

Suggested Maintenance Practices for Roadside Weed and Brush Problems



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Suggested Maintenance Practices for Roadside Weed and Brush Control

Right-of-way vegetation management is a very important part of the overall roadside maintenance program. The vegetation adjacent to the road surface is a functional part of the road. In addition to mechanical methods, herbicides are used for managing right-of-way vegetation. When used correctly, herbicides can selectively control undesirable weeds and leave nearby beneficial plants unharmed.

This Extension circular summarizes herbicides, rates of application per acre, water carrier rates, timing of application, and important comments regarding vegetation management programs. These programs include control of johnsongrass, annual grasses and broadleaves, silver bluestem (silver

beardgrass), switchgrass, bermudagrass encroachment, and aquatic weeds. With respect to recommended timing of applications, refer to the spray zone map (Figure 1) based on your location within Oklahoma.

Please remember these are only suggestions and the following information is for preliminary planning. There is no substitute for an applicator scouting roadside areas regularly to note the conditions of the desired species, weeds present, and their stage of development. Be sure to follow the manufacturer's directions, notwithstanding the information contained in this circular. Read and follow all label directions.

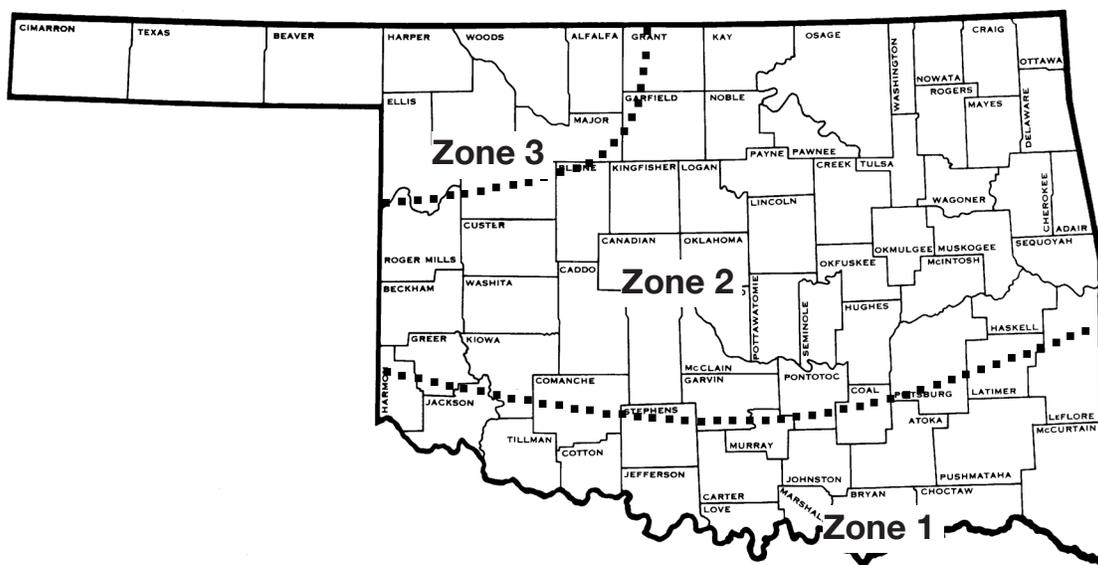


Figure 1. Seasonal herbicide spray zones along Oklahoma roadsides. Seasonal spray zones are based on many factors. Optimize your weed control results by following the recommended treatment dates for your specific zone.

Johnsongrass Control (Postemergence)

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate + sulfometuron. Apply 16 to 24 fluid ounces of product + 1 ounce of product, respectively in 20 to 40 gallons of water per acre.

Time of Application:
 Zone 1: April 20 - May 31
 Zone 2: May 10 - June 15
 Zone 3: May 20 - June 30

- Comments:**
1. If Roundup Pro Concentrate® is used, apply 13 to 19 fluid ounces of product per acre.
 2. Application should be made after bermudagrass has broken dormancy and is 100 percent green and actively growing.

3. Add glyphosate to the tank mixture first and then add the sulfometuron.
4. Applications should not be made to areas that have little or no bermudagrass to release. It is recommended that roadsides have at least 30 percent bermudagrass cover. If not, use a MSMA program until you achieve recommended coverage.
5. Applications should not be made on newly sprigged or seeded areas. This treatment will slow the rate of coverage from sprigs and inhibit seed germination.
6. Do not apply to saturated soils or if rainfall will occur within 2 to 6 hours. Rainfall will wash the glyphosate from the plants and reduce the level of control. Generic glyphosate needs to remain on foliage for at least 6 hours before any significant rainfall event.
7. Glyphosate rates higher than 16 fluid ounces of product per acre should not be used in the western one-third of Oklahoma.
8. Do not mow roadsides prior to treatment. Wait at least 10 days after treatment before mowing or weed control may be reduced.

Johnsongrass Control (Postemergence)

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate + Plateau®. Apply 12 to 16 fluid ounces of product + 4 fluid ounces of product per acre, respectively in 20 to 40 gallons of water per acre.

Time of Application:

- Zone 1: April 20 - May 31
- Zone 2: May 20 - June 15
- Zone 3: May 20 - June 30

Comments:

1. If Roundup Pro Concentrate® is used, apply 10 to 13 fluid ounces of product per acre.
2. Application should be made after bermudagrass has broken dormancy and is 100 percent green and actively growing.
3. Add glyphosate to the tank mixture first and then add the Plateau®.
4. Plateau® is only available through direct purchase from the manufacturer (BASF).
5. Applications should not be made to areas that have little or no bermudagrass to release. It is recommended that roadsides need at least 30 percent bermudagrass cover. If not, use a MSMA program until you achieve this recommended coverage.
6. Applications should not be made on newly sprigged or seeded areas. This treatment will slow the rate of coverage from sprigs and inhibit seed germination.
7. Do not apply to saturated soils or if rainfall will occur within 2 to 6 hours. Rainfall will wash the glyphosate from the plants and reduce the level of control. Generic glyphosate needs at least 6 hours before any significant rainfall event.
8. Do not mow roadsides prior to treatment. Wait at least 10 days after treatment before mowing or weed control may be reduced.

Johnsongrass Control (Postemergence)

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate + Outrider®. Apply 12 to 24 fluid ounces of product + 0.75 to 1.33 ounces of product per acre, respectively in 20 to 40 gallons of water per acre.

Time of Application:

- Zone 1: April 20 - June 30
- Zone 2: May 10 - July 30
- Zone 3: May 20 - August 15

Comments:

1. If Roundup Pro Concentrate® is used, apply 10 to 19 fluid ounces of product per acre.
2. This treatment will produce less noticeable injury to bermudagrass. It has the greatest level of bermudagrass safety of any of the suggested johnsongrass treatments especially at later applications.
3. Application should be made after bermudagrass has broken dormancy and is 100 percent green and actively growing.

4. Add glyphosate to the tank mixture first and then add the Outrider®.
5. Applications should not be made to areas that have little or no bermudagrass to release. It is recommended that roadsides need at least 30 percent bermudagrass cover. If not, use a MSMA program until you achieve recommended coverage.
6. Applications should not be made on newly sprigged or seeded areas. This treatment will slow the rate of coverage from sprigs and inhibit germination of seeds.
7. Do not apply to saturated soils or if rainfall will occur within 2 to 6 hours. Rainfall will wash the glyphosate from the plants and reduce the level of control. Generic glyphosate needs to remain on foliage for at least 6 hours before any significant rainfall event.
8. After mowing wait until johnsongrass has 12 to 24 inches of regrowth before treating. Wait at least 10 days after treatment before mowing or weed control may be reduced.
9. The addition of certain amine-form broadleaf weed control herbicides to this treatment can result in reduced johnsongrass control (antagonism). This is not desirable and one should consult the Outrider® label before tank-mixing.
10. Glyphosate rates higher than 16 fluid ounces of product per acre should not be used in the western one-third of Oklahoma.

Johnsongrass Control (Postemergence)

Herbicide(s) and Rate(s) of Application per Acre: MSMA. Apply 2 to 3 pounds of active ingredient per acre in 40 gallons of water per acre.

Time of Application:

- Zone 1: April 15 - July 30
- Zone 2: May 10 - August 15
- Zone 3: May 20 - August 15

Comments:

1. Two or three applications per year will be required to control johnsongrass. Treatments should start when johnsongrass reaches 12 to 18 inches in height and retreatments should be made when regrowth is 12 to 18 inches tall (retreatments usually will be made on a 3 to 4 week interval maximum).
2. Preemergence seedling johnsongrass control may be achieved by adding sulfometuron or Outrider® at 1 ounce product per acre when the first MSMA treatment is made. Do not add sulfometuron or Outrider® to subsequent MSMA treatments.
3. Never apply MSMA to standing water, creeks, rivers, or ponds. Be sure to shut off spray rigs when passing over bridges.
4. MSMA, alone, can be used on newly sprigged or thin roadsides, as MSMA will produce very little injury or slow bermudagrass growth and development.
5. MSMA should not be applied to young bermudagrass seedlings until they have produced stolons from 1 to 3 inches in length.

Winter Annual Grass and Broadleaf Weed Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Campaign® + ammonium sulfate (AMS). Apply 2 to 4 pints of product per acre + 17 pounds of product per 100 gallons of carrier (AMS is used only with low end rates of Campaign®) in 20 to 40 gallons of water per acre.

Time of Application:

Zone 1: February 15 - March 20

Zone 2: February 25 - March 31

Zone 3: March 10 - April 15

Comments:

1. Apply to dormant bermudagrass. Applications made to bermudagrass that is beginning to green-up will result in temporary discoloration and slight bermudagrass green-up delay.
2. Campaign® should be applied at a rate of 3 to 4 pints of product per acre alone. Campaign® applied at 2 pints product per acre requires the addition of AMS. The AMS treatment will significantly reduce treatment costs while maintaining acceptable weed control.
3. Targeted weeds must be actively growing and may take 2 to 3 weeks before showing any phytotoxicity symptoms from the herbicides (this is because of the cool temperatures).
4. This product is for the control of emerged weeds only, there is no preemergence control of weeds with this treatment.
5. Precautions should be taken to avoid drift to susceptible non-target plants.
6. AMS should be mixed thoroughly into the tank first, then add the Campaign®.
7. This treatment needs to be applied before targeted weeds reach 6 inches tall to assure good coverage and control.
8. Roadsides that are infested with musk thistle would benefit from an addition of Overdrive® at 2 ounces per acre.
9. The addition of Milestone VM® at 4 ounces product per acre to this treatment would provide 3 to 5 months of summer annual broadleaf weed control.

Annual Ryegrass Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Campaign® + glyphosate + ammonium sulfate (AMS). Apply 2 pints product + 16 fluid ounces of product per acre + 17 pounds of product per 100 gallons of carrier in 20 to 40 gallons of water per acre.

Time of Application:

Zone 1: February 15 - March 10

Zone 2: February 20 - March 25

Zone 3: March 5 - April 5

Comments:

1. This treatment should only be substituted for a traditional

Campaign® program when annual ryegrass becomes a problem in the clear zone.

2. Annual ryegrass requires higher herbicide rates to achieve successful control.
3. If Roundup Pro Concentrate® is used apply at 13 fluid ounces of product per acre.
4. Apply to dormant bermudagrass only. Applications made to bermudagrass that is beginning to green-up will result in significant bermudagrass green-up delay.
5. Targeted weeds must be actively growing and may take 2 to 3 weeks before showing any phytotoxicity symptoms from the herbicides (this is because of the cool temperatures).
6. This product is for the control of emerged weeds only, there is no preemergence (residual) control of weeds with this treatment. Milestone VM® at 4 ounces product per acre may be added to this treatment to provide 3 to 5 months of summer annual broadleaf weed control.
7. Precautions should be taken to avoid drift to susceptible non-target plants.
9. This treatment needs to be applied before targeted weeds reach 12 inches tall to assure good coverage and control.

Annual Ryegrass Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate. Apply 32 fluid ounces of product per acre in 20 to 40 gallons of water per acre.

Time of Application:

Zone 1: February 15 - March 10

Zone 2: February 20 - March 25

Zone 3: March 5 - April 5

Comments:

1. This treatment should only be substituted for a traditional Campaign® program when annual ryegrass becomes a problem in the clear zone.
2. Annual ryegrass requires higher herbicide rates to achieve successful control.
3. If Roundup Pro Concentrate® is used apply at 25 fluid ounces of product per acre.
4. Apply to dormant bermudagrass only. Applications made to bermudagrass that is beginning to green-up will result in significant bermudagrass green-up delay.
5. Targeted weeds must be actively growing and may take 2 to 3 weeks before showing any phytotoxicity symptoms from the herbicides (this is because of the cool temperatures).
6. This product is for the control of emerged weeds only, there is no preemergence control of weeds with this treatment. Milestone VM® at 4 ounces product per acre may be added to this treatment to provide 3 to 5 months of summer annual broadleaf weed control.
7. Precautions should be taken to avoid drift to susceptible non-target plants.
8. This treatment needs to be applied before targeted weeds reach 12 inches tall to assure good coverage and control.

Early Preemergence and Postemergence Control of Winter and Summer Broadleaf Weeds

Herbicide(s) and Rate(s) of Application per Acre: Milestone VM® + non-ionic surfactant. Apply 4 ounces of product per acre + 0.25 percent solution in 20 to 40 gallons of water per acre.

Time of Application:

- Zone 1: February 15 - March 10
- Zone 2: February 25 - March 31
- Zone 3: March 5 - April 5

Comments:

1. This treatment can be tank-mixed with any of the Winter Annual Weed Control Treatments to add a residual component.
2. This treatment produces good postemergence control of emerged winter broadleaf weeds and provides 4 to 5 months of residual control of many common summer annual broadleaf weeds.
3. This treatment will provide some kochia suppression if applied and activated with rainfall before kochia emerges (late February).
4. A quality non-ionic surfactant should be used that has a minimum of 80 percent active ingredient if used alone.
5. Precautions should be taken to avoid drift to susceptible non-target plants.
6. This product can provide summer broadleaf weed control from March applications. This reduces potential to damage broadleaf crops that are planted after April or May. It reduces the need for summer applications of Vanquish® to control broadleaf weeds.

Early Preemergence and Postemergence Control of Winter and Summer Broadleaf Weeds

Herbicide(s) and Rate(s) of Application per Acre: Diuron 80 WDG® + non-ionic surfactant. Apply 3 to 5 pounds product per acre + 0.25 percent solution in 25 to 40 gallons of water per acre.

Time of Application: Zone 1, 2, and 3: January 15 - February.

Comments:

1. Diuron 80 WDG® is used primarily in areas infested with kochia.
2. This recommendation is specific to the Diuron 80 WDG® Loveland Industries product as it is currently labeled for recommended rates.
3. A quality non-ionic surfactant should be used that has a minimum of 80 percent active ingredient if used alone.
4. Application should be made on completely dormant bermudagrass.
5. Applications should never be made to saturated or frozen soils (there is a potential for runoff if application is followed by rain).
6. Regardless of right-of-way width, always leave an untreated buffer zone.
7. Diuron 80 WDG® can be used with imazapyr or glyphosate treatments to provide long-term total vegetation control around signs and guardrails.

General Broadleaf Weed Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Vanquish® + non-ionic surfactant. Apply 1 to 2 pints of product per acre + 0.25 percent solution, respectively. In 20 to 40 gallons of water per acre as a broadcast application or 50 to 100 gallons per acre as a handgun or backpack application.

Time of Application: Zone 1, 2, and 3: March 15 - June 30.

Comments:

1. A quality non-ionic surfactant should be used that has a minimum of 80 percent active ingredient.
2. Precautions should be taken to avoid drift to susceptible crops. This herbicide can volatilize at higher air temperatures.
3. One timely application per year should control most broadleaf weeds including kochia.
4. Because of different carrier rates, a single tank mixture should not be used for both broadcast and handgun applications. This could cause a severe over or under application of targeted herbicide rates.
5. Vanquish® should provide good broad spectrum broadleaf weed control, however, refer to label for specific weed species.
6. Better control can be achieved by treating smaller seedlings or early vegetative stage weeds that are no taller than 3 inches.
7. For best results on biennial weeds, applications should be made to rosettes or at the early vegetative stage when plants are no taller than 6 inches.
8. This treatment is also very effective at controlling the state noxious weed, scotch thistle when applied in March through April.

Musk Thistle Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Overdrive® + non-ionic surfactant. Apply 2 to 4 ounces product per acre + 0.25 percent solution. In 20 to 40 gallons of water per acre or 50 to 100 gallons per acre as a handgun or backpack application.

Time of Application: Zone 1, 2, and 3: March - May 10.

Comments:

1. Currently, this is the most economical treatment for controlling musk thistle.
2. Rates less than 4 ounces per acre are made under a 2ee label and is approved for Oklahoma Department of Transportation and pasture use only. The 2ee label must be in possession during the application. Applications at 2 ounces per acre must be made to the rosette stage of growth, poor control will result if applied to bolted (flowered) thistles at this rate.
3. A quality non-ionic surfactant should be used that has a minimum of 80 percent active ingredient if used alone.
4. Due to different carrier rates, a single tank mixture should not be used for both broadcast and handgun applications. This could cause a severe over or under application of targeted rates.

- Applications should be made to actively growing thistles prior to bolting.
- Extreme growing conditions such as drought or near freezing temperatures prior to, at, and following time of application may reduce thistle control.
- Precautions should be taken to avoid drift to susceptible non-target plants. This herbicide can volatilize at higher air temperatures.
- By law (Oklahoma Noxious Weed Law), musk thistles must be prevented from flowering statewide.
- The 2 ounces per acre rate makes an excellent tank-mix partner with Campaign® + AMS at recommended rates to control musk thistle.

Musk Thistle Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Transline® + non-ionic surfactant. Apply 6 to 10 fluid ounces of product per acre + 0.25 percent solution. In 20 to 40 gallons of water per acre as a broadcast application or 50 to 100 gallons of water per acre as a handgun or backpack application.

Time of Application: Zone 1, 2, and 3: March - May 10.

Comments:

- A quality non-ionic surfactant should be used that has a minimum of 80 percent active ingredient.
- Due to different carrier rates, a single tank mixture should not be used for both broadcast and handgun applications. This could cause a severe over or under application of targeted rates.
- Applications should be made to actively growing thistles prior to bolting. The lower rate can be used when treating the rosette stage.
- Extreme growing conditions such as drought or near freezing temperatures prior to, at, and following time of application may reduce thistle control.
- Precautions should be taken to avoid drift to susceptible non-target plants.
- By law (Oklahoma Noxious Weed Law), musk thistles must be prevented from flowering statewide.

Scotch Thistle Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Met-sulfuron methyl + non-ionic surfactant. Apply 1 ounce of product per acre + 0.25 percent solution. In 20 to 40 gallons of water per acre broadcast application or 50 to 100 gallons per acre as a handgun or backpack application.

Time of Application: Zone 1, 2, and 3: March - April.

Comments:

- A quality non-ionic surfactant should be used that has a minimum of 80 percent active ingredient.
- Due to different carrier rates, a single tank mixture should not be used for both broadcast and handgun applications. This could cause a severe over or under application of targeted rates.
- Broadcast applications should be made to rosettes that are 6 inches or smaller in diameter.

- Poor results will occur if applications are made during drought conditions.
- Refer to label for other susceptible species.
- Precautions should be taken to avoid drift to susceptible crops, gardens, and nontarget areas.
- By law (Oklahoma Noxious Weed Law), scotch thistle must be prevented from flowering statewide.

Silver Bluestem Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate. Apply 24 fluid ounces of product per acre in 20 to 40 gallons of water per acre.

Time of Application:

- Zone 1: April 20 - May 31
- Zone 2: May 10 - June 15
- Zone 3: May 20 - June 30

Comments:

- If Roundup Pro Concentrate® is used, apply 19 fluid ounces of product per acre.
- Sprayer equipment must be properly calibrated to ensure desirable silver bluestem control and minimize bermudagrass injury.
- Glyphosate, alone, is used in areas where there is little or no previous history of johnsongrass. In areas where there is a history of johnsongrass, glyphosate plus Out-rider®, sulfometuron, or Plateau® should be used. If a summer preemergent is not added to the treatment in areas where there are johnsongrass seeds in the soil, the seeds could germinate and create an even bigger problem than the silver bluestem that was controlled. This is because glyphosate has no soil activity.
- Do not apply glyphosate if rainfall will occur within 2 to 6 hours. Rainfall will wash the glyphosate off the plants and reduce the level of control. Generic glyphosate products need at least 6 hours before a significant rainfall event.
- Do not mow roadsides prior to treatment. Wait at least 10 days after treatment before mowing or weed control may be reduced.

Silver Bluestem Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate + sulfometuron. Apply 24 fluid ounces of product + 1 ounce of product per acre, respectively in 20 to 40 gallons of water per acre.

Time of Application:

- Zone 1: April 20 - May 31
- Zone 2: May 10 - June 15
- Zone 3: May 20 - June 30

Comments:

- If Roundup Pro Concentrate® is used, apply at 19 fluid ounces of product per acre.
- Glyphosate + sulfometuron should be used in areas where there is a past history of johnsongrass problems. If the history of an area is not known, then it is best to add the sulfometuron to the glyphosate treatment. The sulfometuron is soil active and will help prevent johnsongrass seeds from emerging.

3. Spray equipment must be properly calibrated to ensure desirable silver bluestem control and minimal bermudagrass injury.
4. Application should be made after bermudagrass has broken dormancy and is green and actively growing.
5. Add the glyphosate to the tank mixture first then add the sulfometuron.
6. Applications should not be made to areas that have little or no bermudagrass to release. It is recommended that a roadside needs at least 30 percent coverage of bermudagrass, if not, use a MSMA program until this is achieved.
7. Applications should not be made on newly sprigged or seeded areas. This treatment will slow the rate of coverage from sprigs and inhibit germination of seeds.
8. Do not apply to saturated soils or if rainfall will occur within 2 to 6 hours. Rainfall will wash the glyphosate from the plants and reduce the level of control. Generic glyphosate needs at least 6 hours before a significant rainfall event.
9. Do not mow roadsides prior to treatment. Wait at least 10 days after treatment before mowing or weed control may be reduced.
10. This treatment should not be used in the western one-third of Oklahoma. Use glyphosate only treatments to control silver bluestem in western Oklahoma.

Switchgrass Management (Ropewick or Wiper Application)

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate. Apply 1:2 ratio of herbicide to water.

Time of Application: Zone 1, 2, and 3: May - June (followed by mowing).

Comments:

1. This treatment is to be selectively applied with either a ropewick or wiper-type applicator.
2. An important component of switchgrass management is timely mowing following application. Switchgrass areas should be mowed approximately 1 month and 3 months after treatment. Mowing should occur when switchgrass regrowth begins producing seed heads.
3. Dense stands of switchgrass will require wiping in 2 directions.
4. Do not wipe bermudagrass with this treatment as severe damage will occur.
5. Do not apply to plants that are drought stressed. Wait for a 1/2 to 1 inch rain before making the application.
6. Do not apply if rainfall will occur within 2 to 6 hours. Rainfall will wash glyphosate from the plants and reduce the level of control. Generic glyphosate needs at least 6 hours before any significant rainfall event.
7. Do not use drift control products with this treatment.
8. Equipment used should include polyester over acrylic fiber core ropes or canvas and should be cleaned daily with detergent and water. This will remove wax buildup and allow for an even flow of herbicide across the wiping surface.
9. Applications made to plants noticeably covered with dust will result in reduced control.
10. This treatment followed by timely mowings will take a minimum of 2 years to remove switchgrass from safety areas.

11. Do not mow switchgrass areas prior to treatment.
12. Switchgrass should be wiped as low as possible without wiping the bermudagrass.

General Brush Control Using Postemergence and Preemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Tordon K® + Garlon 4 Ultra®. Refer to labeled rates for specific brush species. Apply 50 gallons of water per acre as a broadcast application or a minimum of 100 gallons of water per acre as a handgun application.

Time of Application: Zone 1, 2, and 3: May - July (see comments).

Comments:

1. This herbicide treatment can volatilize at higher air temperatures.
2. The use of this treatment will cause a very quick brown-out of the brush species in 7 to 14 days. Public acceptance of the treatment should be considered before choosing this treatment.
3. Refer to herbicide labels for susceptible target species. This treatment, applied in early summer to new leaves, should give very good control of most brush species found along Oklahoma roadsides.
4. Handgun applications should be made on a spray-to-wet basis using a minimum of 100 gallons per acre for low-density brush and up to 250 gallons per acre for high-density brush areas.
5. Due to different carrier rates, it is not recommended that a single tank mixture be used for both broadcast and handgun applications. This could cause a severe over or under application of targeted rates.
6. Most brush species are susceptible to this treatment, extreme caution should be used to prevent off-target movement of fine spray particles.
7. Always use a quality drift control additive to reduce the number of fine spray particles. This will help reduce the hazard of off-target drift.
8. Follow label rates for the specific brush species you are targeting.
9. Use extreme caution when treating near any ground water. Leave a buffer zone around all ground water sources.
10. Tordon K® is a restricted use herbicide because of its potential to move to groundwater sources.
11. Brush should not be removed following application for a minimum of 1 month.

General Brush Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Krenite S® + crop oil. Refer to label for specific brush control rates. Apply a minimum of 100 gallons of water per acre as a handgun application or broadcast application.

Time of Application: Zone 1, 2, and 3: June - October (see comments).

Comments:

1. Little or no foliage brown-out will occur after treatment. Leaves will drop off the tree in a normal fashion and

the following spring the tree will not produce any new leaves.

2. The addition of a crop oil is critical to aid in absorption of the herbicide through the waxy leaves.
3. Handgun applications should be made on a spray-to-wet basis using a minimum of 100 gallons per acre for low-density brush and up to 250 gallons per acre for high-density brush areas.
4. Refer to herbicide label for susceptible species. This treatment does not produce as broad a spectrum of brush control as Tordon K® + Garlon 4 Ultra®. Identifying problem brush species is very important.
5. Thorough coverage of the entire target plant is necessary for complete control of susceptible species as this treatment has little if any translocation in the treated brush.
6. Do not apply Krenite S® if rainfall will occur anytime during the day of application. The Krenite S® will be washed off the leaves and reduce the level of control.
7. Applications made in October should be made before fall leaf discoloration.

General Brush Control

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate—foliar spot treatment only. Apply 1.5 gallons of product per acre in 100 gallons of water per acre—handgun only.

Time of Application: Zone 1, 2, and 3: June - October.

Comments:

1. If Roundup Pro Concentrate® is used, apply at 1.25 gallons of product per acre.
2. Do not make broadcast applications with this treatment. This herbicide treatment will cause severe damage or death of desirable grass understory if applied as a broadcast treatment.
3. This treatment should be applied as a foliar spot treatment using a handgun application only.
4. Apply the herbicide mixture on a spray-to-wet basis.
5. At this rate of application the grass understory will be killed at the base of the spot treatment.
6. Do not apply glyphosate if rainfall will occur within 2 to 6 hours. Rainfall will wash the glyphosate off the plant and reduce the level of control. Generics require 6 hours before they are rainfast.
7. Refer to the herbicide label for susceptible target species.
8. This treatment should only be used on low-density brush areas.

Brush Control Using Cut Surface Treatments

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate (cut surface treatments only). Apply 1:1 water to herbicide ratio.

Time of Application: Zone 1, 2, and 3: May - September.

Comments:

1. All brush manually cut by Oklahoma Department of Transportation crews and not previously treated with a

herbicide should receive a cut stump treatment to prevent resprouting.

2. Applications should be made immediately after cutting or as soon as possible. Delay in application of more than 30 minutes may result in reduced performance on hard-to-control species.
3. Apply using a backpack sprayer or squirt bottle.
4. Remove wood chips from the stump before application. It is only necessary to treat the outside 1/3 of the top of the cut stump as this is where the cambium layer is found. The cambium will move the herbicide to the roots. Treat the entire circumference of the cut surface.
5. It would be useful to include an agricultural dye in this treatment to prevent waste and mark treated stumps. Use a water soluble dye with glyphosate and oil soluble dye with Garlon 4 Ultra®.
6. No drift control product should be used with this treatment.
7. The Garlon 4 Ultra® + oil carrier treatment (low volume dormant basal) should be used in the dormant season instead of glyphosate.

Brush Control Using Dormant Basal Stem and Cut Surface Treatments

Herbicide(s) and Rate(s) of Application per Acre: Garlon 4 Ultra® + oil carrier. Apply 4:1 oil to herbicide ratio (low volume dormant basal and cut surface). Apply 20:1 oil to herbicide ratio (high volume dormant basal only).

Time of Application: Zone 1, 2, and 3: Year-round, especially during the dormant season.

Comments:

1. Low volume applications are made by lightly spraying the cambium area (outside 1/3 of the top of the cut surface) or entire circumference of the trunk (dormant basal) to the point of wetting but not runoff. This treatment usually requires the additional purchase of very small nozzle tips that will produce a fine spray. This low volume solution is very concentrated, if runoff occurs the expensive herbicide is wasted.
2. High volume applications are made by spraying the entire circumference of the trunk (dormant basal) to the point where the mixture is allowed to runoff and pool at the base of the target for a few seconds. Most backpack or small hand-pump sprayers when purchased have nozzle tips designed to make this type of treatment.
3. High volume (20:1 oil to herbicide) mixtures should not be used for cut surface applications.
4. It is critical that the entire cambium area (cut surface) or entire circumference of the trunk (dormant basal) is treated to ensure complete control no matter what ratio of oil to herbicide is used. Failure to get good coverage will result in possible resprouting.
5. Dormant basal stem treatments should be made to trees with stems 6 inches or less in diameter.
6. Trunks that are 0 to 3 inches in diameter should be treated to a height of 18 inches. Trunks larger than 3 inches in diameter should be treated to a height of 24 inches.
7. The addition of an oil soluble dye may assist in getting the desired coverage from these treatments as well as marking treated areas.
8. Backpack or small hand sprayers would work well for these treatments, but it is important to only use ones

that have Viton seals. Garlon 4 Ultra® will cause rubber or pvc seals to leak.

9. Applications may be made up to the edge of water but may not be applied to brush in water.
10. No drift control product should be used with this treatment.
11. This treatment should be mixed with a penetrating oil as a carrier and should never be mixed with water as a carrier.

Bermudagrass Encroachment Control Using Postemergence Herbicides

Herbicide(s) and Rate(s) of Application per Acre: Imazapyr + non-ionic surfactant. Apply 4 pints of product per acre + 0.5 percent solution, respectively in 40 gallons of water per acre.

Time of Application:

- Zone 1: April 25 - September 15
- Zone 2: May 10 - September 15
- Zone 3: May 20 - September 15

Comments:

1. Application is to be made to 100 percent green and actively growing bermudagrass.
2. This treatment should only be applied once per year.
3. In areas that have not been treated with glyphosate plus a summer preemergence, a herbicide such as sulfometuron or diuron should be added to control weeds that germinate from seed.
4. Do not apply directly to water or wetlands.
5. Do not treat irrigation ditches.
6. Do not apply, drain, or flush equipment on or near desirable trees or other plants; onto areas into which their roots may extend; or locations where the chemical may be washed or moved into contact with their roots or into water features.

Postemergence Total Vegetation Control under Cable-Barrier Systems (no residual)

Herbicide(s) and Rate(s) of Application per Acre: glyphosate + ammonium sulfate (AMS). Applied broadcast at 1-5 quarts of product per acre or by handgun at 1%-2% solution (spray-to-wet). AMS should be mixed at 17 lbs. product per 100 gallons of water. Use 20-40 gallons of water per acre if broadcast or 100 gallons per acre if handguned.

Time of Application: Zone 1, 2, or 3: May 1 – September 1

Comments:

1. If Roundup Pro Concentrate is used apply 0.8 to 4.0 quarts of product per acre broadcast or 0.8% to 1.6% solution by handgun.
2. Add and thoroughly mix the ammonium sulfate in water before the glyphosate.
3. This treatment will control vegetation that is present on the day of application. This treatment will not provide long-term residual control and may be safely applied to ditch bottoms.
4. Use the low end rate (1 qt./A or 1% solution) of glyphosate to treat under cable-barrier systems that are infested with

winter and/or summer annual weeds only (no perennial weeds present).

5. Use the higher end rate (5 qt./A or 2% solution) of glyphosate to treat under cable-barrier systems that are infested with annual weeds and perennial weeds.
6. Do not apply if rainfall will occur within 2 to 6 hours. Rainfall will wash glyphosate from the plants and reduce control.
7. Areas treated in May-July will likely require 1-2 retreatments to maintain total vegetation control under the cable-barrier for the entire growing season.
8. Applications of higher rates should only be made to the gravel or hard surfaces underneath cable-barrier systems and not adjacent soils. Applications of higher rates outside of this zone could promote soil erosion around cable-barrier edges.

Aquatic Weed Control in Standing or Moving Water (Postemergence)

Herbicide(s) and Rate(s) of Application per Acre: Glyphosate (aquatic) + non-ionic surfactant. Apply 1 percent solution + 1 percent solution, respectively in 100 gallons of water per acre—**handgun treatment only.**

Time of Application: Zone 1, 2, and 3: May 15 - August.

Comments:

1. A non-ionic aquatic-approved surfactant is critical to the success of this herbicide treatment.
2. If the low end glyphosate rate is used then use the high end non-ionic surfactant rate. Complete control of cattails will likely require a spot retreatment the following year.
3. Apply with a handgun or backpack sprayer only. This treatment should not be made as a broadcast application as the desirable grass understory may be damaged or destroyed.
4. In dense stands of willow or cattails, good coverage is critical. Plants should be treated from both sides if possible.
5. Plants that have not emerged at the time of treatment will not be controlled and they will require retreatment.
6. Do not apply if rainfall will occur within 2 to 6 hours. Rainfall will wash glyphosate from the plants and reduce control.

Aquatic Weed Control in Standing or Moving Water (Postemergence)

Herbicide(s) and Rate(s) of Application per Acre: Habitat® + aquatic-approved non-ionic surfactant or methylated seed oil. Apply 1 percent solution + 1 percent solution, respectively in 20 to 100 gallons of water per acre—**handgun treatment only.**

Time of Application: Zone 1, 2, and 3: May - July.

Comments:

1. This is the best treatment for long-term cattail control.
2. A non-ionic aquatic-approved surfactant or methylated seed oil is critical to the success of this herbicide treatment.
3. When a low volume carrier rate is used target vegetation should receive approximately 70 percent coverage. Low

- volume applications are made with back-pack sprayers equipped with small fan-type spray tips. The high volume carrier rate is a spray-to-wet application and is typically achieved with larger spray tips and powered handguns.
4. Apply with a handgun or backpack sprayer only. This treatment should not be made as a broadcast application as the desirable grass understory may be damaged or destroyed.
 5. Refer to label for restrictions on treating irrigation ditches and in the vicinity of potable water intakes.
 6. Plants that have not emerged or are underwater at the time of treatment will not be controlled.
 7. This treatment is very slow to produce brown-out of target vegetation, it may take up to 12 weeks for final brown-out. Be patient the final results should be very good through 1 year-after-treatment.

Trade Name	Active Ingredient(s)	Company
Campaign®	glyphosate + 2,4-D	Monsanto
Diuron 80 WDG®	diuron	Loveland Industries, Inc.
Garlon 4 Ultra®	triclopyr ester	Dow AgroSciences
Aquamaster®	glyphosate (aquatic)	Monsanto & others
Aquastar®		
Ranger Pro®, Honcho®, Mirage®	glyphosate	Monsanto & others
Habitat®	imazapyr (aquatic)	BASF
Arsenal®, Imazapyr 2 SL®	imazapyr	BASF & others
Krenite S®	fosamine	Dupont
Escort XP, MSM E-Pro®, Metsulfuron methyl®	metsulfuron methyl	Dupont & others
Milestone VM®	aminopyralid	Dow AgroSciences
MSMA 6.0 Plus	MSMA	Drexel
Oust XP®, SFM E-Pro®, SFM-75®	sulfometuron	Dupont & others
Outrider®	sulfosulfuron	Monsanto Agricultural Company
Overdrive®	dicamba + diflufenzopyr	BASF
Plateau®	imazapic	BASF
Roundup Pro Concentrate®	glyphosate	Monsanto
Tordon K® ¹	picloram	Dow AgroSciences
Transline®	clopyralid	Dow AgroSciences
Vanquish®	diglycolamine salt of dicamba	Nufarm/Syngenta

¹ Restricted use herbicide.

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