

Weed Management in Pastures and Rangeland—2018¹

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Weeds in pastures and rangeland cost ranchers in excess of \$180 million annually in Florida by reducing forage yield, lowering forage quality, and causing animal injury through toxicity or specialized plant organs (thorns and spines). Effective weed management begins with a healthy pasture. Weeds are seldom a serious problem in a well-managed, vigorously growing pasture. Good pasture management involves the proper choice of the forage species and variety, an adequate fertility program, controlled grazing management, and pest management (weeds, insects, and diseases).

If pasture health declines, weeds will exploit the situation and become established. Bare ground is the perfect environment for establishment of weeds. Once established, weeds must be controlled with mechanical or chemical methods. However, unless the pasture-management problem that caused forage decline is corrected, the grass will not re-establish and weeds will re-infest the area.

Integrated weed management is both an economically and environmentally sound approach to weed management. An integrated approach involves scouting, prevention, and control (biological, cultural, mechanical, and chemical) in a coordinated plan.

Scouting

Scouting pastures is the foundation of a sound weed management program, but is often overlooked. Scouting involves routinely walking or driving through pastures and identifying weeds. This defines the scope of the problem and allows the best management practices to be implemented in a timely fashion. The number of weeds, the species present, and their locations are important. Note the dominant species as well as uncommon or perennial weeds. The management strategies adopted should focus on controlling the dominant species, while preventing the spread of less common species. If not managed proactively, the less common weeds in a pasture may become future dominant weed problems.

Proper identification of weeds is the first step toward weed control. A good example is knowing the difference between tropical soda apple (TSA) and red soda apple (cockroach berry). Of the two, only TSA is a troublesome invasive weed that must be controlled. However, some have occasionally confused the two species and allowed TSA to go uncontrolled. Unfortunately, this costly mistake results in TSA spreading throughout the ranch and potentially onto neighboring ranches. If there are questions concerning weed identification, contact your local UF/IFAS Extension office for assistance.

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Some weeds grow best in wet sites (maidencane ponds, depressional areas, ditches, etc.), while others can be found on dry sites (ditch banks, upland areas, and fence rows). Scout pastures for weeds in conjunction with other activities, such as checking calves, working cattle, and feeding. When a weed is first discovered, remove it or spot treat with an appropriate herbicide. Do not allow that one plant to produce seed and give rise to hundreds of new plants. It is less expensive (in terms of both time and money) to control one plant than to wait and have to control hundreds of plants.

Poisonous plants (e.g., *Crotalaria*, black nightshade, spiny pigweed, lantana, etc.) are commonly found throughout Florida. Animals do not usually choose to graze most poisonous plants when forage is abundant; however, when quality forage is limited because of poor growing conditions or overstocking, they may graze these plants.

Prevention

Prevention is any activity that keeps weeds from infesting a pasture. Most weeds spread by seed. Thus, preventing the movement of weed seeds onto the ranch reduces potential weed pressure. Weed seeds can be transported in hay, harvested grass seed, sod, cattle, mowing equipment, or dispersed by wind, water, and wildlife. Producers should avoid buying hay or grass seed that is contaminated with weed seeds. Refuse to purchase hay from someone who cannot provide a weed-free product. Using certified forage seed reduces weed seed contamination and is highly recommended.

Also, consider TSA. Cattle have been shown to excrete TSA seeds for at least 7 days after consumption. If cattle are grazing in a TSA-infested pasture, it is recommended that the cattle are held in a clean area for 10 days before moving them to a new pasture. This will reduce the likelihood of transporting TSA seeds. Remember, an ounce of prevention is worth a pound of cure.

Control

Cultural Control

Cultural practices improve weed control by increasing the competitiveness of the forage. This involves optimizing forage production through monitoring soil pH, fertility, and, potentially, water management. Generally speaking, a thick sward will prevent weed emergence, will outcompete emerged weeds, and will capture the majority of environmental resources (light, water, nutrients) necessary for growth. The aim of cultural practices is to modify your

management program so that the sward is as competitive as possible.

Soil pH is an important factor for forage growth as well as weed establishment. Forage agronomists and soil scientists at the University of Florida have determined the optimum soil pH for most forages grown in Florida. Acidic soils limit plant growth and can result in aluminum and manganese toxicity, and magnesium, calcium, phosphorous, molybdenum, and potassium deficiency. Soil acidity may also result in poor root growth, which can reduce water and nutrient uptake. Weeds that grow under such conditions can be indicators of low soil pH. For example, crowfoot grass germination is optimum at soil pH levels between 4 and 5, which is too low for optimum forage growth. Thus, the presence of crowfoot grass in your pasture may warrant a soil test and corrective action.

Mechanical Control

Mowing is one of the most often used weed control methods in pastures. Mowing improves the appearance of a pasture, temporarily increases forage production, and, if properly timed, prevents weeds from producing seed. Mowing is generally more effective on broadleaf weeds than grass weeds and is more effective on annual weeds than perennial weeds. Carefully consider the cost of mowing and the anticipated effectiveness. As fuel prices increase, it may be more cost-effective to avoid mowing and use other forms of weed control since other weed control methods may be more effective on a given species.

Mechanical weed control does have drawbacks. Large weeds with extensive root systems will not be controlled through mowing alone. Additionally, mowing misses prostrate-growing weeds like crabgrass, spurge, and matchweed. Mowing can also spread vegetative plant stems, allowing the plant (e.g., prickly pear) to root elsewhere. If mowing is performed after seed set, seeds can accumulate on the mowing equipment and worsen the weed problem by spreading seed to other pastures.

Biological Control

Biological control involves the use of biotic agents (e.g., plants, herbivores, insects, nematodes, and phytopathogens) to suppress weeds. Overall, biological control is still in its infancy, but great strides are being made, especially against invasive plants. Two good examples are the tobacco mild green mosaic tobamovirus (TMGMV), and the newly released insect, *Gratiana boliviana*, both used for TSA control. The virus TMGMV can be sprayed to control

existing TSA plants, while the beetle is used primarily for suppression.

Most biological control agents rarely provide complete weed control, but they usually suppress the weed population to a manageable level. Additionally, biological control agents are rarely fast-acting, so time is needed for the agent to suppress a given weed population. For example, the effect of *Gratiana boliviana* is not often seen until the year following the release of the beetle.

Chemical Control

Chemical weed control includes the use of herbicides. Herbicides kill weeds by inhibiting plant processes that are necessary for growth. Herbicides should be selected based on forage species being grown, weed species present, cost, and ease of application. Application method and environmental impact should also be considered.

Proper herbicide choice and application rate are extremely important. Lower-than-recommended application rates will not provide consistent weed control, while excessive application rates may cause injury to the forage or result in only killing the above-ground portion of perennial weeds. Also, herbicides must be applied at the correct time to be cost-effective.

Preemergence applications are made before weeds germinate and emerge. Understanding the life cycle of the weed is important when using a preemergence herbicide. Some weed seeds germinate in the summer, while others germinate in the winter months. Always refer to the herbicide label for additional information about controlling specific weeds.

Postemergence applications are made after the weeds emerge. The most effective and cost-efficient applications are made when the weeds have recently emerged and are small. For perennial weeds (regrowing from root storage organs), it is advisable to allow them to bloom before spraying, which allows sufficient leaf surface for coverage and ensures that the perennial is transporting photosynthates back to the roots.

Postemergence herbicides may be broadcast over the entire pasture or may be applied as a spot treatment to sparse weed patches. Spot treatment is less costly compared to broadcast spraying. Other application methods include wipers and mowers that dispense herbicide while mowing the weed. In all cases, it is extremely important to carefully read the herbicide label before purchase to determine if that herbicide controls the weeds in your situation.

PRECAUTIONS WHEN USING PHENOXY OR BENZOIC ACID HERBICIDES

1. For information about growth-regulating herbicides not covered below, see UF/IFAS Publication SS-AGR-12, *Florida's Organo-Auxin Herbicide Rule 2015* (<http://edis.ifas.ufl.edu/wg051>).
2. Application of other pesticides from sprayers previously used for 2,4-D, dicamba, or other phenoxy or benzoic acid herbicides to susceptible crops may result in injury.
3. Legumes in pastures or rangelands will be injured or killed by these herbicides.
4. Avoid drift to susceptible crops by applying at low pressures and when wind speeds are low and blowing away from susceptible crops. The use of a drift-control additive is advisable.
5. Clean sprayer thoroughly with household ammonia as follows:
 - a. Flush system with water. Drain.
 - b. Flush the system with ammonia (1 qt ammonia per 25 gallons water); let it circulate for at least 15 minutes, then flush the system again. Drain again.
 - c. Remove screens, strainers, and tips, and then clean in fresh water.
 - d. Repeat step 5b.
 - e. Thoroughly rinse the tank, hoses, booms, and nozzles.
 - f. Be sure to clean all other associated application equipment.

Forage Tolerance

Not all cultivars of a particular forage species respond similarly to a given herbicide (Table 5). 'Argentine' bahiagrass tolerates most pasture herbicides except Roundup, while 'Pensacola' may be severely injured by metsulfuron-containing products such as Cimarron and others. All herbicides may be used on stargrass and bermudagrass, with some level of injury from Velpar (hexazinone). *Hemiarthria*, also known as limpograss, is the most sensitive to herbicide applications of all forage grasses grown in Florida.

It is important to realize that the response observed from an herbicide application can vary. For example, the chance

for forage injury can increase or decrease as the rate of herbicide applied either increases or decreases. Additionally, environmental conditions such as high temperature and high relative humidity may increase the potential for herbicide injury. For example, we have observed little or no injury to limpoglass from 8 pt./acre 2,4-D amine when applied under cooler conditions, while 4 pt./acre in warmer weather caused moderate to severe injury.

The response of forages in Table 5 is for established forage cultivars. However, 2,4-D + dicamba (2 pt./acre) can be applied to sprigged forage cultivars, except for limpoglass, seven days after planting/sprigging. A forage can be considered established when at least three tillers are present on bahiagrass or at least 6 in. of new stolon growth is present on sprigged forages.

Summary

Maintaining healthy, productive pastures will minimize the risk associated with weedy plants. Good pasture management practices such as adequate fertilization, insect control, and controlled grazing will result in healthy pastures. Unfortunately, weeds are present in pastures and the associated loss in forage production can have serious economic implications. An integrated weed management strategy involving prevention, detection, and control is the most economical and environmentally friendly approach to pasture weed management.

Table 1. Weed control in pastures and rangeland.

Trade Name and Rate of Commercial Product Per Acre	Common Name	Remarks
DURING ESTABLISHMENT		
Preemergence to Weeds		
2,4-D Several Brands ¹ 1.0–2.0 qt. of 4 lb./gal. formulation	2,4-D amine or LV ester 1.0–2.0 lb.	Bermudagrass and stargrass only. Apply after sprigging and before emergence of sprigged bermudagrass. Will not give complete weed control; however, short residual control of seedling broadleaves, sedges, and certain grasses may be noted for 2–3 weeks, if proper environmental conditions exist.
Diuron 4L 1.5–4.5 pt. or Diuron 80 1–3 lb.	Diuron 0.8–2.4 lb.	Bermudagrass only. Will provide fair to good control of crabgrass, crowfootgrass, and goosegrass. Plant sprigs 2 inches deep. If sprigs have emerged at time of application, bermudagrass injury will occur. Do not graze or cut hay within 70 days. Before application, ensure that your product has proper labeling, since not all Diuron products are labeled for use in pastures. Do not use this herbicide when planting tops.
2,4-D + dicamba ¹ (Weedmaster, others) 2 pt.	dicamba + 2,4-D	Bermudagrass and stargrass only. Similar to 2,4-D, but often provides greater weed control. Short residual control of seedling broadleaves, sedges, and certain grasses may be noted for 2–3 weeks if proper environmental conditions exist. Do not apply to limpograss (<i>Hemarthria</i>).
Postemergence to Weeds		
2,4-D Several Brands ¹ (0.5–1.0 qt. of 4 lb./gal. formulation)	2,4-D amine	Do not apply to bahiagrass until plants are 5"–6" tall. Do not apply to limpograss (<i>Hemarthria</i> sp.). Bermudagrass can tolerate 2,4-D at any growth stage. Controls most seedling broadleaf weeds. Repeat application may be needed.
2,4-D + dicamba ¹ (Weedmaster, others) 2 pt.	dicamba + 2,4-D	Can be used during establishment of hybrid bermudagrass, stargrass, and pangolagrass. Annual sedges and some grasses will be suppressed if less than one inch at time of application. Best results are seen if applications are made 7–10 days after planting. Do not apply to limpograss (<i>Hemarthria</i>).
Banvel, Clarity, Vanquish 1.5–2 pt.	dicamba	Primarily used for establishment of limpograss (<i>Hemarthria</i>). Annual sedges and some grasses will be suppressed if less than one inch at time of application. Best results are seen if applications are made 7–10 days after planting.
ESTABLISHED STANDS		
Dormant Pastures		
Gramoxone SL 1–2 pt.	paraquat	For dormant bermudagrass or bahiagrass. Apply in 20–30 gallons of water in late winter or early spring (probably in January or February) before grass begins spring green-up. Add one pt. surfactant (non-ionic) per 100 gal. spray mix. Do not mow for hay until 40 days after treatment. Can be mixed with 2,4-D or other herbicides for more broad-spectrum control.
Prowl H ₂ O 1.1–4.2 qt.	pendimethalin	Applications of 3 qt./ac. have provided satisfactory weed control, but late-season escapes should be expected. Provides preemergence control of crabgrass, goosegrass, Texas panicum, sandbur, and other summer annual grasses. Must have activating rainfall or irrigation within two weeks or control will be minimal at best. Does not control plants that have already emerged.
Roundup Weathermax (or other 5.5 lb formulations) 11 fl. oz. or Roundup Ultra (or other 4 lb formulations 16 fl. oz.)	glyphosate	Apply in mid- to late-winter months to bermudagrass or bahiagrass pastures and hayfields for the control of weedy grasses. Apply before new growth appears in the spring. Bermudagrass that is not dormant at the time of application may show a 2–4 week delay in green-up. No restrictions exist between application and grazing or haying.
Non-Dormant Pastures		
2,4-D Several Brands ¹ 2.0–4.0 pt. of 4 lb./gal. formulation	2,4-D amine or LV ester 1.0–2.0 lb.	Broadleaf weeds. Annual weeds should be treated soon after emergence for best control with lower rates. Perennial weeds should be allowed to obtain a leaf surface large enough to allow sufficient spray coverage (about 12"–18" tall). Use amine formulations during warm weather and LV esters during cool weather. Avoid drift. Applications of 2,4-D to limpograss (<i>Hemarthria</i> sp.) will cause significant injury during periods of high temperatures and humidity; much less injury has been observed during cool and dry conditions.

Trade Name and Rate of Commercial Product Per Acre	Common Name	Remarks
Banvel ¹ , Clarity, Vanquish 0.5–2.0 qt	dicamba	Broadleaf weeds. Rate depends on weed species and size. Refer to the label for grazing restrictions. Avoid drift. <i>Hemarthria</i> has generally exhibited more tolerance to dicamba than 2,4-D.
Chaparral 2.0–3.3 oz.	metsulfuron + aminopyralid	Use on bermudagrass, pangolagrass, stargrass, and limpograss. Do not use on bahiagrass. Controls tropical soda apple, pigweed, blackberry, and many other problematic weed species. Will not control dogfennel. Add a non-ionic surfactant at 1–2 pt./100 gal. of solution. Avoid applications during spring green-up.
Cimarron Plus 0.125–1.25 oz. or Cimarron Xtra 0.5–2.0 oz./ac.	metsulfuron + chlorsulfuron	Use on bermudagrass, pangolagrass, and stargrass. Controls several cool-season broadleaf weeds, pigweeds, and Pensacola bahiagrass. Bermudagrass should be established no less than 60 days prior to application. Add a non-ionic surfactant at 1–2 pts./100 gal. of solution. Avoid application during spring green-up.
Cimarron Max Part A (0.25–1.0 oz.) Part B (1.0–4.0 pt.)	Part A— metsulfuron Part B—2,4-D + dicamba	Cimarron Max is a two-part product that should be mixed at a ratio of 5 oz. Part A to 2.5 gallons Part B. Depending on the weeds present and the rate range that is selected, this mix will treat between 5 to 20 acres. For specific information on rate selection, consult the product label.
GrazonNext HL ¹ 1.6–2.1 pt.	aminopyralid + 2,4-D	Excellent control of TSA, horsenettle, and other members of the nightshade family. Also controls pigweeds and other broadleaf weeds including less than 20" dogfennel. Do not apply more than 2.1 pt./ac./yr. Do not apply to desirable forage legumes or severe injury and stand loss will occur. Do not apply to limpograss. GrazonNext will pass through animals and remain in the waste. Do not mulch sensitive crops with manure if animals have been grazing on GrazonNext-treated pastures. Avoid applications of this product to limpograss pastures during hot and humid conditions.
MSM 60, others 0.3–1.0 oz.	metsulfuron	Use on bermudagrass, pangolagrass, and stargrass. Controls several cool-season broadleaf weeds, pigweeds, and Pensacola bahiagrass. Bermudagrass should be established no less than 60 days prior to application. Add a non-ionic surfactant at 1–2 pt./100 gal. of solution. Avoid application during spring green-up.
Impose or Panoramic 4–12 fl. oz.	imazapic	DO NOT apply to bahiagrass. DO NOT apply during spring transition or severe bermudagrass or stargrass injury will occur. In summer months, expect 3–4 weeks of bermudagrass stunting after application, followed by quick recovery and rapid growth. This will reduce harvest yields of that cutting by 30%–50%. If this yield reduction is not acceptable, do not use these herbicides. Yield reductions of subsequent cuttings have not been observed. For control of crabgrass, sandspur, nutsedges, and vaseygrass, use 4 oz./ac. For suppression of bahiagrass, use 12 oz./ac.
Milestone 3–7 oz.	aminopyralid	Excellent control of tropical soda apple, horsenettle, and other members of the nightshade family. Controls pigweeds and other broadleaf weeds, but does not control blackberry or dogfennel. Can be safely applied under trees. Do not apply more than 7 oz./ac./yr. Do not apply to desirable forage legumes or loss of stand will occur. The use of a non-ionic surfactant is recommended. Milestone will pass through animals and remain in the waste. Do not mulch sensitive crops with manure if animals have been feeding on Milestone-treated pastures. Safe on limpograss.
Outrider 1.0–1.33 oz.	sulfosulfuron	Safe to apply to established bermudagrass and bahiagrass. Provides excellent control of annual and perennial sedges.
Pastora 1–1.5 oz.	metsulfuron + nicosulfuron	Established Bermudagrass Only. Can be used to effectively control seedling crabgrass, sandbur, vaseygrass, and established johnsongrass. Established vaseygrass will require retreatment for long-term control. If sandbur or crabgrass is greater than 4" tall, only seedhead suppression should be expected. Do not apply more than 2.5 oz./ac./yr. Do not apply to limpograss or bahiagrass due to high injury potential.
PastureGard HL ¹ 1–2 pt.	triclopyr + fluroxypyr	Provides excellent control of dogfennel, blackberry, teaweed, and other broadleaf weeds. Less effective on tropical soda apple than triclopyr-ester (Remedy Ultra, others) alone. Forage legumes will be severely injured or lost if present at time of application. Applications of 2 pt/A may result in less than desirable weed control. Do not apply more than 8 pts/A per season. Surfactant should be added to spray mixture at 0.25% v/v.

Trade Name and Rate of Commercial Product Per Acre	Common Name	Remarks
Prowl H ₂ O 1.1–4.2 qt.	pendimethalin	Apply only to established perennial warm-season grasses including bahiagrass and bermudagrass grown for forage or hay production between cutting or grazing events. DO NOT apply to bermudagrass and other warm-season grasses after greenup in the spring before the first cutting. DO NOT apply when surface water is present. Maximum application per year is 4.2 qt./acre. Provides preemergence control of annual and some perennial grass weeds, but does not control existing plants.
Remedy Ultra, others 2 pt.	triclopyr ester	Provides excellent control of herbaceous and certain woody plants in pasture and rangeland. For best results, apply in 30 or 40 gallons of water per acre. The addition of a non-ionic surfactant at 0.25% v/v will increase control. Applications at air temperatures >85F° may cause moderate to severe bermudagrass injury for 2–3 weeks.
Roundup Weathermax 8–11 fl. oz./ac.	glyphosate	For control of annual grasses in bermudagrass and stargrass. Apply immediately after hay removal, but prior to regrowth. Applications made after regrowth has occurred will cause stunting. Application rates as low as 6 oz./ac. are often effective for crabgrass and other small annual grass weeds. Do not apply more than 2 qt./ac./year. If Roundup Weathermax is applied to a dormant pasture, it cannot be sprayed again that season. Be sure to read the label of the particular brand prior to purchase to ensure that the application site is labeled for use.
Sandea 0.67 – 1.33 oz	halosulfuron	Safe to apply to bahiagrass, bermudagrass, and stargrass for annual and perennial sedge control. Does not control Surinam sedge. Do not apply more than 1.33 oz per acre in a 12 month period.
Telar 0.1–1.0 oz.	chlorsulfuron	For use on established warm-season forage grass species. Telar will control blackberry, pigweeds, wild radish, and selected winter weeds. Not effective on ragweed, tropical soda apple, and other common weeds. Ryegrasses will be severely injured or killed by Telar. Do not apply more than 1.3 oz./ac./yr. There are no grazing restrictions for any animals.
2,4-D + dicamba ¹ (Weedmaster, others) 0.5–4.0 pt.	dicamba + 2,4-D amine	See remarks for 2,4-D and dicamba above. This mixture is usually more effective than either herbicide used alone.
Hard-To-Kill Perennial Grasses		
glyphosate 1.3–4. oz per gal	glyphosate 1%–3% solution for hand sprayer	Spot treatment. Apply when perennial weeds are actively growing. Surrounding forage will be killed if sprayed.
glyphosate 4–8 qt. to 2 gal. water	glyphosate 33%–50% solution	Wiper application. Apply at speeds up to 5 mph. Two passes in opposite directions. No more than 10% of any acre should be treated at one time.
Smutgrass		
Velpar L/Tide Hexar 2.75–4.5 pt., Velossa 2.29–3.75 pt. or Velpar DF 0.9–1.5 lb.	hexazinone	Apply hexazinone to established stands of bermudagrass or bahiagrass when soil conditions are warm and moist and weeds are actively growing. Best control of smutgrass is usually achieved in late spring to early summer when regular rainfall occurs. Some temporary yellowing of the bermuda or bahiagrass will be noted, but plants will soon outgrow this effect. Apply hexazinone by ground equipment only, and only one application is allowed per year. KEEP SPRAYS WELL AWAY (AT LEAST 100 ft.) FROM THE BASE OF DESIRABLE TREES, ESPECIALLY OAKS. Check label instructions for further precautions and safe use suggestions.
Pensacola Bahiagrass		
MSM 60, others 0.3 oz.	metsulfuron	Apply to bermudagrass hay fields early in the season, after bahiagrass green-up but prior to seedhead formation. Early applications are often most effective; fall applications rarely control bahiagrass. Do not apply with liquid fertilizer solutions, as poor control may occur. Prolonged periods of dry weather prior to application will greatly decrease herbicide effectiveness. Always include a non-ionic surfactant at a rate of 0.25% v/v. Common or 'Argentine' bahiagrass will not be effectively controlled. Pasture legumes will be severely injured or killed.

Trade Name and Rate of Commercial Product Per Acre	Common Name	Remarks
Cimarron Plus 0.5 oz. or Cimarron Xtra 1.0 oz.	metsulfuron + chlorsulfuron	Same as metsulfuron.
Cogongrass		
Roundup, others 4 to 6 fl oz/ga	glyphosate 3 to 5% solution for hand sprayer	For spot treatment of cogongrass. For best results apply in the fall prior to frost. Applications to the entire patch plus an additional 5 ft beyond the patch is beneficial. Late fall treatment is typically better than spring treatments.
Roundup, others 128 oz.	glyphosate	For broadcast treatment of cogongrass infestations. Burning followed by 6 weeks of regrowth tends to improve control over treating long-established cogongrass stands. Late fall treatment is typically better than spring treatments.
Arsenal, others 1.4 fl oz/gal	imazapyr 1% solution for hand sprayer	For spot treatment of cogongrass. Do not apply near areas with desirable hardwood trees. Provides longer-term control than glyphosate. Applications to the entire patch plus an additional 5 ft beyond the patch is beneficial. Late fall treatment is typically better than spring treatments. DO NOT treat more than 1/10 of the available area to be grazed or cut for hay.
Arsenal, others 48 oz/acre	imazapyr	For broadcast treatment of cogongrass. Do not apply near areas with desirable hardwood trees. Provides longer-term control than glyphosate, but plant-back restrictions may limit opportunities to plant forage crops in treated areas with this herbicide. DO NOT treat more than 1/10 of the available area to be grazed or cut for hay nor apply more than 0.75 lb ae imazapyr (48 fl oz) per acre per year.
Tropical Soda Apple		
Chaparral 2–3 oz.	metsulfuron + aminopyralid	Excellent control of TSA plants. Provides preemergence control of TSA seedlings for approximately six months after application. There are no grazing or haying restrictions; however, delaying cutting for 14 days will enhance weed control. Not for use on 'Pensacola' bahiagrass.
GrazonNext HL ¹ 1.6–2.1 pt.	aminopyralid + 2,4-D	Excellent control of tropical soda apple. Provides preemergence control of TSA seedlings for approximately six months after application. The 1.6 pt./ac. rate is highly effective on emerged TSA plants, but the 2.1 pt./ac. rate will provide the greatest length of residual control. Do not apply more than 2.1 pt./ac./yr. Will severely injure desirable forage legumes. Do not apply to limpgrass. There are no grazing restrictions, but do not harvest for silage or hay for seven days.
Milestone 5–7 oz.	aminopyralid	Excellent control of tropical soda apple. Provides preemergence control of TSA seedlings for approximately six months after application. The 5 oz rate is highly effective on emerged plants, but the 7 oz. rate will provide the greatest length of residual control. Do not apply more than 7 oz./ac./yr. Do not apply to desirable forage legumes or loss of stand will occur. Volatility is low. The use of a non-ionic surfactant at 0.25% v./v. is recommended.
Remedy Ultra, others ¹ 1.0 qt.	triclopyr ester	Apply in late spring through summer as a broadcast spray for control of this species. Best results will occur when plants are adequately covered with spray solutions. Application of 30–40 gal./ac. of herbicide solution will be more effective than 20 or lower. The addition of a non-ionic surfactant at 0.25% v./v. will increase control. Retreatment will be required as new seedlings emerge. Spot spray rate is 0.5%–1.0% v./v.
Prickly Pear Cactus		
Remedy Ultra, others ¹ 20% + basal oil 80%	triclopyr ester 20% diesel fuel or basal oil 80% (Spot treatment)	Apply as a spot treatment directly to prickly pear pads during spring and summer. Grass will be burned in treated spots but will recover. The addition of diesel fuel drastically enhances herbicide uptake, which will lead to prickly pear control. Prickly pear will die slowly over a period of 6–8 months with a few plants requiring retreatment.
Trump Card 3 pt.	fluroxypyr + 2,4-D	Apply Trump Card as a broadcast treatment in water. The use of a surfactant is required. A maximum of 3 pt./acre per growing season is allowed, but 6 pt./ac. is required for effective control. Two applications of 3 pt./ac. over two growing seasons, has been shown to be effective.

Trade Name and Rate of Commercial Product Per Acre	Common Name	Remarks
Vista XRT 22 oz.	fluroxypyr	Apply Vista XRT at 22 oz./ac. as a broadcast treatment in water. The use of a surfactant is required. For spot treatment, use 0.5 fl. oz. (15 ml) per gallon of water. Control is very slow, and it often takes more than one year to see satisfactory results.
Blackberry		
Chaparral 2 oz.	metsulfuron + aminopyralid	Chaparral will provide good to excellent control of blackberry. For best results, apply when moisture conditions are sufficient and blackberry plants are not under drought stress. Late bloom and fall applications of Chaparral are the most effective. DO NOT apply in bahiagrass pastures. Do not mow within six months prior to application or control will be greatly reduced.
Cimarron Plus 0.75 oz. or Cimarron Xtra 2.0 oz./ac.	metsulfuron + chlorsulfuron	Cimarron will provide good to excellent control of blackberry. Results are best when applied at blooming or late in the fall. Do not mow within six months prior to application or control will be reduced. DO NOT apply to bahiagrass pastures.
MSM 60, others 0.3–0.5 oz	metsulfuron	Metsulfuron will provide good to excellent control of blackberry. Results are best when applied at blooming or late in the fall. Apply to bahiagrass pastures only as a last resort and expect 6–8 weeks of reduced growth and some stand thinning. Mixing with 1 pt./ac. 2,4-D amine will help reduce bahiagrass injury when applying in bahiagrass.
PastureGard HL ¹ 2 pt.	triclopyr + fluroxypyr	Control similar to Remedy.
Remedy Ultra, others ¹ 2 pt.	triclopyr	For best control of blackberry, apply 2 pt. when blooming and do not mow within one year prior to application. Remedy does not control dewberry. Applications made during prolonged periods of dry weather can greatly decrease control. Fall applications often provide more consistent blackberry control.
Telar 0.75 oz.	chlorsulfuron	Similar to control with Cimarron. Telar can safely be applied to bahiagrass or bermudagrass.
Dogfennel		
2,4-D + dicamba ¹ (Weedmaster, others) 2–3 pt.	dicamba + 2,4-D	Apply when plants reach a height of 12"–18". Weedmaster is most effective approximately one month after dogfennel transition from winter dormancy. Refer to previous comments for dicamba and 2,4-D above.
GrazonNext HL ¹ 24 oz.	aminopyralid + 2,4-D	Apply when plants are less than 30" tall. If plants are larger than 30", tank-mix GrazonNext with 3 pt./ac. 2,4-D, or 8 oz/A PastureGard HL.
PastureGard HL ¹ 24 oz.	triclopyr + fluroxypyr	For control of larger dogfennel that has reached 40 inches or more in height.
Trump Card 3 pt.	fluroxypyr + 2,4-D	For control of dogfennel that are 18"–36".
Mixed Stands: Grass - Clover/Lespedeza Pastures		
2,4-D amine ¹ 0.5–1.0 pt.	2,4-D (0.25 + 0.5 lb)	Apply only one treatment per year to established perennial clover. Slight to moderate injury may occur. See label for specific use information.
Thistles		
2,4-D 2 qt.	2,4-D	Highly effective if applied to thistles in the rosette stage. 2,4-D is not effective on thistles that have bolted or flowered. During cool temperatures, the ester formulation of 2,4-D will be most effective.
GrazonNext HL ¹ 1.6–2.1 pt.	aminopyralid + 2,4-D	Excellent control of thistles at any stage of growth.
2,4-D + dicamba ¹ (Weedmaster, others) 1.0–2.0 qt	dicamba + 2,4-D	Apply late fall to early spring when daytime temperatures are > 50°F. Applications are most effective if applied before flower stalks elongate. The addition of crop oil will increase herbicidal activity. Refer to previous comments for dicamba and 2,4-D above. For small rosettes, 1 qt./ac. rate is sufficient. For larger rosettes, 1.5–2 qt./ac. will be required.
¹ For state rules pertaining to application of organo-auxin herbicides in Florida, see EDIS Publication SS-AGR-12, <i>Florida Organo-Auxin Herbicide Rule 2015</i> (http://edis.ifas.ufl.edu/wg051). Herbicide recommendations in this report are contingent upon their registration by the U.S. Environmental Protection Agency. If an herbicide's EPA registration is canceled, the herbicide is no longer recommended.		

Table 2. Estimated effectiveness of herbicides on common broadleaf weeds in pastures and hayfields (2,4-D through Impose/Panoramic).¹

Weed Name	2,4-D	Chaparral	Cimarron Plus or Xtra	Banvel or others	Vista XRT	Diuron	GrazonNext HL	Metsulfuron	Impose/Panoramic
bagpod	F-G	E	E	G	-	-	E	E	-
bitter sneezeweed	E	E	E	E	-	G	E	E	-
blackberry	P	G-E	G-E	F-G	F	P	P-F	G-E	P
bracken fern	P	E	E	P-F	P	P	P	E	-
Brazilian pepper-tree	P	P	P	P	P	-	P	P	P
bullrush	G	-	-	G	P	P	P	-	-
bushmint	P	-	-	F	F-G	-	F	-	-
butterweed	F-G	E	E	F-G	-	-	E	E	-
buttonbush	P	-	-	-	-	-	-	-	-
Caesarweed	G-E	G	G	-	G-E	-	G-E	G	-
camphor weed	F-G	-	-	F-G	-	-	G	-	-
Carolina geranium	P-F	G	G	F-G	G	-	F-G	G	-
castor bean	F-G	-	-	-	-	-	F-G	-	-
chickweed	F	E	E	E	-	P	F	E	-
coffee weed	G	E	E	E	G	-	E	E	-
coral ardisia	P	P	P	P	P	-	P	P	G
creeping indigo	G	E	E	G	-	-	E	E	-
crotalaria, showy	G	G	-	G	G	-	G	-	-
cudweed	F	G	G	E	-	-	E	G	-
curly dock	F	E	E	E	-	P	E	E	-
dayflower	G	F	F	F	-	-	F-G	F	-
dewberry	P	F-G	F-G	P	-	-	P	F-G	-
dodder	P	-	-	P	-	P	-	-	-
dogfennel	F-G	P	F	F-G	G	P	F-G	F	-
dollarweed	G	G	G	E	F	-	G	G	-
elderberry	F-G	-	-	F-G	-	-	F-G	-	-
evening primrose	E	G	G	E	-	G	E	G	-
Florida pusley	P	-	-	P-F	P	E	G-E	-	-
flat-top goldenrod	G	P	P	F-G	P	-	G	P	-
gallberry	G	-	-	E	-	P	-	-	-
goatweed	G	G	G	F-G	P-F	-	-	G	P
goldenrod	F	P	P	G	-	P	G	P	-
greenbrier	P	F	F	P	F-G	-	P	F	-
groundcherry	F-G	-	-	F-G	-	-	E	-	-
hairy indigo	F-G	E	E	F-G	F-G	-	E	E	-
hempvine	F-G	E	-	F-G	E	-	E	-	-
honeysuckle	-	-	-	E	-	P	-	-	-
horsenettle	P	E	P-F	G	F	P	E	P-F	-
horseweed	F	G	F	E	-	P	E	F	-
kudzu	P-F	G	P-F	G	P	P	G	P-F	P
lantana	P	P	P	P	F-G	-	P	P	-
matchweed	G	-	-	G	F-G	-	G-E	-	-

Weed Name	2,4-D	Chaparral	Cimarron Plus or Xtra	Banvel or others	Vista XRT	Diuron	GrazonNext HL	Metsulfuron	Impose/Panoramic
maypop	P	P	P	P	-	-	-	P	-
Mexican tea	G	E	E	G-E	-	-	E	E	-
milkweed	F-G	-	-	G	-	-	F-G	-	-
morningglory	G-E	E	G-E	E	E	-	E	G-E	-
palmetto	P	P	P	F	G	P	P	P	P
pawpaw	P	P	F	P	F-G	-	P	F	-
persimmon	P	-	-	F-G	-	P	P	-	P
pigweed	F	E	E	E	P	F	E	E	G
plantains	E	E	E	E	-	-	-	E	-
pokeberry	G	-	-	E	P	P	P	-	-
prickly pear	P	P	P	F	G	P	P	P	P
prickly poppy	G	E	G	G-E	G	-	E	G	-
ragweed	E	E	G	E	G	G	E	G	F
red sorrel	P	E	E	E	-	F	-	E	-
redroot, Carolina	-	P-F	P-F	-	P-F	-	-	P-F	F-G
rosary pea	F	E	G	G	F-G	-	E	G	-
sand vetch	F	E	G	G	G	-	E	G	-
saltbush	P	P	P	P	F	-	P	P	-
shepherd's purse	E	-	-	E	-	G	-	-	-
sicklepod	G	G	G	E	G	F	G	G	F-G
smartweed	G	E	G	G	-	-	E	G	-
softrush	G	P	P	F-G	P	-	F-G	P	-
Spanish needles	G-E	E	G	E	-	-	E	G	-
stinging nettle/ fireweed	P	E	-	-	G-E	-	E	-	P
tall elephant's foot	F	-	-	F-G	-	-	F-G	-	-
teaweed	P	G	G	G	-	-	G	G	-
thistles	E	E	F	G	G	F	E	F	-
toadflax, oldfield	F-G	G-E	G-E	G	-	-	G-E	G-E	-
tropical soda apple	P	E	P	F-G	F	P	E	P	P
Virginia pepperweed	G	-	-	E	G	G	-	-	-
wax myrtle	P	P	-	P-F	-	P	P	-	-
whitehead broom	P	P-F	P-F	P	P	-	P	P-F	-
winged sumac	F-G	-	-	-	F-G	-	F-G	-	-
wild garlic	G-E	G	G	E	-	P	-	G	-
wild radish	G	G-E	G-E	E	-	P	G	G-E	-
yellow jessamine	-	G	G	-	-	-	-	G	-
yellow woodsorrell	P	F-G	F-G	G	F	-	F-G	F-G	-

Weed control symbols: E = 90%–100% control; G = 80%–90% control; F = 60%–80% control; P < 60% control.

Table 3. Estimated effectiveness of herbicides on common broadleaf weeds in pastures and hayfields (Milestone through WeedMaster or others).¹

Weed Name	Milestone	Outrider	PastureGard HL	Remedy	Velpar	WeedMaster, others
bagpod	E	-	G	F-G	-	F-G
bitter sneezeweed	E	-	E	E	-	E
blackberry	P	P	G-E	G-E	F	P-F
bracken fern	P	-	P-F	P-F	F	P
Brazilian pepper-tree	P	P	P-F	G-E	G-E	P
bullrush	P	-	P	F-G	-	-
bushmint	P	-	G	G	-	P
butterweed	G-E	-	G-E	-	-	F-G
buttonbush	-	-	F-G	G	-	-
Caesarweed	G-E	-	E	E	-	G-E
camphor weed	-	-	G	F-G	-	G
Carolina geranium	G-E	-	-	-	-	G
castor bean	-	-	G	G	-	F-G
chickweed	-	-	F	E	E	E
coffee weed	E	-	E	E	-	G
coral ardisia	P	-	F-G	G	-	P
creeping indigo	E	-	G	G	-	G
crotalaria, showy	-	-	E	E	-	G
cudweed	E	-	G	E	-	G
curly dock	E	-	F	E	P	E
dayflowers	-	-	G	G	-	G
dewberry	-	-	F-G	F-G	-	P
dodder	-	-	P	P	-	P-F
dogfennel	P-F	P	E	G-E	G	G
evening primrose	E	-	G	E	E	E
Florida pusley	-	-	G	-	-	F
flat-top goldenrod	P	-	P	P	-	G
gallberry	-	-	E	E	P	G
goatweed	-	-	F	F	-	G
goldenrod	G	-	G	G	-	G-E
hairy indigo	E	-	G-E	G	-	G
hempvine	E	-	E	E	-	F-G
honeysuckle	-	-	P	P	-	E
horsenettle	E	-	F	F-G	-	F
horseweed	E	-	G	G	-	E
kudzu	G	P	F	F	-	F
lantana	P	-	P-F	P-F	-	P
matchweed	G	-	G	G	-	G
maypop	-	P	G	F	-	P-F
Mexican tea	E	-	E	E	-	E
milkweed	F-G	-	F-G	F-G	-	F-G
morningglory	E	-	E	E	-	E
palmetto	P	P	G	F	P	P-F

Weed Name	Milestone	Outrider	PastureGard HL	Remedy	Velpar	WeedMaster, others
pawpaw	P	-	F-G	G	-	P
persimmon	P	P	F-G	F-G	F	P-F
pigweed	E	-	F	E	G	E
plantains	P	-	-	-	-	E
pokeberry	F	-	P	P	-	E
prickly pear	P	P	F	G ²	P	P-F
prickly poppy	E	-	E	E	-	G-E
ragweed	E	-	E	E	F	E
red sorrel	-	-	F	E	-	G
redroot, Carolina	-	-	F-G	G	-	G
rosary pea	E	-	G-E	G-E	-	F-G
sand vetch	E	-	E	E	-	E
saltbush	P	-	G-E	E	-	F
shepherd's purse	-	-	G	E	E	E
sicklepod	-	-	G-E	E	-	E
smartweed	E	-	G	G	-	G-E
softrush	P	-	F	P-F	-	F-G
Spanish needles	E	-	E	E	-	E
stinging nettle/fireweed	E	P	E	E	-	F
tall elephant's foot	F	-	F-G	F-G	-	F
teaweed	-	-	G	G	-	F-G
thistles	E	-	G-E	E	E	E
tropical soda apple	E	P	G	G-E	F-G	F-G
Virginia pepperweed	-	-	G	P	E	E
wax myrtle	P	-	F-G	G	P	P-F
whitehead broom	P	-	P	P	F-G	P
winged sumac	-	-	G	G	-	F-G
wild garlic	P	-	P	-	-	E
wild radish	P	-	G-E	E	E	E
yellow jessamine	-	-	G	G	-	-
yellow woodsorrell	-	-	F	F	-	F

¹ Estimated effectiveness based on rates recommended in this report. Effectiveness may vary depending on factors such as herbicide rate, size of weeds, time of application, soil type, and weather conditions.

²When applied as spot-treatment in basal oil.

Weed control symbols: E = 90%–100% control; G = 80%–90% control; F = 60%–80% control; P < 60% control.

Table 4. Estimated effectiveness of herbicides on common grass and sedges in pastures and hayfields.

Herbicide	bahia-grass	bermuda-grass	broom-sedge	crab-grass	dallis-grass	guinea-grass	johnson-grass	rye-grass	sandbur	smut-grass	vasey-grass	nutsedge
2,4-D	P	P	P	P	P	P	P	P	P	P	P	P
Banvel or others	P	P	P	P	P	P	P	P	P	P	P	P
Chaparral	G	P	P	P	P	P	-	P	P	P	P	P
Cimarron Plus or Xtra	G	P	P	P	P	P	-	P	P	P	P	P
Diuron	P	P	P	F-G	P	P	P	P	G	P	P	P
GrazonNext HL	P	P	P	P	P	P	P	P	P	P	P	P
Metsulfuron	G	P	P	P	P	P	-	P	P	P	P	P
Impose/Panoramic	P-F	P	P	E	F	-	G	F	G-F	P	P-G	G-E
Milestone	P	P	P	P	P	P	P	P	P	P	P	P
Outrider	P	P	P	P	P	P	E	-	-	P	F-G	E
Pastora	F-G	P	P	F-G	F-G	F-G	G	G	G	P	F-G	P
PastureGard HL	P	P	P	P	P	P	P	P	P	P	P	P
Remedy	P	P	P	P	P	P	P	P	P	P	P	P
Velpar	P	P	P	P	-	-	-	G	-	E	-	P
Vista XRT	P	P	P	P	P	P	P	P	P	P	P	P
Weedmaster or others	P	P	P	P	P	P	P	P	P	P	P	P

¹ Estimated effectiveness based on rates recommended in this report. Effectiveness may vary depending on factors such as herbicide rate, size of weeds, time of application, soil type, and weather conditions.

Weed control symbols: E = 90%–100% control; G = 80%–90% control; F = 60%–80% control; P < 60% control.

Table 5. Tolerance of **established** (for at least 6 months) forage cultivars to commonly used herbicides.

Forage Species	Cultivar	2,4-D	Aim	Banvel	Chaparal	Cimmaron Plus	Cimmaron X-tra	Vista XRT	Grazon-Next HL	Im- pose/ Pan- oramic	Met- sul- fur- on (MSM 60, others)	Mile- stone	Out- rider	Pas- tora	Pas- ture- gard HL	Rem- edy Ultra, others	Round- up/ others	Tel- ar	Vis- ta	Ban- vel + 2,4-D (Weed- Mas- ter, etc.)	Vel- par
Bahiagrass	Argentine	T	T	T	I	I	I	T	T	S	I	T	T	NL	T	T	S	T	T	T	T
	Pensacola	T	T	T	S	S	S	T	T	S	S	T	T	NL	T	T	S	T	T	T	T
Bermuda- grass																					
	Coastal	T	T	T	T	T	T	T	T	I	T	T	T	T	T	T	I-S	T	T	T	T-I
	Florakirk	T	T	T	T	T	T	T	T	I	T	T	T	T	T	T	I-S	T	T	T	T-I
	Jiggs	T	T	T	T	T	T	T	T	I-S	T	T	T	T	T	T	I-S	T	T	T	T-I
	Tifton-85	T	T	T	T	T	T	T	T	I	T	T	T	T	T	T	I-S	T	T	T	T-I
Brachiaria																					
	Mulato	T	I	T	N	N	N	T	T	N	N	T	T	NL	T	T	S	N	T	T	N
Stargrass																					
	Florico	T	T	T	T	T	T	T	T	I	T	T	T	NL	T	T	I-S	T	T	T	NL
	Florona	T	T	T	T	T	T	T	T	I	T	T	T	NL	T	T	I-S	T	T	T	NL
	Okeechobee	T	T	T	T	T	T	T	T	I	T	T	T	NL	T	T	I-S	T	T	T	NL
	Ona	T	T	T	T	T	T	T	T	I	T	T	T	NL	T	T	I-S	T	T	T	NL
Hemarthria																					
	Floralta	I-S	T	T	T	T	T	T-I	I-S	T-I	T	I	T	NL	I	I	S	T	I	I-S	NL
	Gibtuck	I-S	T	T	T	T	T	T-I	I-S	T-I	T	I	T	NL	I	I	S	T	I	I-S	NL
	Kenhy	I-S	T	T	T	T	T	T-I	I-S	T-I	T	I	T	NL	I	I	S	T	I	I-S	NL

T = tolerant; very little injury if any
 I = Intermediate; slight injury, will regrow in approximately one month
 S = Severe injury; more than two months to recover or complete death
 N = No current information available
 NL = Not labeled

Table 6. Days between herbicide application to forage or pasture and feeding, grazing, or animal slaughter.

Herbicide	Non-lactating Cattle			Lactating Dairy Cattle		Horses
	Grazing	Hay Cutting	Slaughter	Grazing	Hay Cutting	
Banvel (Up to 1 pt.)	0	0	30	7	37	0
Banvel (Up to 1 pt.)	0	0	30	21	51	0
Banvel (Up to 1 pt.)	0	0	30	40	70	0
Chaparral	0	0	0	0	0	0
Cimarron Plus and Cimarron Xtra	0	0	0	0	0	0
Vista XRT	0	7	0	0	7	0
2,4-D	0	30	3	7	30	0
GrazonNext HL	0	7	0	0	7	0
Metsulfuron	0	0	0	0	0	0
Impose or Panoramic	0	7	0	0	7	0
Milestone	0	0	0	0	0	0
Outrider	0	14	0	0	14	0
Pastora	0	0	0	0	0	0
PastureGard HL	0	14	3	1 season	1 season	0
Prowl H ₂ O	0	0	0	0	0	0
Remedy Ultra, others	0	14	3	1 season	14	0
Roundup Weathermax (Dormant application)	0	0	0	0	0	0
Roundup Weathermax (Between cuttings)	0	0	0	0	0	0
Roundup Weathermax (Pasture renovation)	56	56	56	56	56	56
Sandea	0	37	0	0	37	0
Telar	0	0	0	0	0	0
Trump Card	7	14	2	7	14	7
Velpar	0	38	0	0	38	0
2,4-D + dicamba (Weedmaster, others)	0	37	30	7	37	0