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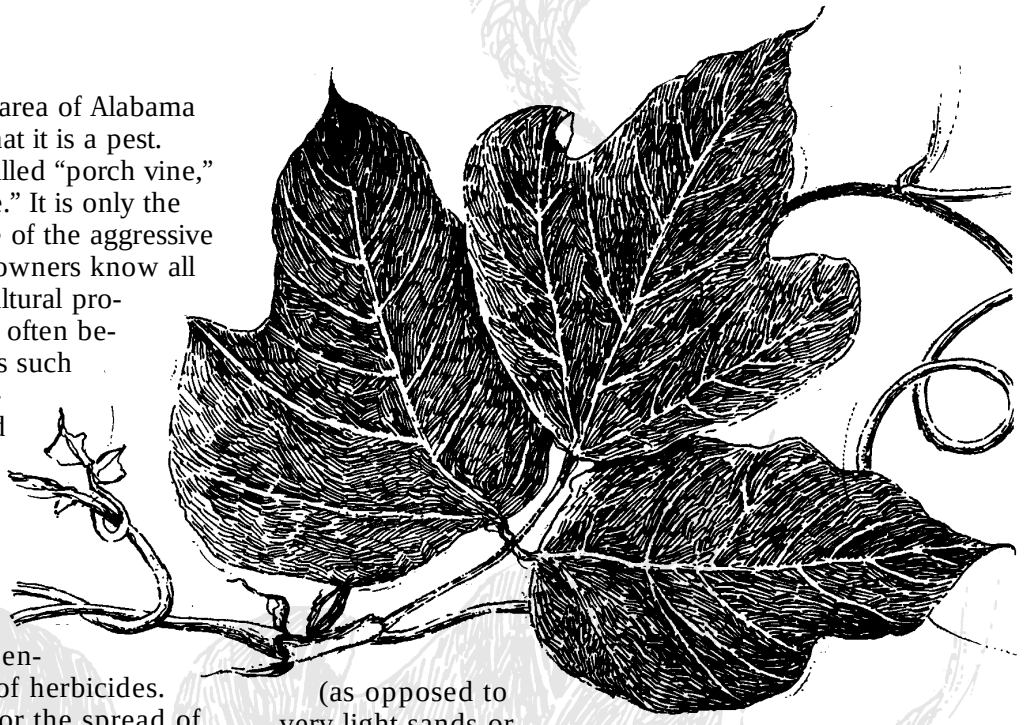
ALABAMA COOPERATIVE Extension SYSTEM

ANR-65

Kudzu in Alabama History, Uses, and Control



Introduction

Almost anyone living in a rural area of Alabama knows what kudzu is and knows that it is a pest. Kudzu in Alabama has also been called "porch vine," "telephone vine," and "wonder vine." It is only the visitor or tourist who asks the name of the aggressive and highly visible green vine. Landowners know all too well that kudzu can stifle agricultural production as well as timber growth. It often becomes a weed in noncropland areas such as road rights-of-way, old fields, vacant lots, or the yards of abandoned or little-used buildings. Problems caused by kudzu are the result of its rapid growth and its ability to climb over trees or shrubs, killing them by heavy shading.

Total control or eradication of kudzu can be a three- to ten-year endeavor, usually involving the use of herbicides. Every kudzu plant must be killed or the spread of the surviving plants will make previous control efforts useless. Success involves using effective herbicides at the proper time and at the correct rate, with repeated treatments as required.

Description

Kudzu *[Pueraria montana (Lour.) Merr.]* is a large, trifoliate-leaved, semi-woody, trailing or climbing perennial vine that belongs to the Fabaceae (legume) family. The vines may grow up to 60 feet in a single season and as much as 1 foot during a single day in the early summer. This amount of vine growth is supported by starchy, tuberous roots that can reach a depth of 12 feet in older patches and weigh as much as 200 to 300 pounds. Vines and roots grow out from a root crown that is positioned on the soil surface. Vines growing from mature root crowns can spread in all directions, rooting every few feet at the nodes and essentially forming new plants. Mature stands usually have a plant every 1 to 2 square feet and may contain tens of thousands of plants per acre.

Kudzu is well adapted to Alabama and is found throughout the state. It will grow on a wide range of soil types, but does best on deep, loamy soils (as opposed to very light sands or poorly drained, heavy clay soils). It has been planted using either seed, vine cuttings, or by transplanting "crowns."

Seeds are only produced on kudzu plants that are draped over vegetation, fences, or other objects. It rarely flowers in open patches. Seeds are formed in pods that come from fragrant purple flowers that form from July to October. Only one to two viable seeds are produced in a cluster of seedpods. Mature seeds are on the vines in October and November. It is thought that a few hard-coated seeds can lie in the kudzu patch for several years before they germinate.

History

Approximately 17 species of kudzu *(Pueraria spp.)* are known throughout the world, all native to China, Taiwan, Japan, and India. For more than 2,000 years, oriental cultures have found great value in kudzu. Early Chinese records tell of kudzu roots being dried and diced for medicinal purposes as early as 1578. Kudzu fiber from stems was used to make "grass" cloth and paper by 1665. During the 1700s, kudzu was imported into Japan where the roots were ground into flour for use in making cakes.

Kudzu first appeared in the United States in 1876 as a display at the Plant Exhibition of the Philadelphia Centennial Exposition. It was later displayed in the United States in 1883 at the New Orleans Exposition. In the late nineteenth century, kudzu was used as an ornamental vine to shade porches and courtyards of southern homes. It was also appreciated for the grape-like fragrance of its flowers and because of its vigorous growth.

At the turn of the century, kudzu was available through mail-order catalogs. By 1905, through the efforts of Mr. C.E. Pleas of Chipley, FL, kudzu was promoted as an inexpensive forage for livestock.

In the 1930s, kudzu reached the height of its prominence. The Soil Erosion Service, established by Congress in 1933 (later renamed the Soil Conservation Service and now the Natural Resource Conservation Service) was charged to reduce soil erosion in the South caused by improper agricultural practices and extensive cotton production. About 85 million kudzu seedlings were given to southern landowners by the Soil Erosion Service for land revitalization and to reduce soil erosion. The Civilian Conservation Corps also planted kudzu throughout the South. The government offered up to $8 per acre as an incentive for farmers to plant their land in kudzu. About 3 million acres of kudzu had been planted on farms by 1946.

In the 1940s, numerous kudzu clubs were formed throughout the South. Kudzu festivals were held and kudzu queens were crowned. In 1943, Channing Cope of Covington, GA, founded the Kudzu Club of America, which eventually had a membership of about 20,000 individuals. He became known as the "Father of Kudzu."

By the early 1950s, kudzu had largely become a nuisance. It had spread rapidly throughout the South because of the long growing season, warm climate, plentiful rainfall, and lack of disease and insect enemies. It was recognized as a problem caused by the introduction of a species outside its normal habitat, without its usual predators. In 1953, the United States Department of Agriculture removed kudzu from the list of cover plants permissible under the Agricultural Conservation Program. In 1962, the Soil Conservation Service limited its recommendation of kudzu to areas far removed from developed areas. Finally, in 1970, the USDA listed kudzu as a common weed in the South. Congress voted in 1997 to place kudzu on the Federal Noxious Weed list.

Today, an estimated 7 million acres of land in the Southeast are infested with kudzu. One-quarter of a million acres cover Alabama. The infestation spreads as far north as Illinois, Pennsylvania, West Virginia, and up to Connecticut and as far west as eastern Texas and central Oklahoma. The heaviest infestations are in Alabama, Georgia, and Mississippi.

Forage Uses

Kudzu produces forage that is high in quality and quite palatable to livestock. The forage quality varies with management and season, but it is not unusual for kudzu hay to have a crude protein content of 15 to 18 percent and a total digestible nutrient value (TDN) of over 60 percent (dry matter basis). The quality decreases as the amount of large vines increases relative to leaves.

Unfortunately, the use of kudzu as a forage plant has definite limitations. Although kudzu appears to make a great deal of growth, it actually produces relatively low forage yields, usually around 2 to 4 tons of dry matter per acre per year. In addition, producers find kudzu difficult to cut and bale because of its viny growth habit. It is possible to remove two cuttings of hay per year from kudzu without damaging the stand. If the stand is to be preserved, the first cutting should be made in late June or early July and the second in the fall just before frost. Since it will not shed water well, kudzu hay should be placed under shelter for protection after it is baled. Kudzu can also be harvested for silage, but the silage is light and difficult to pack.

All types of grazing animals will readily eat kudzu, but frequent defoliation over 3 to 4 years can destroy stands. Therefore, kudzu has little value as a grazing crop except on a very temporary basis. On the positive side, kudzu retains its forage value right up until frost and can even be of some value for grazing for a short time after frost.

A few Alabama farmers still harvest kudzu from areas managed for this purpose by annual or biennial harvesting. It is most frequently used in this manner during dry periods, since its deep root system allows it to obtain moisture for growth when other forage species cannot. Kudzu is still valued as a soil-conserving plant because it helps control erosion on steep slopes and embankments, but better stabilizing plants are now available.

Control

Kudzu can be controlled by persistent application of the right method. In order to eradicate this pest, all large and small kudzu roots must be killed. Any kind of control program must be coordinated with all landowners who share the infestation. Unless each landowner participates fully in the program, none will be successful.

There are several ways in which kudzu can be controlled, but the best approach to take depends on the circumstances: the size of the infested area; proximity of desirable trees, shrubs, or crops; accessibility for grazing, cultivation, or harvesting; and future plans for the infested area.

One way to eliminate or weaken kudzu is frequent defoliation. Using close grazing or mowing is slow, but can be effective on younger patches (less than 25 years old). Grazing requires fencing to surround the infested area that must include a source of water for livestock. Vines or trees must be cut around tree-draped borders. Fencing should encompass the entire patch or excluded kudzu crowns must be controlled by other means. Close grazing of young kudzu patches for three to four years can eliminate kudzu when 80 percent or more of the vegetative growth is continuously consumed. It is particularly helpful if kudzu infestations are heavily overgrazed during August and September of each year. Close mowing every one to two months during the growing season or repeated cultivations are also effective.

Rolling terrain often precludes these measures. Grazing, mowing, tillage, or prescribed burning can also prepare areas for more efficient herbicide applications. However, tillage and prescribed burning should not be used on steeply sloping lands where erosion is a risk.

The only other means of controlling kudzu, other than digging the roots out, is application of herbicides. Only a few herbicides will control kudzu. These chemicals are rather safe to humans, but generally lethal on most plants. For environmental safety and effective control, it helps to divide kudzu-infested sites into six general groups:

- Patches in open areas on level ground
- Patches in gullies, along streams, or in other sensitive areas
- Patches in young pine plantations
- Patches in old stands of pine
- Patches in noncropland areas
- Patches in residential or home ground areas.

The first step in any kudzu control program is to examine the kudzu patch and determine which general site group fits the location. Timbered areas should be logged prior to herbicide treatment if there is a sizable acreage of mature kudzu-draped trees on the site. Logging is easiest during the winter. The logging deck should be positioned within the patch to prevent spreading of the vines.

Kudzu vines form a dense cover and often hide hazards such as old wells and fence posts. Whenever possible, burn the kudzu infested site in the late winter to expose any hazards and to clear debris. Because kudzu seeds have a hard seed coat, burning can help stimulate kudzu seeds to germinate so that these plants can be controlled by subsequent treatments. A good time to burn is in February and early March, to minimize winter exposure of erodible soils.

The second step is to select and use a herbicide appropriate for the site. The choice or selection of a herbicide is dictated by where the kudzu is growing and the degree of control depends on the age of the kudzu stand, the soil type at the site, and the herbicide rate used. In the winter or early spring, examine the root crowns, which are the woody knots at the soil surface. If many of the root crowns are over 2 inches in diameter, it will probably require a higher herbicide rate and perhaps more broadcast and spot treatments. Higher rates and more treatments will be required on clayey soils, especially if there are numerous rocks in the soil or old terraces. A stronger effort is also required around the tree-draped borders of old fields where kudzu roots generally grow the largest.

Open Area Sites on Level Ground. Use either Tordon 101 Mixture or Tordon K manufactured by Dow AgroSciences on kudzu growing in open areas with little or no slope. Although Tordon (picloram) is quite effective, its usefulness is limited because

- Many desirable plants or crops (including trees) are severely injured or killed by minute quantities of this material.
- The material is relatively persistent and, therefore, can injure plants introduced into the area during the following growing season.
- Under certain conditions, Tordon may be leached through sandy soils or lost in surface runoff water to contaminate streams and possibly groundwater.

Both Tordon materials are RESTRICTED USE herbicides and require a special permit for purchase and use. Apply Tordon 101 at the rate of 1 to 2 gallons per acre or Tordon K at the rate of 0.5 gallon per acre. Make the herbicide application anytime from late May to September. A late May application may be the best since the young green vines may only be 2 feet deep and actively growing. By late summer, intertwined kudzu vines may be 4 to 8 feet deep, making application much more difficult. Tordon should not be used near ponds, streams, or other sensitive areas. This chemical can be moved in rainwater so don't use where slope will permit movement to off-site areas or to roots of desirable trees.

Sites Near Ponds, Streams, and Ditchbanks. These sites are particularly sensitive due to their proximity to water. Veteran 720, sold by Riverdale Chemical Company, is one of the most effective herbicides for this situation. This herbicide should not be sprayed directly into water or on ditchbanks where runoff water will contaminate surface water. Apply Veteran 720 at the rate of 2 to 3 gallons per acre during August or September. Old patches will require the high use rate and good coverage of the

vines. Veteran 720 should never be applied within the root zone of any desirable plants. A similar herbicide treatment can be tank mixed using 2 quarts of Banvel 4 (BASF) or Vanquish (Novartis) per acre with 4 quarts of 2,4-D per acre. A late summer treatment is desirable. The herbicide Garlon 4 (Dow AgroSciences) is another alternative when treating ditchbanks. Apply 2 pints of Garlon 4 per acre with 3 quarts of 2,4-D low volatile ester per acre. Make application in midsummer and ensure thorough spray coverage of kudzu.

In situations where the herbicide applied may contact water, use either Rodeo (5 lb./gal) or Accord (4 lb./gal). Apply Rodeo at 6 pints per acre or Accord at 1 gallon per acre. Add a nonionic surfactant to the spray mix at the rate of 2 quarts per 100 gallons of spray mix. These treatments are not likely to give complete control of well-established kudzu. Successive broadcast applications for several years plus spot treatments will be necessary to achieve desired results.

Young Pine Plantations. Kudzu invading young pine plantations can best be treated with mixtures of the following herbicides: Escort (DuPont Chemical Company), Accord (Monsanto Chemical Company), and Arsenal AC (American Cyanamid Company). For treating plantations of one- to two-year-old pines, apply Escort at 1 to 2 ounces per acre with Accord at 1 pint per acre. Another option would be to apply Escort at 1 to 1.5 ounces per acre with Arsenal AC at 10 fluid ounces per acre. When making either application, add a nonionic surfactant at the rate of 1 quart per 100 gallons of spray mix.

For treating pine plantations of three- to four-year-old pines, apply Escort at 1 to 2 ounces per acre with Accord at 1 quart per acre. Another option would be to apply Escort at 1 to 1.5 ounces per acre with Arsenal AC at 1 pint per acre. Escort can be applied alone at the rate of 3 to 4 ounces per acre. When making any application with Escort, add a nonionic surfactant at the rate of 1 quart per 100 gallons of spray mix. A single treatment should be applied during midsummer when kudzu is actively growing. When possible, direct the spray away from the young pines. Some growth suppression may be observed in young pines treated with these herbicide mixtures. If old, established kudzu root crowns are present, they should be spot treated with Tordon. Care should be taken when making these spot treatments to minimize the injury or death of young pines.

In areas of young pines infested with kudzu and adjacent to industrial or rights-of-way, the herbicide, Transline (Dow AgroSciences) can be applied with a surfactant. Apply Transline at 21 fluid ounces per acre plus a nonionic surfactant at the rate of 1 quart per 100 gallons. Make application in early to midsummer before kudzu blooms. This treatment will injure some hardwoods, while little injury is seen in young pines. An alternate treatment in young pines is Oust (DuPont Chemical Company). Apply Oust at the rate of 8 ounces per acre. Pines have good tolerance to this herbicide, while some hardwoods may be killed. Application should be made between June and August.

Older Pine Plantations. To control kudzu draped on trees, consider using Garlon 4 (Dow AgroSciences). Spray a 4 percent mixture of Garlon 4 in diesel fuel, mineral oil, or vegetable oil on the vines. Vines should be sprayed up to 8 feet high. Apply this mixture in late winter or early spring, before new growth appears. Pines over 6 inches dbh (diameter breast height) are not injured if the mixture gets on the bark. Hardwoods may be injured by this mixture. Kudzu growing under loblolly pines larger than 10 inches dbh can be broadcast sprayed using Tordon 101 at 1 gallon per acre, with little or no mortality. The needles may turn somewhat brown the first year, but should recover if not attacked by pine beetles. Because it kills large kudzu plants, Tordon 101 should be used to spot spray older kudzu in pines, even if this means accepting the resulting death of some trees.

Noncropland. Spike (Dow AgroSciences) can be used to eradicate kudzu, often with a single application. Spike 80WP, a wettable powder formulation, and Spike 20P pellets are labeled for noncrop areas such as rights-of-way and fencerows. Effective rates for Spike 80WP have been found to be 5 pounds per acre and for Spike 20P, 20 pounds per acre. Spike can be applied any time of the year, but early spring is best. The long persistence of this soil-active herbicide can provide control for over 3 years. In one test, loblolly pine seedlings planted on Spike-treated plots in the third planting season after application showed some toxicity symptoms, but 75 percent survived one growing season. ***Caution:*** Desirable trees and shrubs having roots extending into or near areas treated with Spike will be killed. Spike can move with runoff water and should not be applied to sloped areas where the herbicide will move off site into sensitive areas.

Residential or Home Ground Sites. In this situation, kudzu is usually close to desirable vegetation such as shrubs, trees, and ornamental grasses. Kudzu may also be on land owned by two or more individuals or families. Unless the entire patch can be treated, complete control or eradication is not possible. In such situations, a herbicide can only be used to check the growth or establishment of kudzu in new or sensitive areas. The use of glyphosate herbicide, sold by Monsanto Chemical Company under the

trade names of Roundup Ultra, Roundup Pro, and Accord, is most appropriate in this case. Apply Roundup Ultra (4 lb./gal) or Roundup Pro (4 lb./gallon) at the rate of 1 gallon per acre. If Accord is applied at the rate of 1 gallon per acre, a nonionic surfactant should be added at the rate of 2 quarts per 100 gallons of spray mix. Make application during mid- to late summer. In some cases, mowing invading vines is as effective as making a herbicide application.

Retreatment. An applicator or landowner must be persistent in examining patches for up to 10 years after treatment. In mature stands, some herbicide application may be needed for 7 to 10 years. Most control is accomplished with one or two broadcast treatments, but plants may continue to appear for many years. Open, level patches less than 10 years old can be controlled by only one broadcast application of Tordon herbicide. Success with Tordon herbicide is evident by complete browning of the patch within a few weeks after the initial application. Retreatment should then be delayed for a complete growing season. Broadcast retreatment is usually made using half the rate of the first. In other words, if a successful application is made during year one, then another broadcast treatment using half the rate should be applied in year three. Research has shown that many of the large kudzu roots that are severely injured will not sprout for two years, and thus the recommended delay.

Retreatments in successive years are needed if Tordon herbicide and/or double coverage are not used and if rainfall does not occur within a week after treatment. Retreatments can be applied anytime after the patch is completely covered with new kudzu foliage.

Veteran 720 will require one to three broadcast treatments over successive years depending on the size of the kudzu plants and the degree of control obtained. Glyphosate treatments may require many retreatments since all of the kudzu cannot be treated in many cases and glyphosate will not control the very large kudzu plants with the big roots. Because kudzu can emerge for several years from very large roots, spot treatment applications may be needed thereafter until the problem is eliminated. The cost of the herbicide for the first treatment can range between $80 to $150 per acre. It may take as many as two to three follow-up spot treatments to completely eradicate this durable vine.

Application

Spraying kudzu may be difficult because of the tangle of leafy vines that covers the ground from mid to late summer. Sometimes the vine mat is up to 8 feet deep and can be draped over shrubs and into trees. Complete and thorough coverage by the spray mixture is required for consistent results.

Open patches have been successfully treated using sprayers on crawlers, skidders, and farm tractors; using truck-mounted spray units dragging hose; and by backpack sprayers and mistblowers. Large tractor sprayers are useful for breaking through draped kudzu when treating mature patches. The benefits of using tractor sprayers increases as the depth of kudzu increases. Hose and backpack applications become much more difficult and slow when kudzu is over 2 feet deep. Helicopter applications may be necessary on exceptionally large and hilly tracts.

How much spray mixture is needed per acre? Volumes of 40 to 200 gallons per acre are used by some tractor and hose applicators. There obviously can be benefits in coverage with high volumes. However, the current recommendation is 40 to 80 gallons of spray mixture per acre, because successful eradication has been achieved using these volumes, and higher volumes mean higher application costs.

Double coverage with a tractor sprayer is one of the best methods for “open-patch” kudzu treatments, if terrain permits. Half the mixture is applied by parallel passes in one direction, and the remaining half if applied using parallel passes that are at right angles to the first. Swath overlaps of 3 to 5 feet are used to further minimize skips that are common with kudzu treatments. Always treat skips soon after browning makes them evident.

Where it is impossible to make right-angled passes, double coverage can be achieved by retreating a swath in the opposite direction or by using 50-percent swath overlaps. Only by using double coverage, or perhaps high volume coverage with hose applications, is it possible to hold down the number of retreatments. Both options can lower eradication costs and produce quicker results. One broadcast retreatment can usually be eliminated by using double coverage.

Old terraces, common in Piedmont kudzu patches, make tractor spraying difficult. Good control is hard to achieve in terraces, especially in stony soils. It is best to spray along the lower side, into the terrace, applying in both directions, resulting in a slightly higher rate.

Before beginning open patch treatments, make one or more passes around the outer edge of a patch. Boomjet, Boombuster, and Radi-Arc nozzles can be tilted up on these outer passes to treat up into the draped vines. Use a handgun to treat scattered tree-draped vines. Most pines and hardwoods that are larger than 10 inches dbh will not be killed by spraying the vine up the trunk unless the trees are already weak. Handguns are usually necessary

to treat kudzu in gullies and canyons and steep patches from roadsides.

Pressure-hose spraying, backpack sprayers, and backpack mistblowers are used when workers can enter patches on foot. Handcrews can best treat when the kudzu is about 2 feet deep, although some applications are made in deeper spots. Mature patches in the mid-South grow 2 feet deep by late May or early June. Treatments should not be made with Tordon until at least late May because all kudzu plants must be growing at the time of treatment for control to be effective. The Veteran 720 or similar treatment should not be made until August.

To spot-treat scattered plants, use a backpack sprayer mixture of 1 pint Tordon 101 or ½ pint Tordon K or 1 pint Veteran 720 in 4 to 5 gallons of water. When the vines and root-crown area are sprayed to the point of runoff, effective control can be obtained with these treatments.

Use of Desirable Trees or Plants

To complete kudzu eradication, establish desirable plants on the area to prevent soil loss and regain productivity. The timely planting of grass in the fall after treatment can produce severe competition and help control weakened kudzu plants. Many grasses are not injured by Tordon and Spike residues. A grass cover helps control kudzu, protects the soil, and replaces the abundant weed growth that typically follows kudzu eradication. Pines can be planted 6 months after the last treatment with either Tordon or Veteran 720. However, planted grass will compete with planted pines if further control treatments are not used.

Summary

Probably the main reason people have difficulty in controlling kudzu is that they give up too easily. Eradication, not merely a population reduction, is essential for permanent control. It is important to follow initial treatments with spot applications for as long as new sprouts continue to appear. If follow-up treatments are not exercised, kudzu's quick growth may allow it to reclaim the area within a short time.

The most cost-effective treatment for kudzu on open level ground is either Tordon 101 or Tordon K applied using perpendicular spray passes. Retreatment after a successful initial treatment should be applied two full years after the first. Veteran 720 is a safe herbicide to use near streams, ditches, or gulleys and can provide excellent control with two broadcast treatments in successive years. Spike herbicide shows considerable promise for eradication as a single treatment on noncropland sites. The long persistence of Spike can provide control of kudzu for at least three years. Glyphosate sold under several different trade names is the safe herbicide of choice for kudzu problems in residential, home grounds, and other similar environmentally sensitive sites.

For controlling kudzu draped in trees, use a 4-percent solution of Garlon 4 in diesel fuel on vines that are 1 inch in diameter and smaller. Treatment can be made in late winter and early spring, before new growth appears. Tordon at lower rates can also be used for treating kudzu infestations under large pines in forested areas. Spraying trees draped with kudzu should not be performed unless some tree mortality can be tolerated.

Kudzu is a weed that can be controlled. Cost of herbicides and time are the factors limiting successful control. If the desire is there to control kudzu, the battle can be won. Don't give up too quickly.

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UPS, 4.5M14, **Revised Aug 1999,** ANR=65

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