COOPERATIVE EXTENSION SERVICE
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A Simple Technique for the Application of Forestry Herbicides with a Backpack Sprayer

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Application of foliage and soil applied herbicides in small forestry operations is often done with hand-held or backpack sprayers. However, many herbicides do not have detailed backpack application information. They assume that ground based boom sprayers will be used. They also assume that all of the ground within the treated area will be sprayed. When herbicides are applied with backpack sprayers, in the establishment of tree plantations or for competition control in existing plantations, only a portion of the plantation is sprayed. Normally this is done in spots or strips. These difference often lead to difficulties in determining correct application procedures for those using backpack sprayers.

The application procedure outlined in this fact sheet was developed to aid in the proper delivery of herbicides with backpack sprayers. To properly apply herbicides the amount of herbicide solution you are dispensing per unit of ground area must be known. For example, a herbicide is labeled to apply 2 quarts of herbicide per treated acre in a total of 10 to 40 gallons of solution per acre. To properly apply this herbicide you must determine the amount of solution per treated acre that is within this labeled range (10 to 40 gallons per acre) that you can comfortably achieve. This requires that the applicator control the solution per minute which is being delivered through the nozzle, the width of the spray pattern and the ground speed. Controlling these variables is the most daunting aspect of herbicide application using a backpack sprayer. There are literally thousands of combinations of nozzles, pressures, spray nozzle heights, and ground speeds which can be used. This wide variety of options can be confusing and the application setup described below is offered as a recommendation to achieve a reasonable degree of accuracy using a backpack sprayer.

Once you determine that you can apply a consistent amount of solution, lets say 20 gallons per acre you can determine how to mix the solution. In this example, 2 quarts of herbicide per 19 gallons and 2 quarts of water. For most herbicides rounding the 19 gallons 2 quarts to an even 20 gallons would be reasonable. Most backpack sprayers come with standard 3 to 5 gallon tanks. The ratio of herbicide to water in the above example would be adjusted to mix in 3 to 5 gallon amounts.

Useful Measures and Conversions

43,560 square feet in an acre				1 acre is a square 208 by 208 feet			
Spot Spacing Information (3 feet square)				**One Gallon Equals**			
6' by 6'	**8' by 8'**	**10' by 10'**	**12' by 12'**	128 oz.	4 quarts	16 pints	3.78 liters
trees per acre				**Row Spacing Information (3 feet wide strips)**			
1,210	681	454	302	**6'**	**8'**	**10'**	**12'**
square feet treated per acre of plantation				square feet treated per acre of plantation			
10,890	6,129	4,086	2,718	21,798	16,349	13,079	10,899
portion of acre treated per acre of plantation				portion of acre treated per acre of plantation			
0.25	0.14	0.09	0.06	0.50	0.38	0.30	0.25

The application setup described below will allow applicators to deliver 20 gallons of solution per treated acre. This delivery rate will satisfy the majority of labeling requirements for forestry herbicides. The setup described below uses a spray width of 3 feet which is common for tree establishment or when controlling weeds in young plantations. The 3 feet width can be applied as a 3 feet square with the tree in the middle or a 3 feet wide strip down a row of trees.

1 **Use a flat fan tip that will yield a given amount of solution per minute at a specific pressure (psi).** A good nozzle to use on backpack sprayers is one that delivers close to 30 ounces per minute at 10 psi. For example: 110 degree flat fan Solo™ AN 2.5 will deliver 32 ounces per minute at 10 psi. Do not use standard cone tips. These do not allow an even amount of herbicide to be sprayed across the ground being treated.

2 **Control the pressure at the spray tip using a regulator.** These do not come as standard equipment with all backpack sprayers but are available from most manufactures and are screwed into the spray wand. Some allow variable pressure settings and some provide set intervals. To effectively use backpack sprayers relatively low line pressures should be used. A good recommendation is to set the regulator at 10 psi. The use of a reliable flat fan nozzle coupled with a regulated spray pressure allows for control of the spray volume per minute.

3 **Adjust height of tip to produce a 3 feet wide swath** (test this with water on dry pavement or gravel). The regulation of the nozzle height allows for the determination of the acreage being sprayed. Three foot squares can be used for "spot" applications or strip 3 feet wide can be sprayed down rows.

4 **Adjust your walking, or application speed to 3 feet per second.** This simplifies the spot application of herbicides dramatically. A 3 feet by 3 feet square is sprayed in one second. Use a stop watch to calibrate yourself. When spraying strips a distance of 100 feet will be covered in 30-35 seconds. This rate is easily achieved and maintained. **By completing the previous 4 steps you will deliver 20 gallons of solution per treated acre in strips 3 feet wide at 3 feet per second or in 3 feet by 3 feet spots each completed in one second.**

5 **Mix the herbicide solution based on a delivered rate of 20 gallons per acre.** For example, a herbicide is recommended to be used at a 2 quarts per treated acre. The mixture ratio is then 2 quarts per 20 gallons of final solution or 0.1 quart per gallon of solution (12.8 oz. herbicide per gallon of solution.). This mixture can be obtained by using 115 oz. of water and 13 oz. of herbicide. For a 3 gallon tank; 2 gallons 90 ounces of water and 38 ounces of herbicide.

Mention of trade names does not constitute endorsement by the author or the University of Kentucky Department of Forestry or Cooperative Extension Service.

(J. Stringer, 1M, 7/99)