

Kudzu Eradication In Southeast Parks

By Susan Power Bratton

One of the most widespread resource management problems in the upland parks of the southeast is the invasion of exotic plant species, particularly exotic vines. Field surveys have shown, for instance, that 90 percent of the exotic woody plant cover at Cumberland Gap NHP is Japanese honeysuckle and kudzu, both vines introduced from Japan. Seventeen southeastern parks report difficulties with kudzu and 34 have Japanese honeysuckle. These species also are present in parks outside the Southeast Region, including Rock Creek Parkway and Prince William Forest Park.

Although Japanese honeysuckle has larger populations and more total acreage in most parks, kudzu has a greater impact on the surrounding vegetation. Once kudzu colonizes a road or disturbed site, native tree and shrub species are usually unable to reinvade the location and displace the kudzu. Kudzu climbs into the tops of nearby trees, eventually killing them by shading, and expanding the total area of its population. Due to the density of its thick mats of leaves and vines, very few native species can grow under kudzu. The species diversity and the potential for natural recovery of kudzu patches are both low.

In the past, many of the efforts to control kudzu have failed or have proven extremely expensive or labor intensive. Park staffs have experimented with both hand cutting and herbicide application. Frequently, however, the kudzu has reappeared season after season and remained a chronic management problem, requiring repeated attention.

In effort to convert kudzu management in parks from partial control to eradication, Aaron Rosen, a graduate student from the University of Tennessee, Knoxville, worked under the supervision of scientists from Uplands Field Research Laboratory on experimental removal of kudzu from large roadside populations in Cumberland Gap NHP and at Chickamauga-Chattanooga NMP. The methods also have been used at Shiloh NMP and Cowpens National Battlefield. The study was divided into two phases: 1) removal and control of kudzu, and 2) recovery of native vegetation on the sites. Working with student volunteers, Rosen established test plots on steep road cuts with very heavy kudzu cover, and divided the plots into smaller test blocks for both control and revegetation treatments.

At Cumberland Gap, Jack Collier, the park resources manager supervised a controlled spring burn of one test plot, but fire did little other than remove old foliage, and may actually have stimulated kudzu

growth. Kudzu is very difficult to burn during the summer, when it is in full leaf, so no further burns were attempted. Rosen then tested two different herbicides: Roundup, a general plant toxin that operates through foliar-uptake and Velpar a selective toxin (conifers are not susceptible) that operates through root-uptake. Roundup is applied using a backpack sprayer and Velpar is applied by placing gridballs directly in the soil. Both herbicides are relatively safe if properly used, but Roundup has a much shorter half-life and breaks down into non-toxic substances a few days after application. Velpar persists in the soil from one to six months.

Four initial treatments were tested: 1) June application of Roundup, 2) August application of Roundup, 3) May application of Velpar, and 4) May application of Velpar followed by Roundup. researchers used cover estimates and counts of live kudzu crowns to determine treatment effectiveness. Roundup alone was much more effective than Velpar alone, and late season (August) application of Roundup was more effective than early season application. Perhaps because it was a dry year, initial placement of Velpar gridballs in the soil had almost no effect on the kudzu. At Lookout Mountain, at Chattanooga, 93 percent of the kudzu survived the first Velpar treatment. June Roundup left 59 percent of the kudzu in

test plots at Lookout Mountain and 25 percent at Cumberland Gap. August Roundup left 7 percent of the kudzu at Lookout Mountain and 9 percent at Cumberland Gap. Velpar-Roundup was more effective than either Velpar or June Roundup alone, leaving 22 percent cover at Lookout Mountain and 11 percent at Cumberland Gap.

After all the test plots had received one additional Roundup treatment and had a spot treatment applied just to surviving crowns, Lookout Mountain had from 10 to 25 percent kudzu cover remaining and Cumberland Gap had from 1 to 8 percent. At the latter site, none of the surviving kudzu crowns were vigorous; continued spot treatment will probably eradicate the few remaining plants.

Since the removal of the kudzu left the steep, erosion prone road cuts with little live vegetative cover and it was thought quick establishment of native woody plants might inhibit regrowth of kudzu, Rosen tested several techniques for slowing erosion and speeding revegetation. With the help of a student volunteer, he planted three different species of native tree seedlings, with and without a straw mulch and with and without a seeded rye grass ground cover. In all, 12 different combinations of recovery treatment were tried.

The presence of the straw mulch had a slightly positive effect on seedling survival and the rye grass (*Lolium*



Park maintenance staffer uses a backpack sprayer to apply Roundup to kudzu. Control teams must carefully determine how and when herbicides are to be applied, if a control program is to be fully effective.

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multiflorum) had a slightly negative effect. (Rye grass is an exotic, but it was decided it was safe to use because it is an annual and unlikely to spread or self seed). Of the three species of seedlings planted, short leaf pine (*Pinus echinata*) had the best survivorship, followed by tulip poplar (*Liriodendron tulipifera*). Black walnut (*Juglans nigra*) had about 10 percent greater mortality than the other two species, and showed visible signs of insect damage through the first season. Spot spraying with Roundup to remove remaining kudzu crowns did result in some pesticide drift and in some seedling mortality. At Lookout Mountain seedling survival dropped from 90 percent to 75 percent after further herbicide treatment and at Cumberland Gap it fell from 92 to 86 percent. The remaining seedlings should still produce more than enough saplings to recover the plots, however.

The mulch and the rye grass did relatively little to suppress the kudzu. The only statistically significant effect was the difference between the mulched and unmulched plots at Cumberland Gap,

where the former had 6 percent cover of kudzu and the latter 10 percent. The mulch and the rye grass did significantly suppress natural recovery of herbaceous vegetation on the test sites, particularly at Cumberland Gap. Plots without mulch or rye grass had between 50 and 60 percent herb cover the first season after treatment. This natural regeneration probably does little to retard kudzu growth, but appeared to inhibit surface soil erosion. (Note, however, that erosion was not quantified). In most cases, the addition of mulch or rye grass is probably not worth the extra expense and effort.

The results of this study indicate that 80 percent control or better can be achieved in a single growing season if repeat herbicide applications are used and timed far enough apart for foliage to resprout. Roundup proved to be much more effective than Velpar, especially in late season application. The resources manager should note that some of the past problems with kudzu control through herbicides are probably the result of once a year treatment without follow-up. If kudzu is given a chance to resprout and begin to

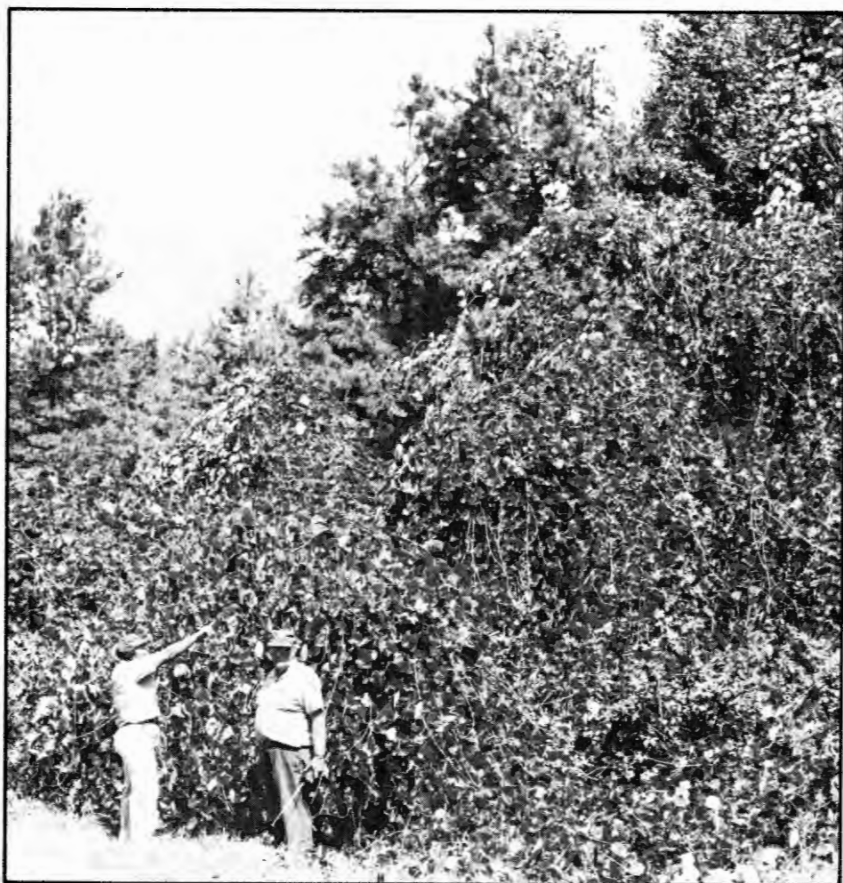
add much new foliage it will quickly reoccupy a site. Timing is very important in optimizing control strategies. Also, if the control team applies too much foliar herbicide, they will top kill the plant without killing the roots. If too little is applied the leaves will yellow but the plant will survive.

The manager needs to consider the recovery of native vegetation. In the first two general applications of Roundup, almost all the vegetation in direct contact with the spray will die. Thus after the major portion of the kudzu is gone, it is important to switch to spot spraying to allow native species to recover. Some problems with drift are to be expected even if chemicals are carefully applied. A control team working on spot spraying needs to search thoroughly for all kudzu crowns and needs to be able to distinguish native from non-native plant species. Careful general application of herbicide at the beginning, repeated as soon as necessary and followed by spot spraying can greatly reduce the amount of herbicide used through time, because of the immediate and species specific nature of the control.

Throughout the project, records were kept on the costs of material and the man hours necessary for each treatment. Roundup cost more per acre than Velpar for materials (\$128 per acre versus \$83 per acre, in 1980) and took twice as much time to apply (20 man hours per acre versus 10 person hours per acre.) Estimating labor at \$5 an hour, Roundup cost \$228 per acre as opposed to \$133 for Velpar. Mulch cost \$360 per acre for materials and \$50 for labor, totaling \$410, and ryegrass cost \$8 per acre for materials and \$15 for labor, totaling \$23. The tree seedlings varied in price from \$190 per acre for pine, to \$220 for tulip poplar, to \$475 per acre for black walnut. Cost of planting was estimated at \$1,050 per acre, although during the research project this was accomplished by volunteers. It is still too soon to see if the plantings have accelerated recovery enough to make the extra expense worthwhile.

In order to make the results of this study generally available to interested park managers, the Office of the Chief Scientist, Southeast Region has had copies printed for distribution. These may be obtained from: Uplands Field Research Laboratory, Great Smoky Mountains National Park, Gatlinburg, TN 37738 by requesting: Feasibility Study: Eradication of Kudzu, Research/Resources Management Report SER-59.

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A population of kudzu climbing into the trees at Cowpens National Battlefield. The park staff had attempted to remove the kudzu by hand-cutting but the vine returned.