



Alligare®

A member of the ADAMA Group



Range & Pasture

WEED MANAGEMENT GUIDE





We Are Alligare.



Alligare is America's largest post-patent industrial vegetation management (IVM) company, proudly offering more bare ground herbicide solutions than any other provider. ADAMA, our parent company, is a leader in the global chemistry industry. With their support we are continually adding to our portfolio, which currently stands at 48 products.

But we're much more than an array of trusted herbicides. We're a formidable team of leading experts who take the time to listen and learn of your bare ground IVM needs, and formulate and deliver innovative solutions to control your problem vegetation. Unlike other manufacturers who only offer a few products with limited modes of action to choose from, Alligare offers the widest range of modes of action in the market. We pride ourselves in not just selling product, but also solutions to your problems. Our solutions provide you with peace of mind, efficiently addressing today's needs, while helping ensure that herbicide resistance does not become a concern tomorrow.

Controlling vegetation in bare ground areas is an immensely important task. Alligare solutions, along with your efforts, help ensure that visibility is safely maintained; that parking areas, buildings and equipment are not damaged by root growth and water intrusion; that weeds, brush and trees don't create fire hazards; and that plant growth doesn't impede drainage or interfere with intended facility uses.

This bare ground reference guide was written and designed with your needs in mind — a tool for you to easily match the product to the vegetation you need to control. The guide also includes application tips, safe handling advice, an adjuvant selection guide, and volume conversion tables.

Alligare is here to provide the bare ground herbicides and expertise you need. Our field reps are seasoned experts who will work with you to provide a customized prescription of multiple active ingredients (AIs) for your specific needs. We will even custom blend the solution for you, simplifying your job in the field with fewer containers and easier measuring and clean-up.

Alligare is the Latin word for "ally" and this is the core of who we are. Our commitment to you is that through our people and products you will have no better ally than Alligare.

Please let us know how we can help you today.



Austin Tinsley
President and CEO

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Grow More Beef Per Acre



Brush and weeds may not look like a threat to your livestock and land, but they are. They start by robbing beneficial grasses of sunlight, soil nutrients and moisture. And while some weeds are harmful to livestock, other invasive or noxious weeds will seemingly stop at nothing to take over your land.

Multiply this by thousands of weeds, and they collectively rob your cattle of significant nutrition, even to the point of lowering stocking rates and cattle weight gain. Ultimately, with less beef being produced, weeds rob you of income.

The most cost-efficient food source for cattle is forage grown on your own land. Every untreated acre robs you of profit by producing less desirable forage.

Alligare recognizes that not all weeds are created equal. Some plants known as weeds to row crop farmers can be highly palatable and nutritious for cattle (although cattle do prefer grass over broadleaf weeds and brush). A rancher's goal should be to eliminate poisonous plants and those with low palatability or nutritional value, along with weeds and brush that compete with beneficial forage plants.

By eliminating undesirable brush and weeds, your pasture will support more nutritious forage, provide a higher sustainable carrying capacity, and reduce the need for purchased supplemental feed. In fact, recent studies show that for every pound of weeds removed from a native pasture, at least a pound of nutritious grass can be grown – with significantly more grass replacing the weeds on improved pastures.

Four simple steps to taming brush and broad-leaf weeds on pastures:

- | | |
|---|--|
| 1 | Identify the types of brush and weeds growing on your pastures to determine the best treatment options. |
| 2 | Determine if individual plant treatment (IPT) or broadcast spraying is the best course of action. |
| 3 | Consider if residual or non-residual control is needed. Use the treatment solutions and spraying guidelines as noted on label instructions. |
| 4 | Spray at the proper time of year. Early season spraying provides the quickest return through an increased volume of grasses grown without weed or brush competition. However, some brush species are best controlled with fall applications. |

The USDA's annual Crop Values report (dated 2/25/2021) recognized forages as the third most valuable U.S. crop in 2020, behind only corn and soybeans. Alligare knows that successful ranchers must maximize their forage production, as a key input for beef production.

Talk with an Alligare specialist about **eliminating brush and weeds to increase forage production**, and download our new Range & Pasture Product Guide to see the widest array of range and pasture vegetation management solutions for ranchers.

Enhance Forage Production With Less Weeds



It's just common sense - maximizing the productivity of your land is less expensive than acquiring new acreage or buying supplemental feed. Some ranchers increase their land's productivity through highly managed pastures, while others may just correct particularly troublesome areas. All should use some sort of grazing management strategy to avoid overgrazing areas.

Resources needed for plant growth (water, nutrients, sunlight) are finite, so when broadleaf weeds and brush are effectively controlled, beneficial forage plants can fully use the resources available to reach their maximum yield potential. The standard goal for weed control on native pastures is to gain at least an additional pound of grass for every pound of weeds controlled. Most managed pastures report significantly better results, with the best of them reporting six or more pounds of grass replacing every pound of weeds.

Early season weed control provides the highest returns through increased forage production, which supports more beef. Early season applications get ahead of weed growth, stop-

ping the unwanted plant from robbing water and nutrients from desirable grasses. This provides grasses with more resources to use, growing more leaves per plant and increasing the desired forage production on your land.

Late season treatments require higher rates of herbicides and provide lower ROI due to less growing time for grasses. Additionally, the weeds have already robbed the soil of water and nutrients, leaving fewer resources for grasses to use.

When compared to an untreated control plot, an early season herbicide application in a dry year resulted in 953 more pounds of grass production than an untreated area (1330 pounds of grass in treated area versus 377 in control area). An early application in a wet year resulted in a similar tradeoff - for every pound of weeds controlled, about a pound of grass was grown.

Late applications of herbicide also resulted in less weeds and more grass, but on a reduced scale.

Forage Production

Improved pastures with various weed control treatments

TREATMENT	DRY MATTER LBS./ACRE			
	1990 (Dry Year)		1991 (Wet year)	
	GRASS	WEEDS	GRASS	WEEDS
Early Herbicide Application	1,330	202	4,987	0
Late Herbicide Application	477	377	4,898	1,266
Shredding Weeds	341	761	4,787	998
Control (No Weed Control)	377	1,127	1,385	4,252

Data Collected by Texas A&M AgriLife Extension



Why Control Broadleaf Weeds?

Beef operations rely on healthy, productive grass pastures for low cost forage production. Pastures that are well-managed for forage support more cattle, increasing profitable outcomes for ranchers. Grasses also promote soil health by providing a strong buffer from wind and water erosion, capturing and maintaining nutrients and moisture.

Not only do grasses provide more nutritional value, but cattle even prefer grazing on grasses away from broadleaf weeds. Studies show that when given an option to graze grass near or away from broadleaf weeds, cattle will select grass in weed free areas. While this sounds like research gone too far, it highlights a concern that by allowing weeds to grow untreated, cattle will overgraze the weed-free areas (often to the point of reducing the health of native forage species) while under grazing areas with weeds.

This overgrazing of grass reduces plant biomass added to the soil structure, limiting the soil's ability to retain

water, which further limits plant growth and can lead to soil erosion.

Meanwhile, broadleaf weed pressure often overtakes native grasses in pastures, further reducing the land's carrying capacity.

Most grasses are more palatable and nutritious for cattle than broadleaf weeds and brush. Fortunately, Alligare offers a wealth of options to control broadleaf weeds, brush, and invasive plants that overtake pastures and starve out nutritious grasses.



Cattle Prefer Weed-Free Pastures



In 2009, University of Missouri Plant Science Researcher, Dr. Kevin Bradley, posed a simple question, "do cattle really prefer weed-free pastures?" To answer the question, he outfitted beef cattle with a GPS tracking device and a tilt indicator, showing when and where they grazed. A 90 acre continuously-grazed pasture was selected in Albany, MO for the test, and after benchmark tracking was established, one half of the field was treated with a broadleaf herbicide.

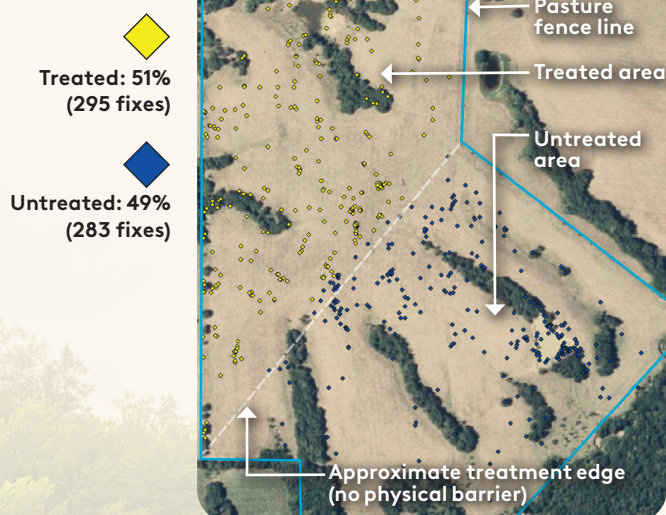
The results were stunning. After two months, cattle unquestionably migrated to the weed-free pastures, with an even more pronounced grazing distribution in later months.

Dr. Bradley concluded that cattle preferentially graze in weed-free areas.

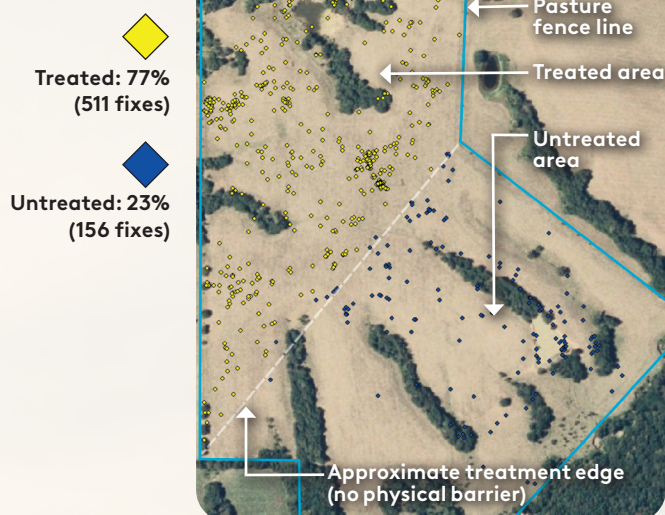
As a general rule, for every pound of weeds removed from a pasture, at least a pound of nutritious grass will take its place, leading to potentially higher stocking rates. Likewise, non-treated acres will be less grazed, allowing weeds to further overtake grasses.

The research is clear - cattle do prefer weed-free pastures, and with treated pastures supporting more cattle, ranchers can profit more.

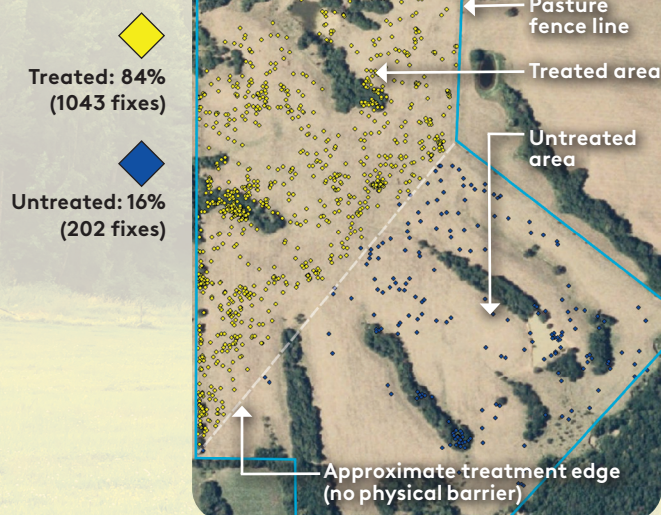
Month 1



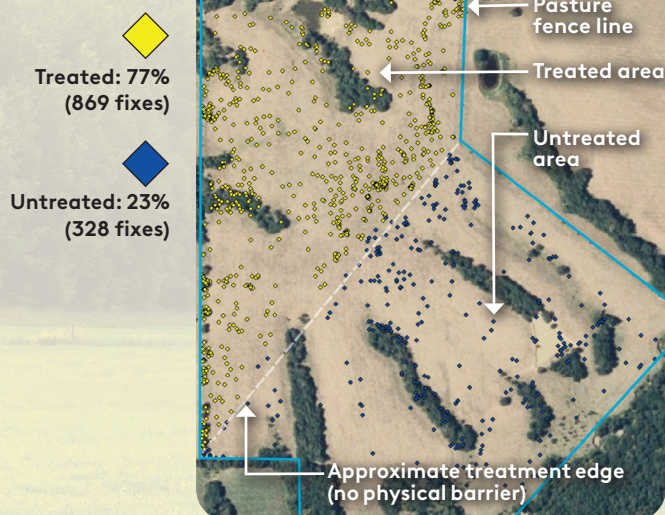
Month 2



Month 3



Month 4



Sather, B.C., R.L. Kallenbach, W.J. Sexten, and K.W. Bradley. 2013. Evaluation of Cattle Grazing Distribution in Response to Weed and Legume Removal in Mixed Tall Fescue (*Schedonorus phoenix*) and Legume Pastures. *Weed Technol.* 27:101-107.



Broadleaf Weed Treatments and Timing

	ROSETTE/BOLT			FLOWERING			MATURE			
BROADLEAF WEED SPECIES	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TREATMENT
Aster species: Yarrow, Heath, Aster, others (P)										24 oz of Gunslinger AMP*
Broom Snakeweed (P)										32 oz of Gunslinger P+D or 0.3 oz of MSM 60
Broomweed (A)		Best to be treated prior to branching								32 oz of Gunslinger P+D or 24 oz of Gunslinger AMP
Buffalobur (A) **										32 oz of Gunslinger P+D or 24 oz of Gunslinger AMP
Bull Nettle/Horse Nettle (P)			Best results if treated in flower stage							24 oz of Gunslinger AMP*
Camphor Weed (A)										32 oz of Gunslinger P+D or 24 oz of Gunslinger AMP
Chicory (P)										24 oz of Gunslinger AMP or 0.5 MSM 60
Clover, White or Sweet (P)										32 oz of Gunslinger P+D or 24 oz of Gunslinger AMP
Cocklebur (A)		Must be emerged prior to treatment								32 oz of Gunslinger P+D or 24 oz of Gunslinger AMP
Curly Cup Gumweed (P)										32 oz of Gunslinger P+D or 24 oz of Gunslinger AMP
Curly Dock (P)	Best results if treated in rosette stage									24 oz of Gunslinger AMP
Field Bindweed (P)			Hard-to-control weed: best results if plant is mature							32 oz of Triumph 22K
Goldenrod (P)										24 oz of Gunslinger AMP
Hemlock, Poison (B)										2-2.5 oz of MSM 60
Horseweed (Marestail) (A)										24 oz of Gunslinger AMP
Hounds Tongue (B)										1 oz of MSM 60
Ironweed (P)			Best applied prior to bud stage							32 oz of Gunslinger AMP
Knapweed (B/P)										24-34 oz of Gunslinger AMP
Knapweed, Russian (P)			Bud to flower							7 oz of Whetstone
Leafy Spurge (P)										32 oz of Triumph 22K
Locoweed (P)										0.3-0.5 oz of MSM 60
Louisiana Wormweed (P)										32-64 oz of Gunslinger P+D*
Marijuana (A)										32 oz of Gunslinger P+D

Represents ideal time for product application to achieve maximum effectiveness.

(A)=Annual, (B)=Biennial, (P)=Perennial
Timing shown is estimated and may vary by year and location.
* 0.125-0.5 oz of MSM 60 may increase control on these species
** Pre-emergent applications of Whetstone or Triumph 22K

The above table represents a starting place for weed and brush control recommendations. For more information talk to your Alligare Field Representative.

Treatment noted is per acre.

Broadleaf Weed Treatments and Timing



	ROSETTE/BOLT			FLOWERING			MATURE			
BROADLEAF WEED SPECIES	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TREATMENT
Milkweed (P)	Hard to control weed Do not expect more than 70% control									48 oz of Triumph XTR or 16 oz of Cleargraze*
Mugwort, Common (P)										32-64 oz Gunslinger P+D*
Mullein, Common (B)		Best results if treated when plant is 12-18" tall								32 oz of Gunslinger AMP*
Nightshade, Silverleaf (P)		Best results if applied when plant is flowering								32 oz of Gunslinger AMP*
Oxeye Daisy (P)										24 oz of Gunslinger AMP or 1 oz of MSM 60
Pigweed (A)										32 oz of 2,4-D or 16 oz Dicamba+D
Plains Larkspur (P)										32 oz Gunslinger P + D
Prickly Lettuce (A)										24 oz of Gunslinger AMP
Ragweed, Annual (A)										24 oz Gunslinger AMP or Gunslinger P + D
Ragweed, Lanceleaf (A)			Plant is difficult to control if treated at or after flowering							64 oz of Dicamba + D*
Ragweed, Western (P)										24 oz of Gunslinger AMP*
Scurf Pea (P)										32 oz of Dicamba + D
Sericea Lespedeza (P)			Best control occurs when plant is treated at 8-10" tall							32 oz of Cleargraze
Smartweed (A)										32 oz of Gunslinger P+D
Snow-on-the-Mountain (A)				Difficult to control plant due to late germination						32 oz of Gunslinger P+D
Sunflower, Annual (A) **										32 oz of Gunslinger P+D
Teasel (B)		Best results if treated in rosette stage								24 oz of Gunslinger AMP*
Thistle, Bull (B)	Best results if treated in rosette stage									24 oz of Gunslinger AMP
Thistle, Canada (P)		Best results when first flowers appear								34 oz of Gunslinger AMP
Thistle, Musk (B)	Best results if treated in rosette stage									24 oz of Gunslinger AMP
Thistle, Wavy Leaf (B)	Best results if treated in rosette stage									48-64 oz Gunslinger P+D
Vervain (P)										32 oz of Dicamba + D
Vetch (P)										24 oz of Gunslinger P+D
Yellow Starthistle (A) **										24 oz of Gunslinger AMP*



Brush-Free Pastures Produce More Beef

Typically, 80-90% of a cow's diet comes from grasses. And wherever brush grows on pastures, it reduces grass production. Additionally, brush blocks easy movement for livestock and wildlife while limiting a clear view of the pasture, creating safety and control issues.

Reclaiming land from brush infestation can be a challenging task, but it can also pay big rewards through increased forage production. This guide provides treatment options for 37 of the most problematic brush intrusions on pastures, together with special instructions for controlling several of the most common brush species on pastures.



Top domestic brush problems with treatment options



Mesquite

Mesquite is a common invasive tree throughout the Southwestern United States. Research shows that once a mesquite canopy covers 30 percent of the ground, grass production and grazing capacity declines.

Conditions are right for mesquite spraying typically 45-90 days after bud-break, until bean development begins. When treating mesquite, the brush canopy should have uniformly dark green leaves and less than 25% defoliation. If beans are present, they need to be fully elongated. When applying a broadcast treatment, use a 300-500 micron droplet and a minimum volume of four gallons per acre. Alligare recommends mesquite control with 21 ounces of Sonora per acre. Note that some applicators add 8-32 oz of Triumph 22K depending on other species present in area to be treated.



Prickly Pear

Prickly pear is a common invasive plant throughout the Southwestern United States, limiting forage production and livestock movement and handling. Prickly pear is a very slow growing plant and is slow to show symptoms after being treated (sometimes taking 2-3 years to reach a high level of desiccation).

If individual plant treatment is chosen, it is necessary to cover both sides of the pads to ensure successful control. For broadcast prickly pear control, apply 32 ounces of Triumph 22K per acre, and for individual plant treatment 1.0% v/v of Triumph 22K. For aerial applications with any type of canopy above the prickly pear, use a minimum volume of four gallons per acre and a nozzle that emits a 1000-micron droplet.



Huisache

Huisache is common in the South, particularly in South Texas, where it can form dense monocultures, limit forage production and prevent travel for livestock and wildlife while reducing visibility.

Best control results are noted when leaf canopy is in good condition (no more than 25% defoliation), in the fall when soil temp is 75+° F at 12" deep. Apply Gunslinger AMP 32 ounces per acre, mixed with Triumph 22K at 32 ounces per acre, with a minimum spray volume of 4 gallons per acre and a droplet size of 350-450 microns. Treated huisache can achieve a 55-75% mortality rate two years after treatment with these recommendations.

Broadcast Treatment vs Individual Plant Treatment



If there are only a few problem trees or limited brush to control, it's an easy decision to selectively treat individual plants. However, when brush density increases, a point is reached where it is more efficient and economical to apply a broadcast treatment to the entire area.

To determine which treatment option to utilize, follow these steps:

- | | |
|---|--|
| 1 | Pick a representative area of your pasture and measure a square area 66' x 66.' |
| 2 | Count every non-desired brush and tree inside the area. |
| 3 | Multiply the counted brush and trees by 10 to estimate the non-desired plant density per/acre. |
| 4 | Repeat this in several areas of your pasture and average the density counts. |

If there are more than 300-400 non-desired trees and brush per acre, it may be quicker and less expensive to apply a broadcast treatment. If plant density is below 300-400/acre, individual plant treatment may be the best application method. For IPT application tips, please refer to Page 18 of this guide.



Buckthorn



Locust (*Gleditsia* spp.)



Multiflora Rose

Buckthorn is a common invasive woody brush species throughout the upper Midwest.

It competes favorably against native species for nutrients, overtaking nutritious grasses and decreasing biodiversity. For individual plant treatment, a basal treatment of 20% Triclopyr 4 mixed with diesel or basal oil provides good results. For foliar spray, use Triclopyr 4 at a 2.5% solution with water and Alligare 90 surfactant at 0.25% v/v.

Locust are a common species of invasive trees that grow well throughout the Midwest and Southern United States. Originally introduced as an ornamental, locust trees spread quickly through self-seeding and root suckers.

These trees shade nutritious forage, and compete favorably for moisture and soil nutrients. 21 ounces/acre of Sonora will provide good results as a broadcast spray, or use 1% Sonora as an IPT foliar treatment.

Multiflora rose is a perennial shrub that climbs over other plants to heights above 10 feet. Stems are covered in prickles that discourage grazing of nearby and underlying grasses, reducing the amount of available forage for livestock. The plant and its fruit is eaten by wildlife but offers no value to livestock.

Broadcast treatment for multiflora rose consists of 128 ounces of Gunslinger P+D per acre. IPT control can be gained with Prescott 1% v/v. Apply in spring thru fall from full leaf thru flowering.



Brush Treatments and Timing

	SPRING				SUMMER			FALL			
BRUSH SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TREATMENT
Ash											64 oz of Triumph XTR
Beech											64 oz of Triumph XTR
Blackberry Brambles											0.3-0.4 oz of MSM 60
Buckbrush											48 oz of 2,4-D LV6
Buckthorn											IPT: Triclopyr 4 20% v/v mixed with Diesel or Basal Oil for basal application
Cottonwood											64 oz of Triumph XTR
Chinese Tallow Tree											128 oz of Gunslinger P + D
Dewberry											0.3-0.4 oz of MSM 60
Dogwood											64 oz of Triumph XTR
Elderberry											64 oz of Triclopyr 4 plus 32 oz of 2,4-D Amine
Elms, American or Slippery											10 lbs Tebuthiuron 20P
Greenbrier											IPT: Triclopyr 4 20% v/v mixed with Diesel or Basal Oil applied to the lower 12" of stem
Hackberry											32 oz of Triumph 22K
Hawthorn											64 oz of Triumph XTR
Honeysuckle											IPT: Triclopyr 4 20% v/v mixed with Diesel or Basal Oil applied to the lower 12" of stem
Huisache											32 oz of Gunslinger AMP plus 32 oz of Triumph 22K
Juniper											IPT: Triumph 22K applied to all foliage
Kudzu											4 oz MSM 60 or IPT: Sonora 1% v/v
Locust, Honey and Black											21 oz of Sonora or IPT: Sonora 1% v/v
Maple					For basal application use 20% Triclopyr 4 mixed with diesel						16-32 oz of Triclopyr 4
Mesquite, Honey				For best results do not treat if canopy damage is greater than 20%							21 oz of Sonora or IPT: Sonora 1% v/v
Mulberry											64 oz of Triumph XTR or IPT: Triclopyr 4 2% v/v

Represents ideal time for product application to achieve maximum effectiveness.

Timing shown is estimated and may vary by year and location.
The above table represents a starting place for weed and brush control recommendation.
For more information talk to your Alligare Field Representative.
Treatment noted is per acre, unless Individual Plant Treatment (IPT) is noted.

	SPRING				SUMMER			FALL			
BRUSH SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TREATMENT
Multiflora Rose											128 oz of Gunslinger P + D or IPT: Prescott 1% v/v
Oaks (Post)											10 lbs Tebuthiuron 20P
Oaks (Blackjack)											10 lbs Tebuthiuron 20P
Persimmon											IPT: Triumph XTR 2% v/v
Prickly Pear Cactus	Best results if applied prior to rainfall and when little overstory is present										32 oz of Triumph 22K or IPT: Triumph 22K 1% v/v
Poison Ivy											IPT: Triclopyr 4 1% v/v
Red Cedar											IPT: Triumph 22K 1% v/v applied to all foliage
Russian Olive											IPT: Triclopyr 4 30% v/v mixed with diesel or Basal Oil applied to the lower 12" of stem
Sycamore											32 oz of Triclopyr 4 + 32 oz of 2,4-D Amine
Sagebrush, Big											10 lbs Tebuthiuron 20P
Salt Cedar											32 oz of Imazapyr 4SL
Sumac, Smooth											64 oz of Triumph XTR
Sumac, Aromatic (Skunk Brush)											64 oz of Triumph XTR
Trumpet Creeper											IPT: Triclopyr 4 20% v/v mixed with Diesel or Basal Oil applied to the lower 12" of stem
Willow											IPT: Triclopyr 4 20% v/v mixed with Diesel or Basal Oil applied to the lower 12" of stem
Yucca											IPT: Triclopyr 4 2% v/v mixed with Diesel or Basal Oil applied to the center of the whorl

Reclaim Livestock Pastures With Alligare's Leading Brush Treatment Herbicides





Noxious Weed Control

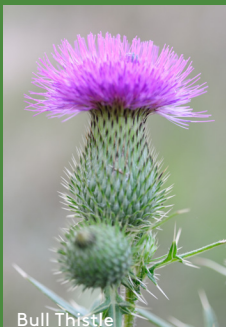


Noxious weeds destroy plant communities by dominating the landscape and reducing the vigor of native plants, ultimately reducing the number and variety of plants, insects, and animals previously supported on the land.

Noxious weeds are responsible for more than \$2 Billion of economic loss in the US each year. Government officials (federal, state or local) or other agricultural authorities can classify weeds as noxious based on their ability to impact public health, agriculture, recreation, wildlife or ecosystems.

Once classified as noxious, authorities can implement weed control measures and take other actions to contain or destroy the weed and limit its spread. Noxious weeds may also be invasive plants, but not all noxious weeds are invasive.

Because noxious weeds are so harmful to native ecosystems, government officials may assist in funding their control. Consult your local county extension or natural resource conservation service office for details in your area.



Bull Thistle



Musk Thistle

Thistle (*Cirsium spp.*)

Thistles are especially harmful to livestock production. With sharp prickles on leaves and stems, cattle generally avoid the plant and nearby grasses.

Thistles can be annual, biennial or perennial, adding complexity to their control. Biennial plants are best controlled in the rosette stage, while perennials are best controlled later in the season once flowers begin to form. Once the plant bolts, treatment efficacy decreases and higher herbicide application rates are necessary. Herbicides containing the active ingredients of aminopyralid and clopyralid provide effective control on all thistle species. See page 7 for treatment options.



Knapweed (*Centaurea spp.*)

Knapweed is a biennial or perennial plant that is part of the daisy family. The plant is reproduced only by seed, with each plant producing about 1000 seeds that remain viable for up to eight years. While some cattle are known to graze on knapweed, many species are highly invasive and can quickly take over pastures, decreasing native plant diversity and grass production, while increasing soil erosion. Apply 24-34 ounces of Gunslinger AMP in the rosette stage for knapweed control.

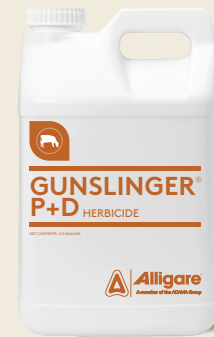
For Troublesome Weeds and Brush, You May Need A Gunslinger

- Active ingredients: Aminopyralid and 2,4-D
- Provides season-long residual control
- Highly effective on Canada thistle, biannual thistles, knapweeds, rag-weeds and locust
- No grazing restrictions
- Won't harm grasses
- Effective burn down with both pre- and post-emergent control
- Federally non-restricted (state restrictions may apply)



- Convenient, low usage rate
- Works well impregnated on dry fertilizer
- See aminopyralid stewardship guidelines

- Active ingredients: Picloram and 2,4-D
- Provides long-term residual control
- Effective on small prickly pear
- Prevents encroaching brush
- Limited grazing restrictions
- Ideal for improved pastures and rangelands to boost forage production
- Foliar and soil active for post-emergent control



- Requires applicator license
- Excellent mixing with liquid fertilizer
- See picloram stewardship guidelines



Sericea lespedeza (*Lespedeza cuneata*)

Sericea lespedeza is a very prolific invasive perennial legume that develops a deep tap root allowing it to compete favorably for moisture against native grasses. Livestock may graze on young plant growth, but they avoid this plant later in the season, due to its production of unpalatable tannins, leading to overgrazing in other areas.

Each stem of this plant can produce thousands of seeds that can remain viable for decades. For decreasing biodiversity and not contributing any nutritious forage, this noxious plant should be eliminated from pastures and rangeland. A treatment consisting of 32 oz of Cleargraze per acre is recommended for control.



Leafy Spurge (*Euphorbia esula* L.)

Leafy spurge is a perennial plant with greenish-yellow flowers that bloom in May and June. The plant can reach a height of four feet. An invasive plant, leafy spurge grows from seedpods that explode, broadcasting seeds up to 20 feet (seeds can remain viable for a decade). Additionally, a vast underground stem and root system allows the weed to spread quickly.

Once established, leafy spurge overtakes native grasses, decreasing forage production. It can be toxic to cattle and horses, making its eradication very important for ranchers. Alligare recommends a treatment of 32 oz of Triumph 22K, which could be enhanced with the addition of 16 oz Dicamba.



Annual Grass Control



Cheatgrass

Invasive and Non-Desirable Grasses

Throughout domestic rangelands, there are three key invasive grasses that offer little or no nutritional value to livestock, while choking out more desirable native forage: cheatgrass, medusahead and ventenata.

The most widespread among these is cheatgrass (aka downy brome) which is found in all states and provinces throughout North America. Commonly seen along roadsides and in planted croplands, it is particularly invasive over large swaths of land in the arid Intermountain Western United States.

Present on over 100 million acres of U.S. rangeland, cheatgrass robs ranchers from receiving the full economic benefits of their land by dominating the landscape and displacing native plants. While cattle do eat cheatgrass, they can only access it for a very short time and have to work very hard to eat it due to its tendency to grow more outward than upward. Within a few short weeks of spring growth, cheatgrass begins to produce a high volume of seeds per plant which are hard and pointy – also not a desirable meal for cattle. Once it grows seed, the rest of the plant dies off, leaving a dry mat of grass for the remainder of the year. This inedible dried grass mat not only limits healthier forage production for livestock, but is also an extreme fire hazard.

Benefits of cheatgrass control:

- Provides room and resources for more nutritional grasses.
- Promotes greater plant diversity and erosion control.
- Mitigates fire hazards.
- Increases herd production.
- Maintains desirable grass species.

Similarly, medusahead and ventenata are two additional examples of invasive grasses with low nutritional value.

While cheatgrass is seemingly everywhere, it is relatively easy and affordable to control. The areas of greatest return tend to be areas that still contain desirable native grasses that can recover when the cheatgrass is controlled. Areas that are completely overrun by cheatgrass may require seeding to reestablish the beneficial grass cover.

Annual Grass Treatments and Timing



	SPRING				SUMMER			FALL			
GRASSES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TREATMENT
Brome, downy/cheatgrass											3-4 oz Laramie 6 oz Panoramic 2SL See note below*
Crabgrass											4-6 oz Panoramic 2SL
Jointed Goatgrass											6 oz Panoramic 2SL fall
Medusahead											6 oz Panoramic 2SL + 7 oz Whetstone spring before bolt 6 oz Panoramic 2SL See note below*
Ryegrass											4-6 oz Panoramic 2SL
Sandbur											4-6 oz Panoramic 2SL
Ventenata											3-4 oz Laramie 25DF spring before bolt 4 oz Laramie 25DF fall

Timing shown is estimated and may vary by year and location.
The above table represents a starting place for weed and brush control recommendation.

Treatment noted is per acre. For more information talk to your Alligare Field Representative.
*May add 4 oz Glyphosate 4+ when desirable grasses are dormant.

Have Invasive Grass Problems? Panoramic 2SL Is The Answer.

With a low use rate and pre- and post-emergent control, Panoramic 2SL is a highly effective and economical grass control product.

Very effective for annual grasses and invasive and non-desirable grasses.

Safe for perennial grasses at label rates. Talk with your Alligare representative about use rates to ensure safety of desirable plants.





Application and Calibration Tips



It's smart to mirror the habits of successful people. When it comes to herbicide, the most successful applicators focus on three areas:

1) Keep Accurate Spray Records

Know what records are required in every state in which you operate. Contact the state's registration office for pesticide applicator certification and licensing for details.

These records can assist in capturing details of what weeds were present, and how the situation was addressed, providing a handy reference for later applications in the same area.

Every state has specific record-keeping requirements for professional applicators, most of which include:

- | | |
|---|--|
| 1 | Application location (GPS coordinates are helpful if treating large areas, or multiple sites at one location). |
| 2 | Date and time of application. |
| 3 | Weather, including wind speed, air and soil temperature, and humidity. |
| 4 | Products applied, including EPA registration numbers. |
| 5 | Spray volume (gallons per area). |
| 6 | Method of application. |

2) Ensure Equipment Operation and Cleanliness

Ensure spray equipment is clean, mechanically sound and properly calibrated prior to every application. If equipment is not adequately cleaned, residue can clog pumps, hoses, filters and nozzles — leading to an uneven application of herbicide and cross-contamination of active ingredients.

Routinely pump clean water through the tanks to ensure strainers, filters, and nozzles allow the water to evenly move throughout the system. Ensure that the water exiting each nozzle is clear, consistent, and does not contain residue from past applications. It is also a smart practice to spray some water on a concrete or gravel area to confirm an even spray distribution pattern.



Application and Calibration Tips



3) Ensure Consistent Volume Application Through Calibration

For Boom-Type Sprayers

(multiple nozzles on stationary boom)

Calibration consists of the following steps:

- 1 Ensure all nozzles are identical along the boom.
- 2 Set the pressure at the proper PSI designated for the type and size of the nozzles being used.
- 3 Establish that all nozzles provide equal flow. With clean water in the tank, place a container under each nozzle, turn on the sprayer for a set time and compare the output from each nozzle. If they are not within 10 percent of the other nozzles you may need to clean out the screen behind the nozzle.
- 4 Once even flow is established, turn on the sprayer and measure the spray pattern width. Divide 1000 by the spray pattern width (for example, if the spray pattern measures 10 feet, $1000/10 = 100$). This is the distance you will need to travel to treat 1000 ft².
- 5 Measure this distance (in our example, 100 feet) and determine how long it takes to travel that distance at the speed used for spraying.
- 6 Place a container under a single nozzle, turn on the sprayer for the time calculated to go the distance in step #5. Measure the volume caught from the single nozzle (in ounces) and multiply it by the number of nozzles on the boom. This will determine the total volume of spray solution applied at the speed traveling over 1000 ft². Multiply this total amount by 43.56 to obtain the spray solution per acre.
- 7 Review the pesticide label to determine the amount of each product to be applied per 1000 ft², or per acre.
- 8 There are three primary methods to apply more or less spray solution per area:
 - Adjust travel speed. This is the simplest way to adjust spray volume, as it does not require adjusting the spray equipment.
 - Increase or decrease the spray pressure.
 - Change the nozzle size.

Once adjustments are made, go back through steps 6 and 7 to ensure the spray volume matches your needs.



For Boomless Sprayers

(mounted boomless sprayers)

- 1 Fill the spray tank with water. Determine the correct pressure to use with the nozzles selected.
- 2 Turn on the spray and measure the distance, or spray width (SW) in feet that the sprayer covers.
- 3 Place a container under the nozzle, turn the sprayer on and collect the spray water for 30 seconds. Measure the volume of the water collected in ounces, multiply by 2 to determine the number of ounces per minute. Then divide the ounces per minute by 128 to calculate gallons per minute (GPM).
- 4 Determine the speed you will be traveling in MPH that allows a uniform application. Now determine gallons per acre (GPA), by inserting the information from above into the formula below.

$$(495 \times \text{GPM}) / (\text{MPH} \times \text{SW}) = \text{GPA}$$

Remember: Effective application begins with ensuring your equipment is properly maintained and calibrated.



Individual Plant Treatments (IPT)

There are four primary IPT application methods. The plant being treated (trunk size and/or size of brush) determines which application method is best.



Foliar Broadcast Spray
(for trees/brush less than 6' tall)

Apply a coarse spray to wet the leaves, stems and root collars completely. Use of a marking dye, such as Alligare Super Marking Dye 1, will help identify treated areas, ensuring total coverage.



Frill or Girdle
(trunks larger than 6" diameter)

Use an axe to frill or girdle through the bark all around the tree at a convenient height and wet the cut surface with undiluted Alligare Triclopyr 3 or Alligare Triumph® RTU.



Basal Bark Application
(trunks 6" in diameter or smaller)

Mix an oil-soluble herbicide like Alligare Triclopyr 4 with an oil carrier (diesel or basal oil) and apply directly to the bottom 12-18" of the tree trunk, completely encircling the tree, coating all stems and connected exposed roots within the treatment area of the target plant. The oil carrier or marking dye will help identify sprayed areas.



Cut Stump and Paint
(trunks larger than 6" diameter)

Cut all stems and trunks near ground level and IMMEDIATELY "paint" at least the outer 20% up to the exposed surface of the freshly cut stump. A marking dye helps identify treated areas.

SEE PAGE 20 OF THIS GUIDE FOR IMPORTANT APPLICATION TIPS.

Adjuvants and Stewardship



Adjuvants

Adjuvants are products that are added to herbicides to enhance the results of the application. Some adjuvants are designed to improve the actual products in the spray tank solution, while others act to break down the surface tension between the leaf and the spray droplet.

For a herbicide to effectively work, it needs to be absorbed by the target plant. The leaf surface (cuticle) is composed of wax molecules, while other plant surfaces may be covered with hairs – either of which can hinder a herbicide from being absorbed. Certain adjuvants and surfactants increase the spray droplet's ability to more fully contact plant surfaces, promoting more herbicide absorption.

Alligare Adjuvants

Below are Alligare's most popular adjuvants and how they are used:

ALLIGARE 90	A popular general purpose nonionic surfactant, used to enhance the surface coverage of many sprayed herbicides.
ALLIGARE 7	A nonionic, low-foam surfactant that is used to enhance herbicide results, and can be applied by ground or air. This surfactant is unique in that it also contains an acidifier, helping to lower the pH of water used in a tank mix (certain herbicides can be adversely affected if the tank mix has a high pH level).
ALLIGARE MSO 1	A methylated seed oil (MSO) adjuvant. Being vegetable oil based, its small molecular structure penetrates the cuticle very effectively with herbicides that suggest or require an oil adjuvant. MSO 1 boosts the performance of products such as 2,4-D esters, sulfonated urea products (like Alligare MSM 60) and many other products where the use of an oil adjuvant is advised. MSOs also boost activity when the target plant species has a waxy leaf surface.
ALLIGARE TRACE	A nonionic wetter that helps herbicides penetrate and activate on broadleaf and woody plant species. Trace is made from a citrus industry by-product, and is safe for many aquatic and terrestrial uses.

Stewardship

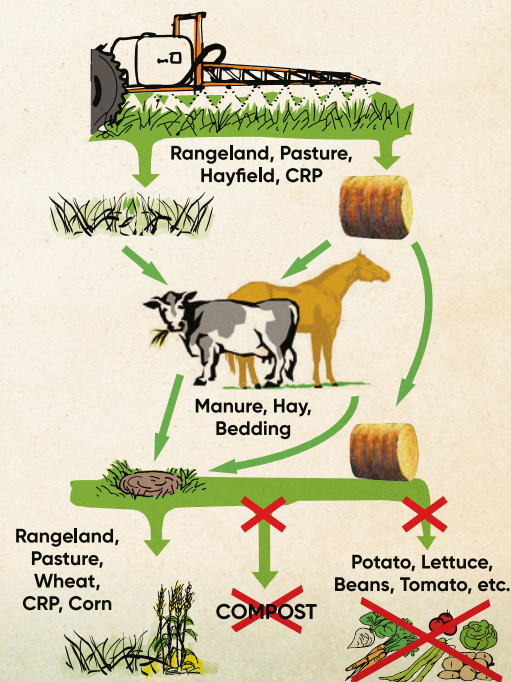
Aminopyralid, clopyralid and picloram are highly active and may remain viable up to 18 months after application. When using products containing these active ingredients, please follow the stewardship requirements as noted on the aminopyralid label and as recommended for clopyralid and for picloram.

Users of Products Containing Aminopyralid, Clopyralid and Picloram Should NOT:

- Use manure from livestock grazing treated area for compost, for 18 months after application;
- Use hay from treated area for compost, for 18 months after application;
- Plan for over seeding pasture, change land use, or plant clover without first checking plant-back intervals on the herbicide label.

Additionally, users of products containing aminopyralid should NOT move hay off farm for 18 months unless allowed by label

Forage and Manure Management





Application Tips and Measuring Equivalency

Application Tips for Individual Plant Treatment (IPT) of Brush

1	Always read and follow label instructions.
2	For foliar spray applications, spray foliage until it is wet but not to the point of runoff.
3	Use an approved agricultural surfactant to ensure adequate spray coverage.
4	Proper timing of application is key for success. To ensure proper timing, contact a local county extension agent, Natural Resource Conservation Service Office, or Alligare representative.
5	Prior to making any foliar application, ensure that the leaves of the target plant are present and in good condition (still green and not under stress). Insect damage, plant hairs, drought or freezing weather can reduce herbicide effectiveness.
6	Ensure adequate coverage and avoid resprays by using 0.25-0.5% Alligare Super Marking Dye.

Most liquid products used for IPT recommend a solution of 1.0% herbicide, equal to 1 gallon of herbicide per every 100 gallons of total spray volume.

INGREDIENTS	TANK SIZE			
	1 GAL	3 GAL	14 GAL	25 GAL
Herbicide at 1.0%	1.28 oz	4 oz	18 oz	32 oz
Marking Dye at 0.25-0.5%	0.32-0.64 oz	1-2 oz	5 oz	8 oz
Surfactant 0.25%	0.32 oz	1 oz	5 oz	8 oz

Liquid and Dry Measurement Equivalency

When creating a tank mix, some products may be in a liquid form while others are dry, leading to potential confusion in measurement translations.

Always measure dry products by net weight and liquid products by fluid volume.

Many of Alligare's products are formulated as dry compounds, such as Water Dispersible Granules (WDG), Dry Flowable (DF) or Soluble Granules (SG). Rates for dry products are always expressed in weight rather than by volume. Since using a scale in the field is not always convenient, manufacturers often create measuring devices that should only be used for the intended product. Each dry product will come packaged with the appropriate measuring device. It is important to ensure the measuring guide is used with the appropriate product and is disposed of after use.

Net dry weight does not equal fluid volume. This photo shows a container (on the left) with 16 net weight ounces (1 pound) of MSM 60, and a container (on the right) contains 16 fluid ounces (1 pint) of MSM 60. In this case, measuring MSM 60 by fluid volume instead of by weight would result in under applying the product by about 50%, likely resulting in a failed application.

Measuring dry products with a volumetric device, such as a quart-sized measuring cup, or a measuring device intended for use with another dry product, will always result in measurement inaccuracies.



Mixing Order and Personal Protective Equipment (PPE)



Mixing Herbicides

Proper mixing order is important for tank mixes, otherwise the mixture may gel, decreasing the effectiveness of the herbicide application and potentially harming the spray equipment. See the WALES mixing order to the right.

Personal Protective Equipment (PPE)

There are inherent risks associated with all herbicides, and applicators should take precautions to ensure safety. Every pesticide label provides information about proper application and safety (including PPE). The label carries a “signal word” regarding how potentially harmful the product is if ingested or in contact with an individual. “Caution” signifies the lowest classification, followed by “Warning” and “Danger” (highest classification). With each of these classifications, there are specific recommendations regarding safe handling.

Labels explain where and when applications can be made, when non-applicators can enter the treated area, nozzle size, and application rates. Review the label to ensure correct personal protective equipment (PPE) is worn to fully protect every worker.

Pesticides in their concentrated form may require additional PPE due to the concentration of materials being handled. In these cases, refer to the label for mixer and loader PPE recommendations.

Additional resources are available for range and pasture herbicide use through state extension offices, and through your Alligare specialist.

Always read and follow label instructions. ©2022 Alligare.

For herbicide applications mixed with water, remember the WALES acronym regarding mixing order:

First, fill the spray tank with about half the water required for the total spray job; begin agitation.

W	Add WETTABLE POWDERS and WATER DISPERSIBLE GRANULARS .
A	Continue AGITATION to fully suspend material between additions.
L	Add LIQUID flowable and suspension concentrated herbicides next.
E	Add EMULSIFIABLE concentrates next.
S	SURFACTANTS are added next, followed by any adjuvants and drift control agents.

*Finally, add water to the required levels and continue agitation.
The tank mix is now ready for spraying.*

Always read and follow label instructions.

Safe Herbicide Storage Tips

Safe and secure storage of herbicides is important to ensure the safety of others, pets, and the environment. It also helps reduce potential for theft and/or misuse of the product.

- Follow all storage instructions noted on the product label. Keep SDS labels with the products.
- Store herbicides in their original containers with their label and directions for use, active ingredients, and accidental poisoning first aid procedures.
- Keep herbicides in a clearly identified, locked, dry (low humidity) and well-ventilated area, out of reach of children and animals, and away from animal feeding stations. Do not store herbicides in areas that flood or have ignition sources.
- Herbicide storage areas should be out of direct sunlight with a temperature generally between 40 and 90 degrees Fahrenheit.
- Mark each container with the date it was received. Use the oldest products first.
 - If a product expires, follow the label instructions for safe disposal.
 - Consult EPA information at <https://www.epa.gov/safepestcontrol/safe-disposal-pesticides>
- Only mix herbicides you intend to quickly use.
- Ensure appropriate PPE is available (stored away from the pesticides).
- Have a first aid kit available.



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