

KUDZU MOP UP AFTER HERBICIDE TREATMENTS  
Sedalia Hunt Camp, Sumter National Forest  
Final Report – November 11, 2007

Property: Sumter National Forest, guidance & direction from Mary Morrison, Planning Team Leader, USDA Forest Service, Enoree Ranger District, Union, SC.

Summary of Results: In this specific situation non-chemical treatments replaced a fourth year of herbicide application. This does not suggest that non-chemical treatments on a 23 acre site can replace first or second year herbicide treatments.

Objectives:

1. Remove all kudzu on the east side of S481 at the Sedalia Hunt Camp.
2. Find ways to do it better to increase kill percentage and reduce work time.
3. Document work protocols for future work.
4. Determine if it is practical to transition to more environmentally friendly treatments by using non-chemical treatments instead of herbicides when kudzu is “scattered” by years of herbicide use.

Potential: Reduction in the use of herbicides on thousands of acres, with possibly a small reduction in kudzu control costs.

Treatment History: As related by Ranger Steve Cobb. Three or four years of application of Transline sprayed by backpack up to 7 feet high and below, with vertical vines cut. In Steve’s opinion, the applicator did a good job.

Treatment Protocols:

1. Sweep through the property abreast, in several passes, at roughly ten foot spacing.
2. Look carefully for surviving kudzu.
3. Trace each kudzu vine back to the crown.
4. The “Kudzu Chop” is the preferred treatment because it is quicker, being sure to chop under the crown and not through the crown.
5. Vines in trees were NOT cut. “Gapping” wastes time. Our objective was to find the crown and take it out. Vertical vines were not pulled down. Nature will do that work.
6. Short breaks were taken mid-morning, with a 30 to 40 minute break for lunch.

Results:

1. Area covered: Approximately 23 acres.
2. Hours:
  - a. Travel Time: 54 person hours (4 days at 2 hours/car).
  - b. Actual on Site: 160 person hours.
  - c. Total Time: 214 person hours.
3. All workers were experienced in removing kudzu without chemicals. All were dedicated and highly motivated.

4. Total hours including travel per acre: 9.3 person hours.
5. Working hours at site excluding travel per acre: 7.0 person hours.
6. Estimated rate of crown removed: 15 to 25 per hour.
7. Estimated number of crowns removed: Approximately 3,200.
8. Estimated number of crowns removed per acre: 139.
  - a. In full canopy and brush: Less than 50 per acre.
  - b. In light canopy and open areas: More than 200 per acre.
9. Estimated time utilization: 60 to 70 % walking and looking, 30 to 40% crown removal.
10. Estimated Effectiveness:
  - a. Area coverage (walked completely): 90 to 95%. This was affected by some heavy brush and occasional breaking of marching line.
11. Kudzu spotted inside the boundary of the work area: 80 to 85%. Deer stripped leaves from vines making detection difficult.
  - a. Kudzu killed (treatment effectiveness): 90 to 95% using well-trained workers.
  - b. Conservative estimate of first pass effectiveness:  $0.90 \times 0.80 \times 0.90 = 65\%$  kill of all kudzu plants present.
  - c. Optimistic estimate of first pass effectiveness:  $0.95 \times 0.85 \times 0.95 = 77\%$  kill.
  - d. Rework (double back) effect: Detected and removed 1/3 of crowns missed during the first pass. "Rework" and "double back" actions for areas previously worked are explained below.
  - e. Overall estimated effectiveness: 77% plus one third removal of remainder during rework (7%), for a total of 84% for all crowns present.
12. 58% of the hours were provided by volunteers. We are particularly grateful to Paul Savko, Lou Adams, John Woodward, and Rich Mead.

#### Kudzu Findings:

1. Less than 5% of the living vines were vertical. The previous treatments had done a good job of stopping the vines in the trees.
2. The leaves on almost all ground vines were had been nibbled away by deer. Most vines were "naked" with almost no leaves and the leaves which were still there were mostly one inch in diameter. This made the kudzu much harder to detect and raised the percentage of kudzu missed (not seen).
  - a. Since the observations concerning deer consumption of leaves was not consistent with what we have observed in other kudzu patches and in other years in Spartanburg County, we talked with Dr. Gillian Newberry, Botany Professor at USC Upstate and member of the Kudzu Coalition Board of Directors. Dr. Newberry cautioned that the deer may normally prefer other plants but might have been driven to kudzu because of the effect of drought on more favored foodstuffs.
  - b. Mr. Steve Patton, local landscaper and environmentalist and also member of the Coalition Board, reviewed this issue and made several interesting observations. He has seen deer bedded down in kudzu in Spartanburg County but without noticeable nibbled leaves. He suggests that the amount of eaten leaves may be a function of the density of the deer population. Perhaps the nibbling of leaves suggests over population.
3. The leaves which were still present were smaller than normal for untreated kudzu – probably due to the stress from herbicides.
4. Vines were mostly only three or four feet long. Only a few were as long as 20 to 30 feet. This was surprising for October, the end of the growing season. This is probably the result of prior years stress by herbicide.

5. The crowns were unusually large – mostly lemon to baseball size with a few of softball size. The number and length of vines were amazingly small relative to the size of the crowns.
6. The crowns were deeper than normal – often one or more inches deep. Herbicides probably have less effect on deeper crowns or else deeper crowns are larger and hence harder to kill.
7. The roots were unusually large. Some were 12 inches in diameter. We guessed that the plants with smaller roots had been killed by the herbicides.
8. Many roots contained black areas – probably the result of the herbicide at work.
9. Virtually all vines were current year. Almost no vines had rooted this year. This means kudzu probably would not spread in 2007.
10. Virtually all vines were less than 3/8ths of an inch in diameter. Virtually all would have died during the winter.
11. White Peach Scale was the heaviest we have ever seen on one vine but absent on all but a few vines. This is probably due to the vines being mostly current year growth.
12. We extracted a large root – about 12 inches in circumference – which was hollow. The inside portions were black - probably herbicide kill. This specimen will be used for show & tell.
13. Only one living vertical vine as large as one inch in diameter was found.

#### Ideas for Improved Kudzu Removal Effectiveness:

1. The line of march is difficult to keep straight in heavy brush. Contact is helped by continually talking to the worker on either side so as to avoid separation.
2. Long sleeved shirts are helpful in briars.
3. The line of march is broken when workers are held up removing relatively heavy pockets of kudzu. This can be dealt with by having the worker on either side “collapse” onto the pocket of kudzu.
4. Tape was used to identify the edge of each pass for the first three days. In woods and heavy brush, tape works better because it is at eye level. It is hard to tie the tape without removing gloves. Place tape in back pocket with edge hanging out. Wrap lightly at eye level.
5. Construction flags were used to mark the edge of each pass on the fourth day. In open areas flags work well. Paul Savko’s specially made quiver (made from plastic pipe with a cap on the bottom and hook for the belt) worked well. The top of the quiver should be lowered to make reach easier.
6. Due to size and depth of crowns, the Kudzu Chop using the 16 inch hand hoe was largely not effective. The pruning saw was necessary on the majority of crowns. This slowed down the crown removal. The 26 inch handle hand hoe was useful in many crown excisions.
7. By the fourth day, most workers had moved to a longer handled tool. Several followed Lou Adams’ preference for the pick – less bending and more power for chopping the larger crowns. However, the 36 inch handle pick is difficult to use where the underbrush is heavy.
8. This was very difficult work and went slower than expected. This was no place for high school students or for “light duty” workers!
9. In making estimates and when considering the use of herbicides, it is important to factor in the effect of deer. Identification is more difficult. Extra training helps.
10. Workers in line abreast need to be closer together in areas where the kudzu is heavier. Usually the open areas have a much higher incidence of kudzu.

11. Our individual techniques improved during these four days. For example, we found that using a scabbard for the razor knife was more efficient. Due to this, the use of the longer handled tools – especially the pick, and sharpening the edges of the hand hoes, we were probably 10 to 15% more efficient at the end than at the beginning.
12. As bad luck would have it, the grass along the shoulder of the highway was mowed the day before we worked that area. We found this out when the mowing crew worked on the other side of the road while we were there. This mowing of the shoulder removed much of the vines and sprigs of kudzu growing there, which, in turn, reduced our ability to see and remove kudzu plants. Lesson learned: Where ever possible, allow two weeks between last mowing and kudzu removal. This applies to both herbicide application and non-chemical treatments. See “Rework/Double Back” comments below for corrective action which was taken to “fix” this problem.

#### Rework/Double Back Activities:

1. The previous mowing of grass – and kudzu – along the roadside alerted the team to be on the lookout for areas where kudzu plants had gone undetected and hence untreated.
2. We reworked the area along the highway twice, finding 51 kudzu plants on the first rework and nine on the second rework during which we walked at a 90 degree angle to the earlier passes.
3. An open area along the dirt, campsite road was reworked and a few dozen kudzu plants were found and removed.
4. With these findings in mind, we decided to rework as much of the central, open area as practical. By luck, the first mid-morning break came when the team was at the far end of the field. We used the walk back to the vehicles (and drinks) to look for kudzu plants which had been missed during an earlier pass. This worked so well that on the fourth day, two returns to the vehicles for breaks and one return for lunch all came from the far side of the kudzu. This provided three opportunities for rework. Each was productive in the sense that we found plants in previously worked areas. Some had sprouts of only four or five inches with leaves eaten by the deer.
5. During the last hour of work by the main crew, I reworked a sizeable portion of the open area by patrolling at a 90 degree angle from the previous passes. 31 kudzu missed plants were detected and removed.
6. We believe that this type of rework/double back effort substantially improves the overall effectiveness – especially when deer have been active.

#### Other Ideas for Cost Reduction:

1. The lesson learned is that travel costs are higher when volunteers are involved. In general they don't have as many per car and they don't stay as long as contract workers. For example, volunteers often come from different areas such as Greenville and Spartanburg in this case. Several times volunteers left after lunch due to other commitments and tiredness. Our volunteers paid their travel costs out of their own pockets.
2. Travel time was large (25%) relative to the total time – roughly two hours for each eight hours of work. This was impacted by the same reasons mentioned above.
3. The cost of travel could be reduced by bringing more volunteers and/or more contract workers each of the first three days. This would have permitted completion in three days rather than four.

4. I should have researched the quickest route earlier. On the last day, we found out about directions which reduced the travel time by about 10 minutes each way.

Comparisons:

1. We doubt seriously that herbicide application, even by the best applicators, could have been as effective – killed as many kudzu plants – as this work. We feel very good about the value delivered. We may be prejudiced.
2. At \$100 per acre, this treatment was one third less expensive than the \$150 quote for chemical treatment. However, this year's price per acre was probably 10% less than it would be quoted for the same job next time.
3. Next year's quote will be less than this year's price because there will be less kudzu. The walking and hunting time will remain the same but the actual time needed to kill kudzu will be less.

Thank you for the opportunity to participate in this study.

Respectfully submitted,

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