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USE OF A CANOPY WALKWAY FOR COLLECTING ARTHROPODS AND ASSESSING LEAF AREA REMOVED

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ABSTRACT. Canopy walkways are wooden platforms and connecting bridges that provide access to the upper canopy of mature trees. Canopy walkways were constructed at the Coweeta Hydrologic Laboratory in the Southern Appalachian mountains to study canopy arthropods and leaf area removed in deciduous forest stands. A pole pruner/plastic bag method was used to sample branches bearing leaves and their attendant arthropods. The arthropods were picked from the samples and the leaves were photocopied. Photocopies were measured for percentage of leaf area removed. An advantage of the canopy walkway method is that foliage and leaf-dwelling arthropods from the upper canopy can be sampled simultaneously, thus providing information on arthropod density per weight of leaves. Vertical stratification of arthropods can be studied by sampling from smaller platforms built higher in the crowns and by using pole pruners to sample the lower canopy.

INTRODUCTION

Access to the canopy has been a major obstacle for canopy research. Although recently developed techniques have largely overcome these difficulties (Lowman *et al.* 1993), methods such as the canopy raft (Halle and Pascal 1992) or construction cranes (Parker *et al.* 1992) are expensive. Technical climbing (Lowman 1984) may present physical challenges to many investigators. Canopy walkways (Lowman and Bouricius 1993) are relatively inexpensive and are easier to use than technical climbing techniques. Our objectives were to investigate leaf area removed (LAR) and associated arthropods in the upper canopy of two species of trees on three sites with different elevations. We also sampled lower canopy branches from the ground to compare LAR and vertical distribution of arthropods.

MATERIALS AND METHODS

Walkways were constructed in two forested watersheds (WS18 and WS27) at Coweeta Hydrologic Laboratory, North Carolina, operated by the USDA Forest Service (Swank and Crossley 1988). Canopy walkways consisted of 20m long canopy bridges suspended between platforms built into the crowns of carefully selected trees, approximately 60m to 80m tall (FIGURE 1). The platforms were reached by climbing aluminum extension ladders permanently attached to the tree trunks. An investigator wears a climbing harness, and attaches the harness to an ascender fastened to a climbing rope. The climbing rope is securely fastened to an eye-bolt in the tree crown; its use increases safety while the investigator climbs the ladders. A cable is suspended above the bridge, and investigators are clipped onto the cable while using the bridge. On some trees, smaller platforms higher up in the crown have also been constructed. These are accessible by footholds driven into the tree trunk and allow sampling from higher in the canopy.

Samples were taken using a 15 foot pole pruner and plastic bags (Crossley *et al.* 1988). A nylon drawstring bag on a hoop was placed over the selected branch and the drawstring pulled as soon as the branch was cut by the pruners; a plastic bag liner inside the drawstring bag contained the sample. Arthropods inside the plastic bag were anesthetized with a chloroformed cotton ball placed in the bag. Sampling was done from the platforms and the bridges (although balancing on the bridge while wielding a long pole was sometimes challenging).

Samples were also taken with the pole pruner from the ground, thus allowing comparison of leaf area removed (LAR), arthropod weight intensity (Crossley *et al.* 1988) and arthropod feeding groups between the lower and upper canopy.

In the lab, leaves were removed from the branches and arthropods were picked off and identified. Leaves were photocopied and weighed; the photocopies were digitized for LAR using a video camera interfaced with a microcomputer (Hargrove & Crossley 1988).

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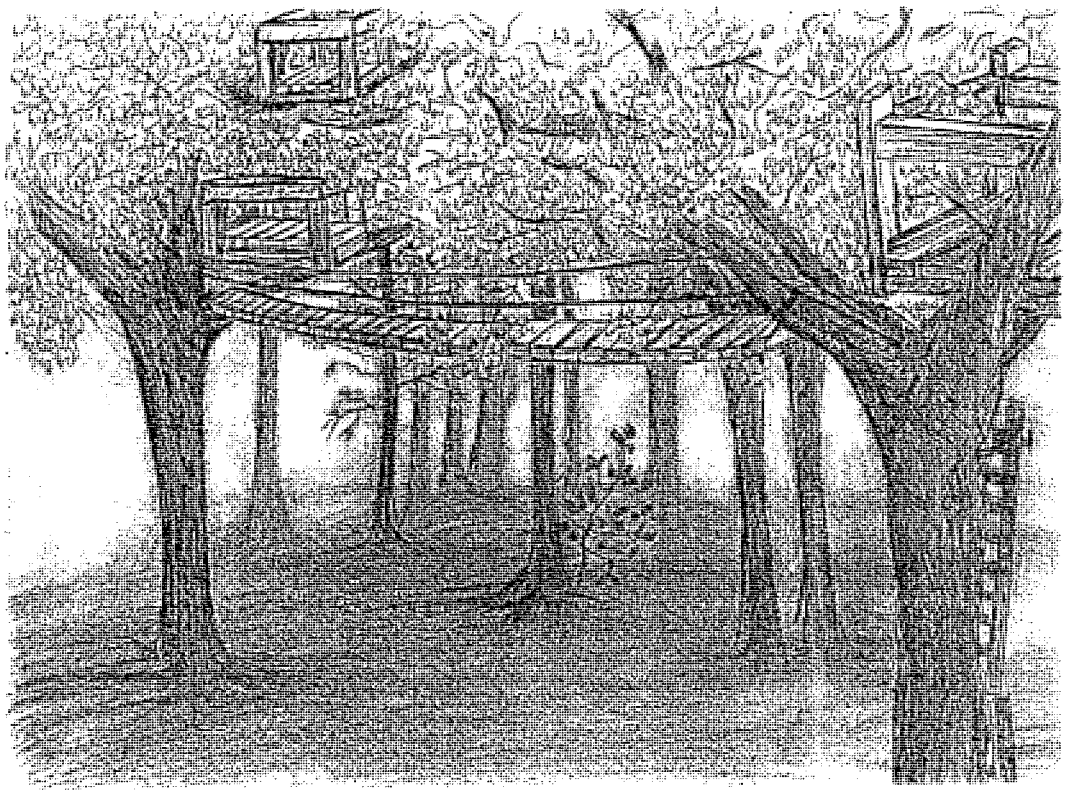

FIGURE 1. A canopy walkway at the Coweeta Hydrologic Lab, Otto, North Carolina. Illustration by Franzie Charen.

RESULTS

Canopy walkways provided access to the upper canopy of two red oaks (*Quercus rubra*) and one red maple (*Acer rubrum*) on upper WS27. On lower WS27 three red maples were sampled from the walkways and on WS18 one large red oak could be reached. Sixty nine branches were collected in one summer (1994), with a total of almost 6,000 leaves. No tree had more than 10% of its branches removed. Preliminary analyses indicate that significantly less herbivory occurred on the higher elevation sites, and that significantly less herbivory occurred higher in the canopy than in the lower canopy. Our data also indicate that leaves were smaller and more abundant at the higher elevation sites.

DISCUSSION

The combination of pole pruners and canopy walkways allows sampling of leaves and their attendant arthropods from various heights in the canopy, especially if higher platforms are also used. A drawback to this technique is that one is limited to only a few large trees, depending on the length of the bridge, tree density, and pole lengths. If trees were sampled more intensively or for more than one year, this technique of destructive sampling could possibly affect the growth of the tree. Sampling from the bridge itself is difficult, especially if the bridge sways.

An advantage of this technique for arthropod sampling, compared to fogging, is that the investigator knows from what part of a tree the sample originates and calculations of arthropod weight intensity per weight of leaves can be made (Crossley *et al.* 1988). However, fogging methods yield more arthropods per unit effort (Blanton 1989).

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