Rainfall Interception by Broom Snakeweed

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Snakeweed's water interception capacity can be estimated from plant size and density.

Rainfall interception by snakeweed involves plants catching and redistributing precipitation back to the atmosphere and to the ground. The process may change the quantity, quality, and distribution of precipitation that reaches the soil surface. For most storms, interception results in less water falling through the canopy and reaching the ground. It may drip from the foliage or it may run down the stem. The precipitation reaching the ground as foliar drip and stemflow is often distributed quite differently than when it fell on the canopy. The size of the drops may increase from accumulation on the foliage before falling off the plant, which may result in increased potential energy for erosion.

Water associated with foliar drip and stemflow may change in quality as dry particles are dissolved or washed off the foliage. Other materials such as metal ions may originate in deep soil layers and be transported up through the plant to be deposited on the foliage. Some substances have nutrient value, and some influence the formation of the soil. Some retard the growth of other plants, and some make the soil repellent to infiltration. Much of the water intercepted by leaves, twigs, and stems may return to the atmosphere by evaporation.

Any analysis of water delivery to and from plant canopies requires data on the pertinent characteristics of foliage and branch structure. The impact conditions from precipitation should be measured as well as the buildup of rain and snow. These kinds of data are rare.

Rain interception is great at the beginning of a storm as the area under a plant, such as a tree with much foliage, remains dry. As time passes, the interception capacity of the plant is reached, so the area under the plant receives precipitation similar to the area between plants. This process can be expressed as a model (Figure 1). At the beginning of the precipitation event, all water is intercepted. A maximum is reached when the cumulative interception no longer increases because the amount of throughfall, foliar drip, and stemflow equal the amount of precipitation. Most evaporation takes place after the precipitation event has ceased. The amount of time between the beginning of the precipitation event and the point of maximum rain interception varies with each plant species and size. The amount of cumulative interception (the highest point on the curve) also varies with each plant.

The purpose of this study was to determine the potential amounts of water lost to interception by broom snakeweed in the Chihuahuan Desert. Canopy storage of water is the most important variable in the interception process. Storage capacity is a function of leaf area index and surface tension forces resulting from leaf surface configurations. Each of these are difficult to measure for an entire plant. Related plant characteristics that are easier to measure include plant green weight, dry weight, height, and diameter.

Fifty snakeweed plants of various sizes were collected near Las Cruces, New Mexico. Plants were transported to a laboratory, cleaned, and pruned. Each plant was weighed by attaching the plant to lines below a suspended analytical balance. The plants were then submerged in a water pool. After submersion, the plants were returned to the suspended analytical balance and weighed. The difference in weight was recorded as the maximum water storage capacity of the plant's canopy. This value is used to approximate the maximum amount of rainfall interception that could occur during rainfall. The crown diameter (maximum and minimum), height, green weight, and oven-dry weight of each plant were measured.

Dry and green weight were the two variables that had the strongest relationship to the amount of water intercepted by broom snakeweed. Of less importance were height and crown diameter. Snakeweed's interception capacity or potential can now be calculated for a snakeweed community if plant sizes and densities are known.

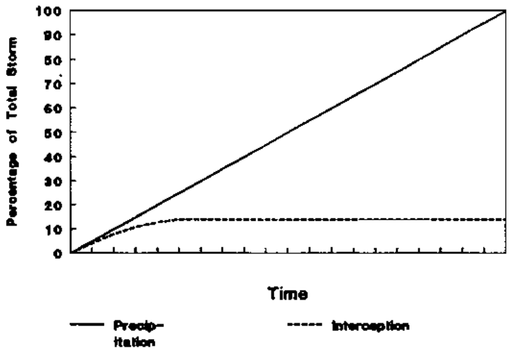

Figure 1. Precipitation and interception during a single storm event.

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