

In: Hoots, Diane; Baldwin, Juanitta, comps., eds. 1996. Kudzu the vine to love or hate. Kodak, TN: Suntop Press: 137-149,

Chapter 28
Kudzu Eradication
and Management .
By: Dr. James H. Miller
USDA Forest Service, Southern Research Station
Auburn University, Alabama

Kudzu patches can be eradicated with *persistent* treatments or they can be contained and managed with other treatment options. Herbicides, grazing, prescribed **burning**, and disk harrowing can be used as eradication or containment **treatments**. For **eradication**, every **kudzu** plant in and around a patch must be killed or the spread from any surviving plants can make all prior efforts and investments useless. This means that all landowners sharing a patch must arrange to treat the whole patch simultaneously.

Landowners often **find** herbicide applications the easiest means for eradication and containment but herbicides should only be applied according to exact label instructions, requirements, and prohibitions. Read, understand, and follow herbicide labels completely before and during use. Commercial **firms** that are licensed herbicide applicators **can be** contracted to perform herbicide applications, but in most cases the landowner must give directions **if the** treatment is to be successful and cost effective.

Kudzu Containment and Management

Kudzu is **difficult** to contain because vine runners on the soil surface can grow up to a foot a day in the spring. Newly

rooted plantlets then occur at every node on these runners. Kudzu also has rhizomes (underground runners) and these will spread the plants. Containment then requires cutting these runners and herbicide treatments to control newly emerging plants. The ability of kudzu to spread increases as the plants age, because their roots are growing larger with time. Thus, mowing and herbicide applications of the entire patch area are used to weaken kudzu plants to prevent rapid spreading. The less effective herbicides discussed later can be used for this purpose.

Eradication using Livestock Grazing

One treatment option for some landowners is livestock grazing. Close grazing for 3 to 4 years can eliminate kudzu when 80 percent or more of the vegetative growth is continuously consumed. All **types** of grazing animals will readily eat kudzu, but cattle grazing has shown the most success in eradication.

It is particularly helpful **if kudzu** is overgrazed in August and September of each year. Then fast growing tree species should be established at close spacing or pasture grasses planted and grazing pressure continued for one or two additional years. Grazing requires fencing around the area that is to be eradicated and a source of water, plus supplemental feed **to maintain livestock health. Also, vines** must be cut from draped trees within the area so that animals can reach the foliage. Kudzu plants that persist after grazing can be eliminated with spot applications of herbicides.

Eradication using Herbicides

Successful eradication programs using herbicides require that the following jobs be performed correctly: **1} identify** and inspect the site from which kudzu is to be

eradicated, **2}** prepare the site, **3}** select the most effective herbicides, 4) treat properly, **5}** retreat when necessary, and finally 6) establish desirable vegetation such as trees or grasses for long-term suppression of any emerging kudzu. Standards for what constitutes correct performance of each of these jobs is defined in the following paragraphs.

{1} Site Inspection

Each patch of kudzu should be inspected closely before treatments begin. This inspection, if done properly, will permit **a more** careful plan of attack on the patch. There are several basic situations that will require different treatment methods. These are:

- a) **open** patches on level ground,
- b) patches near ponds, streams, and ditch banks,
- c) residential sites,
- d) young pine plantations,
- e) non-croplands like fence-rows, and
- f) forest openings with kudzu in desirable trees.

In the winter or early spring when kudzu is dormant, walk over the patch and determine which situations identified in a) through f) exist in the patch you want to eradicate. Next, identify the boundaries of each situation within the patch.

The location of nearby sensitive crops like soybeans, peanuts, and cotton, or gardens or **ornamental** trees should also be noted. Streams, gullies, ponds, and ditch banks should be identified and **their** surrounding slopes estimated as far as possible routes of herbicide movement during rain **storms**.

Eradication difficulty and herbicide rates will be determined by the age of the patch. Older kudzu patches, with large roots, are the most difficult to eradicate. Roots will be large when the patch is over 10 years old or when vines

have spread into nearby trees. Examine the kudzu root crowns, which are 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 more retreatments for eradication. Higher rates and more treatments will also be required on clayey soils, especially if there are numerous rocks or old terraces, or both. Also, downed trees and debris will hinder herbicides from reaching hidden kudzu plants. Kudzu is especially difficult to eradicate under these situations.

{2} Site Preparation

For some patches, prescribed burning can be used not only to reduce debris for more effective treatment but also to kill small kudzu plants and to sever tree-draped vines. Burning will kill only the very small plants. A good time to burn is in February and early March when dead kudzu leaves are compacted for good fuel and winter exposure to erodible soils can be minimized following the burn.

Many hazards can be found after a burn, such as old wells and gullies. For safety, each hazard should be flagged **with a very tall pole. Also, the size and density of kudzu root crowns** can be readily seen after a burn. This helps identify the areas within the patch that will require higher rates of herbicide or more coverage.

Logging of kudzu-draped trees is advised one year in advance of treatment, if possible. Winter logging can permit the logs to be skidded into the patch so that vines are not spread further with logging. Skidding outside the patch will invariably spread kudzu.

Both grazing by livestock and disking with a harrow can be used for one or two summers prior to treatment to weaken the kudzu plants. **Disking** can also be used several months after treatment to help disrupt and dislodge weakened kudzu roots.

{3} Effective Herbicides

Open Patches on Level Ground

Most herbicides will brown **kudzu** leaves and vines, but few will result in root control. Tordon 101 Mixture and Tordon K (see the Recommendation Summary at the end of this Chapter for the common **names** and manufacturers) are the most cost-effective herbicides of the 25 tested on **kudzu** over an **8-year** period. Both herbicides are applied as sprays to the foliage and then must be washed from the leaves by **rainfall** to the roots for uptake. Both of these are **restricted use herbicides** because they are very water soluble and can leach through sandy soils into streams **and** ground water, nearby trees with roots in the area can be **killed** or injured. Many crops are very sensitive to these herbicides, and they are relatively persistent and may injure or kill plants introduced into the area too soon. Because of this a permit for purchase is issued by your county agent or state regulatory agency after proper use procedures are reviewed. Kudzu is a legume and Tordon herbicides are very effective on leguminous plants.

Effective rates are:

Kudzu less than 10 years old

- a. Tordon. 101 Mixture at 1 gallon per acre
- b. Tordon K at 0.5 gallons per acre
- c. Tordon 101 Mixture at 0.5 gallon per acre
+ Tordon K at 1 quart per acre

Kudzu more than 10 years old

- a. Tordon 101 Mixture at 2 gallons per acre
- b. Tordon K at 0.5 gallons per acre
- c. Tordon 101 Mixture at 0.5 gallon per acre
+ Tordon K at 1 quart per acre

The higher rates should be used on patches that are

older than 10 years and on clayey and stony soils. Application of these herbicides can occur from June through September (see later section on application). Treatments should not be made with Tordon until at least 'June, because all **kudzu** plants must be growing at the **time** of treatment for control to be effective. **Kudzu** plants do not all emerge in a patch at the same time.

Rainfall is required within 2 - 5 days after application for good control to occur with Tordon herbicides.

Ideally, rainfall less than one inch should occur 2 to 3 days after application. The herbicide must be washed into the upper soil layer for root uptake after foliar uptake. Also, Tordon is decomposed by sunlight and the longer it remains on the foliage without **rainfall** the less active ingredient is present. Any trees with roots in or near the treated area may be injured or killed. Even after using the **most-effective Tordon** herbicides, broadcast retreatments will be required in most cases and spot treatments in all cases, with specifics discussed in later sections.

There are other herbicides that are less effective than Tordon that can be used for containment and management on forested sites, as well as, multi-year treatments for possible eradication. These herbicides are (in decreasing order of effectiveness):

Veteran 720 (formerly **Banvel 720**) by Riverdale (**recommended** at 2 gallons per acre),

Transline by DowElanco (2 1 ounces per acre),

Krenite by DuPont (3 gallons per acre),

Garlon 4 and 3A by DowElanco (1 to 2 gallons per acre),

Accord by Monsanto (1 gallon per acre),

Arsenal Applicators Concentrate by American

Cyanamid (2 quarts per acre),

Oust by DuPont plus Accord (3 ounces plus 2 quarts per acre), and

Escort by DuPont (4 ounces per acre).

These herbicides work best on patches less than 10 years

old, but may require two to ten annual broadcast treatments before spot treatments begin. All of these should be applied after **midsummer**, after draped **kudzu** has started to flower. **Foliar** browning will occur with all these herbicides, but regrowth can be expected.

Tordon should not be used near streams, ponds, and other sensitive areas. This chemical can move in rain water, so do not use it where the slope will permit washing into off-site areas or to roots of desirable trees and plants.

Sites near Streams, Ponds, and Ditch Banks

These sites are particularly sensitive because of their proximity to water. Veteran **720**, sold by Riverdale Chemical Company, is the herbicide of choice in these situations. This herbicide should not be sprayed directly into water or on ditch banks where runoff will contaminate surface water.

Veteran 720 is applied at 2 gallons per acre for patches less than 10 years old, and at 3 gallons per acre for older patches. Applications should be made in August or September. Veteran 720 should never be applied within or near the root zone of any desirable plant. Moderate rainfall is required for its necessary soil-activation.

Residential Sites

Multiple applications per year can be made with Roundup, sold by Monsanto Chemical Company. Apply Roundup at the rate of 1 to 2 gallons per acre (spot treatment with 2.5 ounces Roundup per gallon of water). Extreme care should be used when spraying around desirable plants so that unseen **spray** does not drift. Trees with roots in the treated area should not be damaged because Roundup is not soil active. In some cases, continued mowing of invading vines is as effective as making a herbicide application.

Young Pine Plantations

Kudzu invading pine plantations can best be treated with mixtures of Escort (DuPont Chemical Company) **with** Arsenal AC (American Cyanamid Company) or Accord

(Monsanto Chemical Company). Only partial control can be expected by these treatments when the kudzu has been present for several years.

For treating plantations of **2 year old loblolly pines**, apply Escort at 1 to 1.5 ounces per acre with either Arsenal AC at 1 pint or Accord at 1 quart. Apply a single treatment during midsummer when kudzu is actively growing and the pines are not water stressed. Direct the spray away **from the young pines when possible**, especially the growing tips. Some growth suppression and possible damage of the pine may occur. Two years of treatment will probably be required. If old established kudzu plants are present, they should be spot treated just around the root crown with **Tordon**. For old kudzu growing in **young** pines, treatment with Tordon should be considered for eradication, although the pines will be killed.

Non-croplands

Spike herbicides, sold by DowElanco, can be used to eradicate kudzu, often with a single application. Spike **80W**, a dry **flowable** formulation, and Spike 20P pellets are labeled for non-crop areas such as rights-of-ways and fence rows. Effective rates for Spike 80W have been found to be 6 to 8 pounds per acre and for Spike **20P**, 20 to 30 pounds per acre. These herbicides can be applied any time of the year, but early spring is best. The long persistence of these soil-active herbicides can provide control for over 3 years.

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. Spike herbicides are very persistent and it may be several years before desirable plants can be planted after treatment.

Forest Openings and Kudzu in Desirable Trees

Apply Transline, sold by DowElanco, at 2 1 ounces per

acre as a spray solution. This herbicide is safe on many tree species except black locust, redbud, and mimosa. These trees belong to the family of legumes, like kudzu, and Transline is selective for controlling legumes.

[4] Application for Eradication

Complete and thorough coverage by spray mixtures is required by any application approach. Open patches have **been successfully treated using sprayers on crawler**, skidder, and farm tractors, using truck-mounted spray **units and** dragging hose; and by backpack sprayers and **mistblowers**. Helicopter applications are also effective. barge tractor sprayer 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.

How much Spray mixture is needed per acre when treating with Tordon? Many applicators give different answers. Volumes of 40 to 200 gallons per acre are used by some tractor and hose applicators. Obviously there are benefits in coverage by high volumes and possible soil activation can occur with very 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.

Double coverage with a tractor sprayer is one of the best methods for "open-patch" kudzu treatment, where terrain permits. Half the mixture is applied by parallel passes in one direction, and the remaining half is 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 skipped spots 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 with tractor sprayers, make one or more passes around the outer edge of a patch. **Boomless** spray nozzles can be tilted up on these outer passes to treat up into the draped vines **eliminating** the need for cutting. A spray gun can also be used to treat vines in trees. Most pines and hardwoods that are larger than 10 inches in trunk diameter will not be killed by spraying the vines with Tordon **101**, unless the trees are already weak. Spray guns are also necessary to treat kudzu in gullies and canyons, and steep patches from roadsides.

[5] Retreatment

An applicator or landowner must be persistent in examining patches for up to 10 years after treatment. Most control is accomplished with one or two broadcast treatments; but plants may continue to appear for many years. Of course, patches less than 10 years old will probably be mostly controlled by only one broadcast application of Tordon herbicides. Success with Tordon herbicides is evident by complete browning of the patch within a few weeks after the initial application.

Following a successful initial treatment, retreatments

should then be delayed for 2 years, with a 1 year layout.

Broadcast **retreatments** are usually made using half the rate of the first. In other words, if a successful application is made **in year 1**, then another broadcast treatment using half the rate should be applied in year 3.

Research has shown that many of the large kudzu roots that are severely injured will not sprout for 2 years, and thus the recommended delay. On older patches, some kudzu will regrow in the year after application, but all injured large rooted plants will lay dormant for 2 or more years before sending up **a vine. Retreatments** in successive years are needed **if Tordon** herbicides and double coverage are not used, and if rainfall does not occur within a week after treatment with Tordon.

For spot treating of scattered plants, use the backpack sprayer mixture of 1 pint Tordon 10 1, **1/2** pint Tordon K, or 1 pint Veteran 720 in 4 to 5 gallons of water. Only the vines near the root crown should be sprayed to medium wetness **with** this mixture as well as the soil within 1 foot of the root crown (all vines do not have to be treated). When the vines and root-crown area are sprayed to medium wetness, **99-percent** effective control can be obtained with these mixtures.

{6} Plant Desirable Trees or Plants

To complete kudzu eradication, establish desirable plants on the area to prevent soil loss and regain productivity. **Kudzu** should be positively eradicated before planting desirable trees. For older patches, this means a minimum 4 year treatment period using Tordon herbicides: initial broadcast application in year **1**, layout in year 2, rebroadcast treatment in year 3, and spot treatments in year 4. Pines and hardwood trees can be planted 6 months after the last treatment with Tordon or Veteran. Further planting delays may be required when multiple year applica-

tions have been used on sandy soils.

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 residual Tordon and Spike. In fact, these two herbicides are labeled for use on **rangeland** and pastures.. A grass cover helps control kudzu, protects the soil, and replaces the abundantweed growth that follows kudzu eradication.

Recommendation Summary

Persistence is the key to successful kudzu eradication and management,

The most cost-effective treatment for kudzu eradication is Tordon 101 Mixture applied at 2 gallons per acre, or Tordon K applied at 1 gallon per acre, using perpendicular spray passes.

Retreatment after a **successful** initial treatment should be applied 2 **full** years after the **first**. Then spot treatments of remaining plants in the 4th year.

Veteran 720 is a herbicide that **can** be used near streams and drainage ditches and can provide better than **95-**percent control with two broadcast treatments in successive years. Other labeled herbicides are usually less **effective** than these and can be used for containment and management of kudzu cover.

Spike herbicides show considerable promise for **eradica-**tion, using a single treatment. Spike herbicides are labeled for **non-cropland** situations. The long persistence of the soil-active ingredient in Spike continued to provide control over a 3 year period.

Roundup is the safest herbicide of choice for kudzu problems in residential, home-grounds, and other environmentally sensitive sites. Many years of application with Roundup will be required for eradication of older patches. Persistence in the control treatments outlined in this

chapter have been successful in eradicating many kudzu patches, and can work for **you**.

Herbicides registered by the U. S. Environmental Protection Agency for kudzu control

<u>Trade Name</u>	<u>Common Name</u>	<u>Manufacturer</u>
Accord	glyphosate	Monsanto
Arsenal AC	imazapyr	American Cyanamid
oust	sulfometum	DuPont
Escort	metsulfuron	DuPont
Krenite	fosamine	DuPont
Garlon 3A	triclopyr	DowElanco
Garlon 4	triclopyr	DowElanco
Roundup	glyphosate	Monsanto
Tordon 10 1	picloram + 2, 4-D	DowElanco
Tordon K	picloram	DowElanco
Transline	clopyralid	DowElanco
Veteran 720	dicamba + 2.4-D	Riverdale

CAUTION

Herbicides and pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife -- if they are not handled properly.

Use all herbicides and pesticides selectively and carefully. Follow recommended practices for the disposal of surplus herbicides and pesticides and their containers.