



Campsite Ecology of the Boundary Waters Canoe Area Wilderness

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Introduction

The Boundary Waters Canoe Area Wilderness (BWCAW) of northern Minnesota is vast, over one million acres in size, with over 1200 miles of canoe routes and over 2000 designated campsites. Throughout the year, visitors from all over the United States flock to the area for recreational enjoyment. Because of this, visitors are required to practice "Leave No Trace" camping techniques. This includes strict adherence to designated camping areas, minimizing campfire impact, not molesting the native organisms, and proper disposal of human waste. Despite these efforts to leave a minimum impact on the BWCAW ecosystems, people inevitably alter the campsite areas. Our study investigated this impact at 12 campsites on 8 lakes extending along a 26 miles canoe.



Campsite research team: (left to right) Brian Pauley, Billie Jo Buechler, Dane Ferguson and Kris Hennig.

Methods

Twelve random campsites in the BWCAW were sampled for size, species richness, and amount of trash. Soil core samples were taken to determine soil pH, conductivity, and density.

Soil Samples

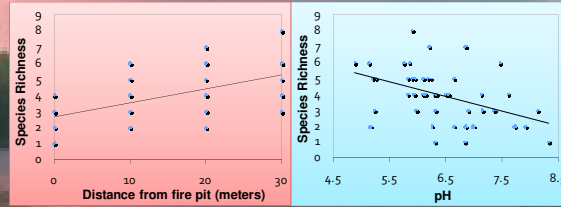
A transect line was established extending from the fire pit to the latrine. Two, 5 mm radii soil cores were taken at 0, 10, 20 and 30 m.

Species Data

All tree and woody shrub species within a 4 m radius of each soil core were identified and counted.

Trash Count

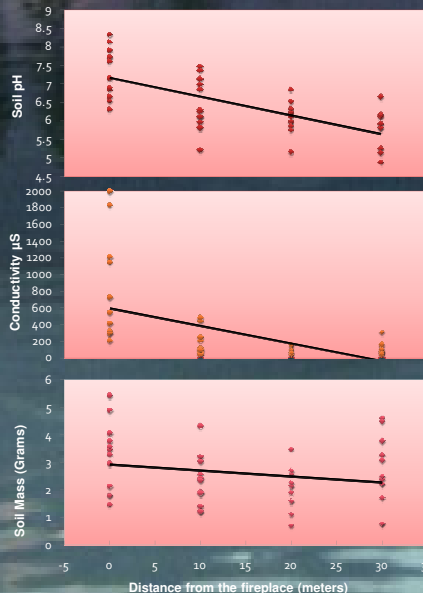
All visible trash encountered within 40 min. was collected and counted at each campsite.



Species richness decreased closer to the fire pit ($p < 0.0001$; $r^2 = 0.46$), while species richness dropped with an increase in soil pH ($p < 0.0001$; $r^2 = 0.59$).



Brian collects and counts trash as Kris identifies tree and shrubs



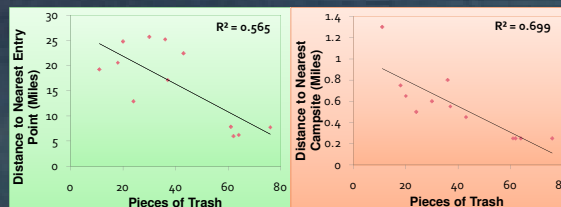
pH ($p < 0.0001$; $r^2 = 0.67$) and conductivity ($p < 0.0001$; $r^2 = 0.56$) decreased with increasing distance from the campfire pit, while soil mass did not change.

Species showing significant correlations between relative abundance and soil variables:

pH
Thuja occidentalis
Betula papyrifera
Rubus occidentalis

Conductivity
Thuja occidentalis
Rubus occidentalis

Soil Mass
Thuja occidentalis
Betula papyrifera



Trash count decreased with increasing distance from the nearest entry point ($p = 0.005$; $r^2 = 0.75$) and adjacent campsites ($p = 0.0007$; $r^2 = 0.836$).

Discussion

It is a fact that human presence within any geographical region will have an impact on the environment. The BWCAW is intended for maximizing human enjoyment while also attempting to minimize the habitat degradation. Conservation planners have to determine the means of minimizing human impacts. Our research focused on quantifiable variables that we believed would tell us the most about campsite impact with the least time consuming on-site methods.

One defining factor of campsite degradation is the presence of garbage. As distance from entry points became greater, noticeable evidence of campsite use and garbage abundance declined. A possible explanation of this relationship may be that as distance from entry point increased, the campsites were less visited. Garbage abundance also increased as distance between adjacent campsites was reduced. The wilderness between these sites was visibly trampled with connecting trails. As expected, species richness dropped with increased proximity to the campfire pit, however, there was an unexpected increase in the relative abundance of Eastern White Cedar (*Thuja occidentalis*), suggesting that some species, are more resilient in areas of impact and represent a species compositional change within campsites.



The savior of many nights; the infamous camp fire.

Implications of Research

Government is often hesitant to limit the amount of public usage of national parks and other wilderness areas such as the BWCAW. In order to minimize impact in the BWCAW, various restrictions are in place such as maximum group size, no cutting of live vegetation, and bathing 150 feet from a lake or stream. Our research suggest a few additional methods may reduce impact:

- Increasing the distance between adjacent campsites may reduce how much trash accumulates within campsites.
- Offering "bounties" on trash brought back from the BWCAW.
- Reducing campfires and concomitant ash accumulation (which raises pH) by selling discounted camp stove-only permits.



Kris, Billie, and Dane collecting data and setting up a campsite transect.