

**Brush Management
with Herbicides for Gopher Tortoise Habitat Restoration**
GA Practice Job Sheet-314-643-645

Prepared for: _____

Prepared by: _____

Farm: _____ Tract Number: _____ Date: _____



Definition

The manipulation of species composition, stand structure and stocking by cutting or killing selected trees and understory vegetation.

Criteria

The method, intensity and timing of a chemical control of mid-story hardwoods should match the limitations of the site, equipment, and the requirements for removing the desired woody species.

For the restoration of Gopher Tortoise habitat, the control of competing hardwood trees and brush, while maintaining groundcover plant diversity is very important for the management of southern pines especially longleaf pine. This will allow the trees to optimize their growth, but at the same time, provide the protection of the native ground cover. The ground cover, which is a mix of native grasses and forbs or weeds, is the primary food source for the Gopher Tortoise.

A minimum of 2.5 acres of gopher tortoise foraging habitat of grasses and forbs should be maintained around a burrow at all times and not be permanently converted, removed, or degraded by any means (e.g. clearing, trampling, flooding). Clearing of gopher tortoise habitat should be minimized and restored as soon as possible when such clearing is temporary.

For best results use prescribe burning (338) with this practice.

Considerations

Herbicides can be applied in 4 ways:

- broadcasting
- spot grid pattern
- hack and squirt
- basal bark spraying

Broadcast methods are usually the preferred method of application but also run the highest risk of destroying native groundcover when established Gopher Tortoise forage is on the site. The other 3 methods of application may be more appropriate.

Broadcast method

This method applies when treating large tracts using helicopter or with specialized ground spray equipment. This treatment is also possible when using backpack sprayers provided the competition is less than 5 feet tall.

After the leaves turn and fall, usually about six to eight weeks, the area should be burned.

For the Gopher Tortoise program, Imazapyr is the recommended herbicide. Based on recommendations from UGA, use 16-28oz of Arsenal per acre, based on a 4lb formulation. If a good stand of native grasses such as bluestem and wiregrass occur on the site, then the lower rates would maintain these grasses. Never use glyphosate when native grasses occur. When controlling waxy leaved hardwoods such as gall berry, add Triclopyr (Garlon) at the rate of 16-48 oz/ac, (Personal communication with Dave Moorhead, UGA Warnell School of Forestry & Natural Resources).

Spot Grid Pattern

The optimum time of application is the spring using Velpar L (hexazinone). It may be applied directly to the soil surface

at the base of individual stems or when the brush is dense, by making applications in a grid pattern. It is effective in removing larger trees/midstory, particularly oaks but depends upon proper timing and good rain fall after application. If applied during times of drought, there is a possibility of excessive stress on the residual pines. See Figure 1 for details

Hack and Squirt

This approach is most appropriate where there are few scattered individuals with diameters greater than 3 inches. The method uses a small hatchet to cut a small gash in the tree then applying a small amount of herbicide directly into the wound. For Arsenal, See Figure 2 for details.

If glyphosate is used, use a 41% label concentration. Inject 1 ml of 50-100% concentrate into each cut that are spaced at 1 inch intervals around the stem. Avoid treatment during spring green-up. (Personal communication with Dave Moorhead, UGA Warnell School of Forestry & Natural Resources).

Basal Bark Treatment

Where undesirable hardwood crowns are too tall to reach with a backpack sprayer applying herbicide to the lower parts of the trunk. Consider using Pathfinder II (triclopyr). See Label for specifications and rates.

It is best to treat the lower 12 inches of the trunk including the root collar. The approach is most effective on stems less than 6 inches in diameter, and is suggested for stems less than three inches. There are several approaches described on the product label, but essentially a mixture of herbicide in oil is applied to lower portion of the stem.

***Note:** Always read and carefully follow the herbicide label directions when selecting and using any herbicide. Herbicides currently registered for site preparation treatment in Georgia are listed in the "Georgia Pest Control Handbook". The handbook is available on the web at <http://www.caes.uga.edu/departments/ent/pmh/> or Contact the Cooperative Extension Service for information.*

Prescribed Burning

Fire can be used to increase the effective effectiveness of herbicides, but also encourage the regeneration of native ground cover.

OPERATION AND MAINTENANCE

It is important to maintain a prescribe burn program on a 2 year rotation with an occasional 3 year burn due to weather limitations. This will maintain hardwoods as a minor component of the ecosystem. If burning is used on a longer rotation, it is very likely that the hardwood component will again shade out the native ground cover. If burning within the wire grass range, an occasional growing season burn will encourage wire grass reproduction

Summary

Providing the proper amount of sunlight is essential for the successful establishment of native ground cover plant species.

References

Minogue, P. , K. Bohn and R. Williams. 2010. Controlling Hardwoods in Longleaf Pine Restoration. University of Florida IFAS Extension, FOR125, 5p.

Moorhead, D. 2012. Forest Herbicides., Georgia Pest Management Handbook. University of Georgia Extension service

Certification Job Sheet:

Prepared by: _____

Title: _____ Date: _____

Approved by: _____

Title: _____ Date: _____

Installation:

Answer: YES or NO to the following:

Was hardwood control utilized correctly to maintain ground cover? _____

Meets NRCS Standards and Specifications _____

Certification by: _____

Date: _____

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Figure 1

SPOT GRID PATTERN WITH HEXAZINONE * (Velpar L, Velpar DF)

by Dave Moorhead UGA Warnell School of Forestry & Natural Resources

Activity

Soil and some contact foliar activity.

Soils Products are very cost effective on coarse or light-textured soils with predominantly oak species. Hexazinone is mobile in soil. Persistence studies indicate that the half-life in soil ranges from 1 to 6 months depending on soil texture, moisture, temperature, etc. Activity is low or inconsistent on poorly drained soils.

Timing

Apply early spring to early summer when rainfall necessary for activation is available. In freshly harvested areas with numerous stumps, a delay of one growing season to allow stump sprouts to develop will enhance control.

Environmental Concerns

Volatility - Little to none.

Toxicity - Very low toxicity rating for fish and wildlife, but Velpar L can cause severe eye irritation by direct exposure. Use eye protection when mixing & applying.

Precautions - Mobility with soil water can be a problem on certain sites. Attention should be paid to soil type and slope when considering possible movement to sensitive areas or into water table or agricultural and domestic use water. Do not apply within the root zone of desirable hardwoods.

Other Critical Factors

Treatments on clay soils can be expensive due to high application rates required for effectiveness.

Efficacy will be inconsistent during drought conditions.

Site preparation treatment of upland sites with a mixed hardwood component

Early spring treatment of mixed hardwoods on well-drained sites. Use lower rates on coarse-textured soils and higher rates on fine-textured soils (follow label rates).

The rate for soil spot site preparation applications is made on the basis of soil texture. Less herbicide is used on sand soils and more on clay soils. Note that within textural class recommendations higher rates are required to suppress difficult-to-control hardwood species such as hickory, dogwood, maple, blackgum, sassafras, and sourwood. Velpar L provides little control of yellow-poplar, ash, mountain laurel, persimmon, huckleberry, eastern redcedar, sassafras, blackgum, large pines, boxelder, hollies, American beautyberry, Bermudagrass, broomsedge, cocklebur, Johnsongrass, sicklepod, trumpetcreeper, and morningglory. Seedling pines can be severely damaged or killed, especially when spots are placed too near.

Velpar L and Velpar DF Site Preparation Rates by Soil Texture

Soil Texture	Velpar L (qts/acre)	Velpar DF (lbs/acre)
COARSE sand, loamy sand, sandy loam	4-6	2 2/3 - 4
MEDIUM Loam, silt loam, sandy clay loam	6-8	4 - 5 1/3
FINE Silty clay loam, clay loam, sandy clay, silt, silty clay, clay	8-10	5 1/3 – 6 2/3

Herbicide and Mixing

Velpar L can be diluted with water to aid spot applications. A dilution of 1 part Velpar L herbicide with 1 part water (1 to 1) requires that a 2-ml spot be applied to equal 1 ml of the concentrate. A dilution of 1 to 2 requires a 3-ml spot to equal 1 ml of the concentrate, etc. Dilution reduced the flammability hazard of Velpar L and reduces the chance of application error. For example, if a 1-ml spot of concentration is applied, and by mistaken calibration only ½ ml is applied, the rate is changed by 50 percent. When the 3-ml dilutions are applied, a variation of ½ ml only changes the application rate about 17 percent.

Application Methods

Spot Grid Applications. A prescription for soil spots of Velpar L are usually specified by the volume per spot and the spacing between spots. If the prescription is given only in quarts per acre, then the volume per spot can be selected and the spacing calculated. For example, if the prescription specifies 6 quarts per acre and 2-ml spots are chosen, the number of spots per acre can be calculated by:

$$\text{Number of spots per acre} = \text{Qt/acre} \times 946 \text{ ml/qt} / \text{Number of milliliters per spot} = 6 \times 946 / 2 = 2,838 \text{ spots/acre}$$

Then to calculate the spacing between spots, the area per spot must be determined:

$$\text{Area/spot (ft}^2\text{)} = 43,560 \text{ ft}^2 \text{ per acre} / 2,838 \text{ spots per acre} = 15.3 \text{ ft}^2 \text{ or rounded to } 15 \text{ ft}^2$$

Thus, if the area around each spot is 15 ft², then a 3 ft by 5 ft spacing would work. Natural walking strides tend to match spacings of 3, 4, 5, and 6 ft.

When the prescription is given in quarts per acre and commonly used spacing has been selected, then the volume per spot is as follows:

VELPAR Spot Application – Spots /acre x Spot Spacing x Rate/acre							
Spot Spacing (ft)	3x3	4x3	5x3	6x3	4x6	5x6	6x6
Spots/acre	4,840	3,630	2,904	2,420	1,815	1,452	1,210
Rate (qts/acre)	-----milliliters per spot-----						
2	0.4	0.5	0.6	0.8	1.0	01.3	1.6
3	0.6	0.8	1.0	1.2	1.6	2.0	02.3
4	0.8	1.0	1.3	1.6	2.0	2.6	3.1
5	1.0	1.3	1.6	1.9	2.6	3.3	3.9
6	1.2	1.6	1.9	2.3	3.0	3.9	4.7
7	1.4	1.8	2.3	2.7	3.6	4.6	5.5
8	1.6	2.1	2.6	3.1	4.0	5.2	6.2
9	1.8	2.3	2.9	3.5	4.7	5.9	7.0
10	2.0	2.6	3.3	3.9	5.0	6.5	7.8

To be most effective, the applicator paces the larger dimension of the grid and applies the spots across in front using the smaller dimension. For example, when applying a 3-x-5 ft grid, the applicator paces 5 ft and applies up to 5 spots that are 3 ft apart. One spot can be applied directly in front of the applicator and then one spot 3 ft to the right and another 3 more ft over; then, this is repeated on the left side. After practice, the fastest application is by continuous pacing and shooting of spots, sweeping back-and-forth across the treatment swath.

To be most effective and efficient, the grid pattern should be spaced so that the herbicide spots intercept the most hardwood roots using the least number of spots per acre to minimize application time. Generally a close grid pattern is used when the hardwood competition is small and a wider pattern is used when hardwoods are larger. Thus close patterns are more commonly used for pine release and the wider spacing for site preparation, both pre- and post-harvest, and hardwood stand conversion. For example, to control mainly 6- to 8-inch d.b.h. trees, a wide grid is preferred, such as a 6 x 6 ft, 5 x 6 ft, or 4 x 6 ft. To control thousands of small stems per acre, the most common pattern is 3 x 3 ft.

*Excerpts from:

Williamson & Miller - Ground Applications of Forest Herbicides, USDA FS

Nelson & Cantrell –Herbicide Prescription Manual for South

Figure 2

Wide-space injection with Arsenal AC herbicide for control of undesirable hardwood stems Page 1 of 2



Wide-space injection with Arsenal AC herbicide for control of undesirable hardwood stems

[Dr. Dave Moorhead](#), Warnell School of Forest Resources, The University of Georgia

October 2003, Based on work by Dr. Andy Ezell, Mississippi State University.

Equipment - Supplies

- Arsenal Applicators Concentrate (produced by BASF)
- Chemical resistant spray bottle (available from farm/chemical supply, & auto parts stores)
- Hatchet or brush ax

Mixing

- Mix a 20 percent Arsenal AC in water solution (25 ounces of Arsenal + 103 ounces of water to make 1 gallon of solution)

Application

- Make one cut or hack through the bark into the cambium layer for every 3 inches of stem diameter measured at breast height (DBH at 4.5 feet from the ground).
- Apply 1 ml of herbicide/water solution into each cut.
- Adjust the nozzle of the spray bottle to deliver approximately 1 ml of solution for each trigger squeeze. Inexpensive plastic dose cups graduated in milliliters available at pharmacy & drugstores, can be used to check calibration.

Application Timing

- Treat stems in August to March
- Avoid applications during rapid tree growth/green up in spring and early summer

Species Controlled

- | | |
|-----------------------|-----------------|
| • Ash | • Persimmon |
| • Black oak | • Privet |
| • Blackgum | • Red Maple |
| • Boxelder | • Sassafras |
| • Cherry | • Sourwood |
| • Chinaberry | • Sumac |
| • Chinese Tallow-tree | • Sweetgum |
| • Cottonwood | • Sycamore |
| • Dogwood | • Titi |
| • Hickory | • Willow |
| • Laurel oak | • Willow oak |
| • Live oak | • White oak |
| • Maple | • Yellow-poplar |
| • Mulberry | |

Species in italics are considered difficult-to-control and will require one additional cut for control. For example, on a 6" DBH stem that normally requires 2 cuts, make 1 additional cut for added control.

Treatment Response

- Maximum treatment effectiveness occurs in the second growing season after treatment.
- In the first growing season after treatment, the most susceptible species (such as sweetgum) may die, but other species will lose foliage, produce a new flush of leaves which may exhibit abnormal leaf shapes, color, and clusters of small leaves or buds at branch and terminal tips. These trees will die in the second growing season following treatment.
- Arsenal is a soil active material. Do not spray the herbicide solution on the soil near desirable tree/crop species.



Application equipment: Chemical resistant spray bottle, metric dose cup for calibration of spray bottle, and hatchet.



Hatchet cut into stem.



Injection cut in stem.



Applying 1 ml of herbicide solution to cut by spraying on face of hatchet blade allowing herbicide to run into cut.



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