance of chloroperlid stoneflies in our study and rarity of perlid stoneflies could reflect habitat differences between Burch Creek and the creeks Harvey sampled or could indicate that stonefly distributions have changed over time. More widespread sampling within Burch Creek and within creeks studied by Harvey might provide better resolution on relations among stoneflies and rainbow trout.



Literature cited

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