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Field Guide for Managing Fountain Grass in the Southwest



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Cover Photos

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Fountain grass (*Pennisetum setaceum*; synonyms: *P. ruppelii*, *Phlaris setacea*)

Grass family (Poaceae); Bromeneae tribe

Fountain grass is currently expanding its range in the southwestern U.S. and has been reported as invasive in California, Nevada, and Arizona. This field guide serves as the U.S. Forest Service's recommendations for management of fountain grass in forests, woodlands, and rangelands associated with its Southwestern Region. The Southwestern Region covers Arizona and New Mexico, which together have 11 national forests. The Region also administers 4 national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Fountain grass (synonyms: crimson fountain grass, purple fountain grass, fountaingrass) is a warm climate, perennial bunchgrass native to northern Africa and western Asia. It has been widely planted in urban settings as a landscape ornamental. Over time, it has escaped horticultural areas and is now found in many arid land habitats.

Growth Characteristics

- Tufted perennial bunchgrass; warm climate; uses C4 pathway that fixes CO₂ into a four-carbon compound (C4) rather than a three-carbon compound (C3); may become dormant in the winter; individual plants may live 20 years or more.
- Has several upright stems growing from a densely clumped tussock; 2–4.5 feet tall.
- Leaves are bright green or purplish; these may turn reddish or tan with colder temperatures. Blades are long, slender, and arching (8–25 inches); sheath margin has stiff white hairs.
- Has a showy purplish, bottlebrush-like panicle (6–15 inches); spikelets have 1-inch long bristles.
- Roots are fibrous and grow to 1 foot deep; forms mycorrhizal associations; no rhizomes.
- Reproduces solely by seed, though it may be intentionally propagated through division; seeds germinate in late spring after maturing for several months; seeds viable 6–7 years.

Ecology

Impacts/Threats

While attractive in a contained setting, fountain grass can aggressively spread in an open, arid environment under full sun and rapidly out-compete native herbaceous species. When dry, it is highly flammable. Its presence greatly increases the fire potential and often causes a change in the fire pattern in areas it invades. Other impacts include reduced available forage, diminished diversity of flora and fauna, and decreased wildlife habitat.

Site/Distribution

Warm, arid landscapes including canyons, desert, grassland, and rangeland; roadsides; arroyos and washes. It is found in similar habitats as buffelgrass; however, fountain grass is more cold tolerant and is able to occupy a wider elevational range. Fountain grass prefers mild winters, summer rain, and median annual precipitation of less than 50 inches. It does not tolerate freezing temperatures or saline soils.

Spread

Ornamental plantings serve as the primary way fountain grass can be spread. Even varieties of fountain grass mistakenly sold by nurseries as being infertile can still become pollinated by fertile varieties or closely related plant species and develop viable seed. Seeds have bristles that may become tangled in animal fur; they may be carried by wind, water, birds, or by small rodents. Seeds may also adhere to clothing or be carried for long distances on undercarriages of vehicles and road maintenance equipment.

Invasive Features

Fountain grass is highly adaptable to many environments (high plasticity). Growth characteristics and reproduction may change according to the altitude at which it is growing, and its physiology may adjust in response to physical features of the landscape. For example, its rate of photosynthesis increases at higher altitudes. Repeated wildfire favors fountain grass.

Management

Prolific production of long-lived seed hinders control efforts once fountain grass is established. Control measures should focus on prevention and proactive management. Consider the following actions when planning a management approach:

- Landscape alternatives should be promoted to landowners (especially in housing developments near open rangelands) to minimize new introductions of fountain grass.
- Healthy plant communities should be maintained to limit infestations of fountain grass.
- Check hay, straw, and mulch for presence of weed seed before using them in weed-free areas; certified weed-free hay or pellets should be fed to horses used in the back country.
- Detect and eradicate new populations of fountain grass as early as possible. Keep annual records of reported infestations.
- Combine mechanical, cultural, biological, and chemical methods for most effective control.
- Implement monitoring and a follow-up treatment plan for missed plants or seedlings.

Table 1 summarizes some management options for the most common situations involving fountain grass. Further details on these management options are explained below. Choice of control method for fountain grass depends on the current land use and site conditions; accessibility, terrain, and microclimate; extent and density of infestation; and non-target flora and fauna present. Other considerations include treatment effectiveness, cost, and the number of years needed to achieve control. More than one control method may be needed for each site.

Physical Control

Manual Methods

Hand-pulling, grubbing, and hoeing buffelgrass are effective (but demanding) methods for control. Removal is easiest when the soil is moist, temperatures are cool, and

plants are in their early life stage. Manual removal of seedlings and plants every 1–2 months has been used with some success in Hawaii Volcanoes National Park. A pick, mattock, Pulaski, or shovel may be required for plants with a tussock diameter greater than 4–6 inches. Remove as much of the root as possible. Debris—especially debris with inflorescences—should be bagged and removed from the site to prevent spread. Manual methods may be more effective when combined with herbicide application.

Mechanical Methods

Mowing or tillage with a plow or disc may be used when fountain grass infestations are accessible, level, and free of large rocks. However, mechanical methods are normally not feasible due to the steep, rocky locations the plant frequently inhabits. Cutting with a weed trimmer may be an alternative for areas where mower use is not feasible. Inflorescences should be burned or collected, bagged, and removed to prevent seed bank contribution. Where possible, mechanical methods may be combined with an herbicide application to increase control effectiveness. Whatever method is chosen, anticipate that it may need to be repeated to reach an acceptable level of control.

Prescribed Fire

Burning is not recommended, except as a means to manage debris. Fountain grass rapidly regrows following fire, which often leads to an increase in its dominance.

Cultural Control

Seed and materials used for mulch, forage, or fill should be certified to be weed-free; pellets may be used for horses in backcountry areas. Land managers, the local public, and road crews should be educated in identification of invasive species so they can help report all suspected infestations. Vehicles, humans, and domestic animals should be discouraged from traveling through infested areas; and a program to check and remove seeds from vehicles, clothing, and domestic animals should be implemented to help stop dispersal. Since this species is currently promoted as an ornamental, coordination with local nurseries to distribute information about this plant's invasive potential may be warranted.

Table 1. Management options*

Site	Physical Control	Cultural Control	Biological Control	Chemical Control
Roadsides	Mow or grade repeatedly during growth season to suppress seed production. Assemble volunteer groups to hand pull.	Use seed, mulch, and fill materials certified to be weed-free. Avoid planting as an ornamental near open range areas. Implement requirements for vehicle operations and for reporting infestations along roads.	No classical biological control agents have been approved for use by the USDA.	Use truck spraying equipment. Wash underneath to prevent spread.
Rangeland	Hand pull or use a weed trimmer; repeat every 1–2 months for at least 4 years. Bag debris, especially debris with inflorescences.	Use seed and forage hay certified to be weed-free; use pellets for horses in backcountry areas. After moving livestock or vehicles through an infested area, inspect and remove any seeds from animals, clothing, and vehicles before exiting the infested area.	Early spring grazing can temporarily reduce density, fuel loads, and risk of wildfire. However, plants become less palatable as they mature which may increase preference for non-target plants.	Use systemic, pre or post-emergent herbicides. Use aerial or ground broadcast sprayers or backpack sprayers for areas difficult to access.
Wilderness and other natural areas	Manual methods such as hoeing or hand pulling may be needed to protect other resources.	Use seed and forage hay certified to be weed-free; use pellets for horses in backcountry areas. Post signs warning visitors to remove seeds. Limit public access in severely infested sites. Reseed with desirable perennial plants to suppress fountain grass.	Same as above	Use backpack sprayer for small stands. Broadcast spraying by ground or aerial methods may be used on thicker stands, if allowed.

* Choice of a particular management option must be in compliance with existing regulations for the land resource.

Biological Control

Grazing

Except when young, fountain grass is not highly palatable nor is it very nutritious as a forage grass. It may be grazed intensively by sheep or cattle in early spring while shoots are tender and succulent. However, livestock will usually graze other desirable species first and avoid fountain grass.

Classical Biological Control

No classical biocontrol agents (insects, pathogens, etc.) have been approved by the USDA for use on fountain grass. Development of an acceptable biocontrol agent is hampered by the potential to impact related forage and crop species, such as pearl millet and sugar cane.

Chemical Control

Herbicides listed in table 2 will effectively control fountain grass when properly applied, although some may negatively impact non-target species. Aquatically approved herbicide formulations and surfactants must be used in or near water. Each herbicide product has unique requirements and restrictions; therefore, it is important to read the label carefully and to follow all instructions and guidelines when mixing and applying the chemical.

Herbicide Application

Precautions should be taken to protect desirable non-target plants (particularly woody species) from both direct spray and spray drift of glyphosate and especially imazapyr. Also, imazapyr may kill or injure non-target plants

Table 2. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example ¹	Broadcast Treatment (rate per acre)	Spot Treatment (spray solution) ²	Time of Application	Remarks
Glyphosate	Roundup Pro Rodeo Accord	0.5–1 pint	5–8% + 0.5% nonionic surfactant	Any growth stage when green and actively growing.	Nonselective amino acid inhibitor; will affect most vegetation, including forbs and woody species; quickly inactivated in the soil. Foliar application only. Completely spray all green leaves; follow-up by spraying seedlings annually.
Imazapyr	Habitat Arsenal [others available]	2–3 pints	1–3%	When fountain grass is actively growing as indicated by bright green and glossy leaves.	Imazapyr is a nonselective amino acid inhibitor. In addition to spray drift, non-target plants may also be killed or injured by imazapyr through runoff, residue movement in soil, or root exudates from treated plants. For perennial grasses, imazapyr is best used as a post-emergent control, which requires the use of a 0.25 nonionic surfactant or 1 percent methylated seed oil (MSO); follow label instructions. Herbicidal activity may be slow. Allow two full growing seasons before follow-up treatment.
Hexazinone	Velpar DF	1.5 lbs + 25 gallons water (minimum)	2.66 lbs + 1 gallon water	Anytime, preferably before a rain event.	Not for use near waterways or desirable woody species. High soil mobility; groundwater contamination potential. Contact and residual control; use lower rate on coarse-textured soil (sand to sandy loam); use higher rate with fine-textured soils (clay loam to clay) or soils high in organic matter.
Fluazifop-p-butyl	Fusilade 2000 Fusilade DX	1–1.5 pints	0.5% + 0.25% nonionic surfactant	In spring after emergence but before seed head is detectable.	Attacks meristematic tissue of annual and perennial grasses. Does not affect broad-leaved plants.

¹ Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specific information and appropriate use with fountain grass.

² Spray solution is the herbicide/water ratio in a spray mix that may be used for spot treatment with backpack or hand-held sprayers. The amount of product applied during an annual growing season must not exceed the maximum application rate per acre as specified by the product label – refer to the product label for the site type and application.

through runoff, residue movement in soil, or root exudation from treated plants. Therefore, imazapyr should not be used in residential, urban, or wildland-urban interface (WUI) areas where ornamental vegetation or turf grass may be affected. To protect desirable trees or shrubs, do not apply imazapyr within twice the drip line (canopy edge) distance. For desirable cacti, imazapyr should not be applied closer than at least twice the extent of their lateral root system. Fluzifop-p-butyl will kill annual and perennial grasses but does not harm broad-leaved plants.

When spraying fountain grass with a foliar active herbicide (such as glyphosate, imazapyr, or fluzifop-p-butyl), the foliage should be at least 50 percent green; however, better control may be obtained when plants are more than 80 percent green. Fountain grass mortality rates of at least 90 percent have been attained by the Lake Mead Exotic Plant Management Team of the U.S. National Park Service by using annual spot treatments of glyphosate on actively growing plants. Hexazinone is active mainly through the roots so this herbicide should be applied before anticipated rainfall.

A backpack or hand-held sprayer should be used for small, infestations. With foliarly-applied herbicides, enough spray should be used to moisten the leaves, but not so much that spray drips off the plant. Adding a blue or red dye to the solution will aid in identifying treated plants. For areas with larger, denser infestations, it may be more practical to use an ATV or UTV sprayer or a conventional boom sprayer that is pulled or mounted to a truck or tractor. Any equipment used to spray herbicide should be calibrated.

Integrated Control Methods

The following combinations of control methods should be considered to contain and reduce fountain grass infestations:

- **Manual removal-herbicide** – Coordinate removal efforts between landowners or organizations to hand-pull or dig up fountain grass plants, especially targeting isolated populations and sporadically occurring plants that could become a future source of invasion. Monitor treated areas and follow with

herbicide applications as needed to maximize control.

- **Herbicide-mechanical removal** – Apply herbicide to actively growing plants; allow 2 weeks for herbicide to translocate to roots; then mow or cut with a weed trimmer. An alternative is to mow first, allow plants to regrow to a height of 10 inches and apply herbicide. Another option is to till, followed by an herbicide application to minimize germination of remaining seed.

Management Strategies

Areas slated for treatment should be prioritized, and a combination of control methods should be considered when attacking fountain grass. Treatment priority should be assigned to small or sporadic infestations found on otherwise healthy sites, followed by treatment of more established infestations. Satellite and small, isolated populations should be eradicated, while larger areas of infestation should be contained and gradually reduced over time, starting around the perimeter. Initial treatment of large infestations should try to eliminate as many live plants and disrupt as much seed production as possible. Secondary treatments should include monitoring and additional control measures (such as spot spraying) to eliminate seedlings and increase competition from desirable perennial plants.

Fountain grass seed is viable for 6 or more years in the seed bank; therefore, a short-term strategy for managing fountain grass is unlikely to succeed. Since it is ordinarily useless to treat an area only one time without retreatment, sufficient resources must be allocated for the area where control is attempted. After initial treatment, it is important that resources are also available to respray or retreat the treated area as necessary. Previously treated areas should always be monitored annually to detect regrowth of treated plants and newly emerged seedlings. Follow-up treatment should be anticipated and planned as part of a complete restoration program. Failure to perform follow-up monitoring and adapt control methods as needed could result in a return to pretreatment levels of invasion.

Adaptive Management

Current experience and research suggest that there will not be one overarching process or set of tactics for controlling fountain grass consistently. Therefore, realistic goals and objectives should be established to manage fountain grass infestations occurring broadly across a given landscape. To improve long-term success, consider using an adaptive management approach with overall goals of reducing fires and maintaining or restoring desirable plant communities. The stepwise process for adaptive management involves

1. Assessment of the overall weed problem,
2. Establishing management goals and objectives,
3. Implementation of control strategies and measures,
4. Monitoring effectiveness of management actions,
5. Evaluating actual outcomes in relation to expected results, and
6. Adjusting practices as necessary.

Steps of this process should be repeated in sequence as part of a continuous learning cycle that improves management planning and strategy by learning from the outcomes of previous management actions. In general, an adaptive management approach is considered to be successful if

1. Stakeholders are actively involved and remain committed to the process,
2. Monitoring and assessment are used to adjust and improve management decisions, and
3. Management goals and/or objectives for the resource are being achieved.

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Suggested Web Sites

For information about calibrating spray equipment:
NMSU Cooperative Extension Service Guide A-613, *Sprayer Calibration*. Available at http://aces.nmsu.edu/pubs/_circulars/CR_597.pdf

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Southwestern Region
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