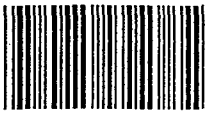
BIALASIEWICZ + DOOLITTLE

Chlorine Impact on the Macroinvertebrates of Bluebell Creek During Early Spring



An Independent Research Project Conducted in the Spring of 1999
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ABSTRACT

In order to take an initial survey of the possible chlorine leak in Bluebell Creek, we attempted to measure the presence of aquatic insects at several points on the creek. The absence of macroinvertebrates led us to conclude that Bluebell Creek is chlorinated enough to prevent the colonization of aquatic hexapods.

INTRODUCTION

Bluebell Creek is a small (approximately 3 ft. wide and 3" – 6" deep) stream that runs along the McClintock Trail located in Chautauqua (City of Boulder Mountain Parks). It is fed by three to five natural springs and a reservoir situated above the creek on Enchanted Mesa. In the winter and early spring, Bluebell Creek is fed exclusively by runoff from the reservoir, which contains water that is treated with chlorine to make it potable. Steve Armstead of Boulder Mountain Parks informed us that a small trailside ditch was potentially carrying chlorinated water to Bluebell Creek. As Bluebell Creek later feeds into Bear Creek in Boulder, the early detection of a possible riparian disruption was needed. As an initial study, the creek's aquatic invertebrates were sampled to monitor the effects of the possible chlorine leak.

MATERIALS AND METHODS

- Four 3" round multi-plate samplers
- kicknet
- 6 pound fishing line
- 2 gallon zip-lock bags

Initial sampling was performed by placing the multi-plate samplers in different locations in the creek bed. Sampling areas were located upstream of the suspected chlorine leak (site 4), directly downstream of the chlorine leak (site 3), and at two other locations farther downstream (sites 1 and 2, also see Fig. 1). The two sampling sites which were farther downstream were meant to measure any long term effects of the chlorine leak on the down-stream invertebrate populations. Each multi-plate sampler was attached to a stationary object on the bank by the fishing line, in order to prevent the samplers from being swept downstream. All of the sites contained the same kind of habitat that each of the samplers were placed into. This habitat can be best described as a "pool", in which mean water velocity is relatively low, and the substrate is composed of gravel and rocks of up to 10 cm in diameter. The multi-plate samplers were left in for two weeks to allow for proper colonization, at which point they were collected and stored in

the large zip-lock bags. The date of sampling occurred between March 31st and April 14th of 1999. Further sampling was performed by kicknetting a square foot section of each sampling area on April 14th.

RESULTS

	Site 1	Site 2	Site 3	Site 4
Number of Invertebrates collected	0	1	0	0
Insect order type	N/A	Trichoptera	N/A	N/A

Table 1. After two weeks in the creek, the multi-plate samplers at sites 1, 3, and 4 remained empty, with no colonization by macroinvertebrates of any kind. Only the sampler at site 2 contained a caddis fly casing with a partially emerged caddis fly (dead).

	Site 1	Site 2	Site 3	Site 4
Number of invertebrates collected	2 (cases only)	0	0	0
Insect order type	Trichoptera	N/A	N/A	N/A

Table 2. Kicknetting of all sites was done as the multi-plate samplers were removed. Of all sites, only site 1 yielded any samples, both of which were empty caddis fly casings.

DISCUSSION

The initial study of the impact of the chlorinated water leak on Bluebell Creek was altered when it was discovered that the water flowing from the pipe, where the creek began at that point in time, was from the same origin as the trail-side leak (see Fig. 1). Both water flows were runoff or leakage from the reservoir. Thus, the impact of that particular leak was inconsequential, since the water quality and level of chlorination was the same in the leak and in the water upstream of the leak. This explains the noticeable absence of hexapod invertebrates in the creek, since the aquatic insects are very sensitive to excessive levels of chlorine. During the latter portion of sampling a flow in the previously dry creek bed was observed, which indicates a period during each year that Bluebell Creek is fed by a natural source. This natural flow would likely dilute the chlorinated water enough for aquatic hexapod re-colonization to occur. The discovery of two empty Trichoptera cases could be attributed to such a yearly re-colonization. These empty pebble encased caddis-fly cases could survive for up to a year in the creek without being destroyed; thus the two cases that were found were likely created during the last summer season. Additionally, the natural flow of the creek, which appears to begin during the middle of spring, will likely facilitate the re-colonization of the creek by aquatic insects upstream from the water pipe. Further pollutants could be incorporated into Bluebell creek through a pipe located between sites 1 and 2 (Fig. 1), however it could not be determined if the pipe was leaking any type of runoff, or from where it

originated. The pipe was also accompanied by a small retaining wall-like structure, which altered the flow of the creek, however the impact of the pipe leakage and the retaining wall-like structure could not be determined due to the lack of macroinvertebrate evidence. Further sampling should be done during the summer and fall seasons in order to accurately gauge the impact of not only the chlorinated water runoff and leaks, but of the physical barrier and the secondary pipe.

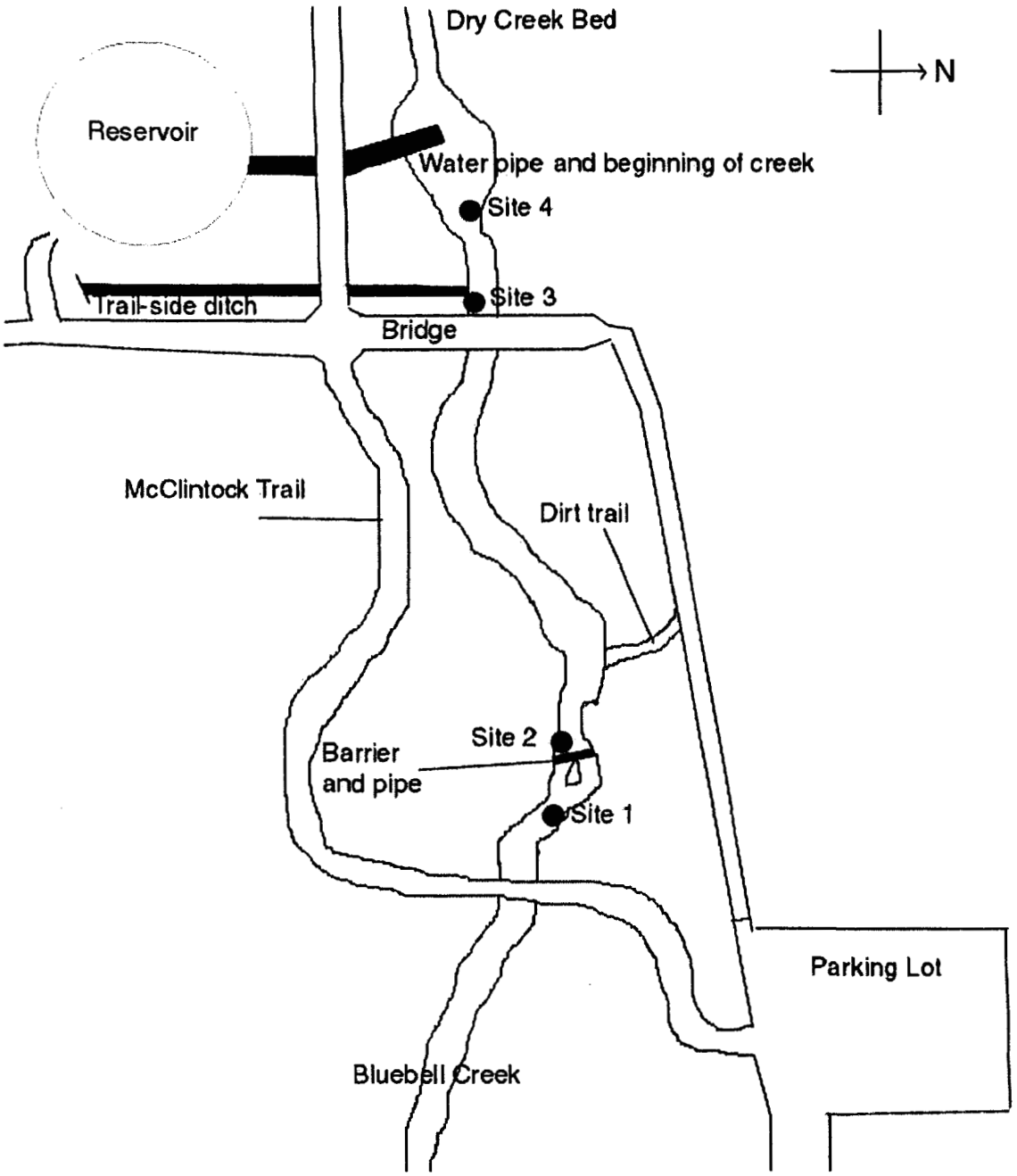

Figure 1. Map of Bluebell Creek section and surrounding area (not to scale).

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