

# Field Guide for Managing Lehmann and Weeping Lovegrasses in the Southwest



## Cover Photos

*Top right—Lehmann lovegrass: John M. Randall, The Nature Conservancy, Bugwood.org*

*Left—Lehmann lovegrass: Joseph M. DiTomaso, University of California, Bugwood.org*

*Lower right—weeping lovegrass: Max Licher, SEINet*

*Lower left—weeping lovegrass: Forest and Kim Starr, U.S. Geological Survey, Bugwood.org*

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## **Lehmann lovegrass** (*Eragrostis lehmanniana* L.)

## **Weeping lovegrass** (*Eragrostis curvula* (Shrad.) Nees. var. *curvula*)

Grass family (Poaceae), Chloridoideae subfamily, Eragrostideae tribe

Lehmann and weeping lovegrasses are introduced grass species that are becoming invasive in southwestern States. This field guide serves as the U.S. Forest Service's recommendation for management of Lehmann and weeping lovegrasses in forests, woodlands, rangelands, desert, and desert scrub 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**

Lehmann lovegrass (synonym: African lovegrass) and weeping lovegrass (synonyms: Boer lovegrass, curved lovegrass, Catalina lovegrass) are hardy, drought-tolerant bunchgrasses that originally came from South Africa. Both species grow in dense tufts and have seed heads that grow as open panicles with lax or drooping branches.

Weeping lovegrass has been widely planted and is more broadly distributed across the United States than Lehmann lovegrass. In the Southwest, both lovegrasses have been planted since the 1930s because of their desirable qualities in reducing soil erosion and providing forage. They have been included in seed mixes used for range, restoration of agricultural land and wildfire burns, highway construction, and other ground-disturbing activities. They also have been widely planted along highway rights-of-way and for range restoration/soil conservation efforts in the Chihuahuan and Sonoran Deserts. During the 1980s and 1990s, weeping lovegrass was the most common grass planted on thousands of acres under the Conservation Reserve Program in New Mexico, Oklahoma, and Texas. However, some of the traits that allow these grasses to thrive in arid areas have also caused them to be highly invasive and unwanted within native plant communities.

### **Growth Characteristics**

- Both species are perennial bunchgrasses; normally warm season but low winter temperatures may make them act as annuals or short-lived perennials.
- Rapid growth; weeping lovegrass grows mostly in summer and is slow to regrow after it is grazed; Lehmann lovegrass actively grows in spring into fall; it has a moderate growth rate following use.
- Weeping lovegrass culms grow erect, 24 to 60 inches tall; the drooping leaves almost touch the ground at the tips; hence, the term "weeping." Lehmann lovegrass culms (18 to 24 inches tall) grow erect or prostrate across the ground, which can lead to rooting at the nodes (weakly stoloniferous).
- Leaf blades flat to slightly rolled under along margins (weeping lovegrass 5 to 20 inches long; 0.04 to 0.11 inch wide and Lehmann lovegrass 0.8 to 5 inches long; width same), Lehmann lovegrass blades are glabrous to slightly scabrous; weeping lovegrass may have long, soft hairs near the base; ligules are ciliate (Lehmann lovegrass ligule is shorter than weeping lovegrass ligule).
- Open, greenish, re-branching panicle (weeping lovegrass inflorescence is 6 to 14 inches long; Lehmann lovegrass inflorescence is 2.75 to 7 inches long); spikelets have 3 to 12 florets each (lower floret reduced); spikelets yellowish at maturity; weeping lovegrass blooms in mid-spring; Lehmann lovegrass blooms in late spring.
- Both species reproduce from seed; however, Lehmann lovegrass may proliferate via rooting at the nodes. Lehmann lovegrass seeds require a ripening period before germination; dry heat improves the likelihood for germination. Weeping lovegrass does not require fertilization to produce seed; it is an obligate, apomictic species.

## **Ecology**

### ***Impacts/Threats***

Lehmann lovegrass is more likely than weeping lovegrass to move beyond planted areas into native plant communities; however, both grasses are expanding their range. The natural fire regime in desert communities has been altered as these species have increased, resulting in more intense wildfires that occur with greater frequency. Both species are not highly preferred by livestock and wildlife for grazing in comparison to native grasses, which has allowed the lovegrasses to become increasingly dominant in many native plant communities.

### ***Site/Distribution***

In southeastern Arizona, Lehmann's lovegrass is commonly found growing away from planted areas, especially on coarse soils at moderate elevations of 3,000 to 4,500 feet. Weeping lovegrass tends not to move far from planted areas and grows in Arizona from 4,900 to 6,500 feet.

### ***Spread***

Lehmann and weeping lovegrass both produce huge quantities of small-sized seed that accumulate in the soil seed bank. Seed is spread by wind, water, animals, and vehicles. Lehmann lovegrass seed is initially dormant and requires 6 to 9 months of after-ripening. Shading inhibits germination since the seed also requires exposure to red light to propagate. In southeastern Arizona, the spread of Lehmann lovegrass is related, in part, to the amount and distribution of summer rain and soil type (spread is more likely in loamy sand or sandy loam soils). Newly emerged weeping lovegrass must have dependable moisture to survive as dry soils will quickly desiccate seedlings.

### ***Invasive Features***

Lehmann lovegrass establishes quickly, produces high quantities of viable seed during its first season of growth, and can spread at a rate of 175 m/year. While weeping lovegrass is less likely to escape boundaries of planted areas, it is very persistent and long lived.

## **Management**

When planning for control and restoration efforts for areas affected by either Lehmann or weeping lovegrass, it is important to understand why and how these grasses were originally planted and how they have since spread into areas where they are unwanted. In the Southwest, they have been planted over the past 75 years across a wide range of ecological sites, often for different reasons. Lehmann lovegrass is of greater concern than weeping lovegrass with respect to its greater ability to spread into desert communities and other non-agricultural areas in the Southwest. From a practical standpoint, these species have become so well established in certain areas that it may be unrealistic to seek their elimination as a management goal. A more realistic goal may be to direct efforts toward reducing their dominance in a local area.

The following actions should be considered when planning a management approach for these two lovegrasses:

- Maintain healthy plant communities to help prevent or limit new infestations. This may involve using improved grazing management practices to prevent excessive grazing and/or reseeding areas with desirable native grasses and forbs after disturbance.
- Detect, report, and map known Lehmann and weeping lovegrass populations. Keep annual records on reported infestations.
- Develop a specific action plan to meet goals and objectives for infested areas, which may include eradication of new populations of Lehmann lovegrass in sensitive sites, such as those areas known to be habitat for threatened and endangered species, travel corridors, seed pathways, etc.
- Combine mechanical, cultural, biological, and chemical control methods for most effective control of these two lovegrass species.
- Implement a monitoring and follow-up treatment plan for missed plants and seedlings. Also, monitor recovery of desirable native plant species following control efforts.

**Table 1. Management options\***

| Site   | Physical Control   | Cultural Control  | Biological Control  | Chemical Control  |
|--|--|---|---|---|
| Roadsides, fence lines, or non-crop areas                  | Disk or plow in agronomic areas. Repeated mowing is a suppression option along roadways.   | Use seed, mulch, and fill materials certified to be weed-free.<br><br>Consider native grass species when reseeding rights-of-way.<br><br>Avoid driving vehicles and equipment through infested areas. | Classical biocontrol agents are unavailable.  | Use truck or tractor-mounted spraying equipment to broadcast treat. Wash underneath vehicle after application to prevent seed spread. |
| Rangelands, pastures, or riparian corridors                | Burning alone is not recommended since it will likely result in increased densities; consider combining burning with herbicide spraying. | Use seed and forage hay certified to be weed-free; use pellets for horses in backcountry areas.<br><br>Where feasible, consider reseeding areas with native grasses following control actions.        | Graze in the winter or spring when livestock will select nonnative lovegrasses over native grasses to reduce biomass and fuel load.<br><br>Classical biocontrol agents are unavailable. | In areas difficult to access, an ATV-mounted sprayer or backpack unit may be the most practical application methods.                  |
| Wilderness, other natural areas, and/or small infestations | Hand pulling or digging may aid in control. Wear gloves for pulling; pull when soil is moist and remove as much root stock as possible.  | Same as above.  | Same as above.  | Use backpack or hand-held sprayers. Broadcast spraying with ground 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.

Table 1 summarizes some management options for common situations involving these two lovegrass species. Further details on these management options are explained below. Choice of control method(s) for Lehmann and weeping lovegrasses depends on many local factors including primary species present, extent of infestation, current land use, and site conditions (terrain, accessibility, microclimate, non-target flora and fauna present, etc.). Other management considerations include treatment effectiveness, cost, and the number of years needed to achieve control and whether the management objective is eradication or containment. Slightly different management approaches may be needed depending on which species is present, and more than one control method may be needed for a particular site.

## Physical Control

Physical methods used to control lovegrass should focus on minimizing plant spread and mitigating adverse impacts

from fire. These methods usually have to be repeated and must be timed properly to be effective.

### Manual Methods

**Hand removal** – Hand pulling, grubbing, and hoeing can be effective (but difficult) year-round methods for control. Hand removal of these lovegrasses can be complicated since mature weeping lovegrass develops a dense mat of roots that fills the soil space between plants; mature Lehmann lovegrass develops dense crowns that root at nodes, making it difficult to distinguish one plant from the next. Manual methods may be combined with herbicide application for smaller or isolated populations of lovegrass on otherwise healthy sites.

Hand removal is easiest when soil is moist, temperatures are cool, and plants are in their early life stage. Simple digging tools (digging bar, hoe, shovel, Pulaski, etc.) may be used to aid root removal. Remove as much of the root as possible. To prevent seed dispersal, plants that have been

pulled up should be placed in plastic bags and properly disposed of in sanitary landfills. For areas too remote for transport with plastic bags, pulled-up weeping and Lehmann lovegrass plants may be left onsite by putting them into a pile and then placing rocks over them. Monitor previously treated sites following significant warm season rains and provide follow-up treatment by hand pulling or spot spraying emerging seedlings with a 2 percent mix of Roundup®. Several consecutive years of hand removal will be required in order to eliminate an infestation completely.

### **Mechanical Methods**

*If using machinery to manage lovegrasses, the equipment should be cleaned after use to prevent movement of seed into un-infested areas.*

**Tillage and mulching** – Both weeping and Lehmann lovegrasses respond to light and are less likely to thrive under shaded conditions. To remove lovegrass from previously seeded cropland or rangeland areas, till with a deep plow or disc. Cultivation is most effective in hot, dry weather that greatly stresses plants. Tillage will exhaust carbohydrate reserves stored in roots but will not eradicate seed in the soil. Leaving tilled vegetation on the surface or adding a layer of gravel or litter mulch will further decrease the likelihood for seedlings to germinate and survive. Reseed tilled areas with a mixture of native seed that is adaptable to the local area.

**Mowing** – Since weeping lovegrass stores carbohydrates principally in its crown, it is especially susceptible to repeated close cutting. Where feasible, cut to a height below 2 inches and leave clippings in place as a mulch. Mowing causes the highest mortality in weeping lovegrass when conducted from September through November. For Lehmann lovegrass, mowing is more effective if combined with a pre or post-herbicide application as follow-up.

### **Prescribed Fire**

Lehmann and weeping lovegrasses regrow quickly after a fire and may return at greater densities than before. Thus, fire is not recommended as a single or stand-alone control method. Studies in central Arizona have shown decreased weeping lovegrass in areas protected from fire and grazing, which is believed to be due to suffocation of new growth in older stands.

## **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. To help limit the spread of Lehmann or weeping lovegrass beyond areas where they are used as forage, landscape disturbance should be minimized. Public education about the use of nonnative grasses, such as Lehmann and weeping lovegrasses, and its impacts on ecosystems is an essential component for changing restoration practices. Since weeping lovegrass is commonly used in roadside reseeding and erosion control on mine spoils, culturally sensitive collaboration may be required to encourage the use of native species for reseeding areas that have been disturbed by mining, fire, overgrazing, or road building. Species such as Arizona cottontop (*Digitaria californica*), plains bristlegrass (*Setaria macrostachya*), sideoats grama (*Bouteloua curtipendula*), sprucetop grama (*Bouteloua chondrosioides*), and other native species adapted to lower elevations may be considered.

## **Biological Control**

### **Grazing**

Lehmann and weeping lovegrasses are moderately palatable forage grasses, especially in the winter and spring when native grasses are not yet green. Grazing is often the most practical means for reducing lovegrass fuel loads and lowering wildfire threats. However, grazing alone will not eliminate future lovegrass spread although it can be used as part of an integrated management approach.

Grazing pressure in summer should be reduced to avoid excessive use of preferred native grasses. Consider using intense grazing over a short period of time in the winter, spring, and fall when cattle are most likely to select these grasses. Use a mineral supplement to enhance livestock consumption and nutrition. Precautionary measures should be taken when moving animals from an infested pasture to one free of invasive lovegrass; consider a 10-day quarantine to prevent seed introduction. According to several Oklahoma-based studies, fall grazing greatly contributes to winter mortality of weeping lovegrass. However, it may be more useful to cease grazing 6 weeks before frost turns the grass straw-colored. By deferring

**Table 2. Herbicide recommendations**

| <b>Common Chemical Name (active ingredient)</b> | <b>Product Example<sup>1</sup></b>                        | <b>Broadcast Treatment (rate per acre)</b> | <b>Spot Treatment (spray solution)<sup>2</sup></b> | <b>Time of Application</b>  | <b>Remarks</b>   |
|---|---|--|--|---|--|
| Glyphosate                                      | Roundup, Roundup Ultra, Rodeo, Accord, [others available] | 0.75–1 pint                                | 2–5%   | Fall or spring when lovegrass is actively growing as indicated by bright green and glossy leaves.<br><br>Best results if lovegrass is at least 50% green. | Glyphosate is formulated as a product with either 2 lb or 4 lb active ingredient per gallon. Certain brands require addition of a NIS <sup>3</sup> . Read label carefully to mix the proper rate of application. Do not add ammonium sulfate when spraying rangelands. Also, consider tank mixes of both glyphosate and imazapyr for increased control. See herbicide label for details.<br><br>Glyphosate is a nonselective amino acid inhibitor and can damage desirable vegetation, including forbs and woody species. Preferred time to spray is when desirable grasses are dormant but lovegrass growth is suitable for spraying. |
| Imazapyr  | Habitat, Arsenal, [others available]                      | 2–3 pints                                  | 1–3%   | Fall or spring when lovegrass is actively growing as indicated by bright green and glossy leaves, but desirable grasses are dormant.                      | Herbicidal activity may be slow. Allow two full growing seasons before follow-up treatment.<br><br>For perennial grasses, it is best used as a post-emergent control, which requires the use of 0.25% NIS <sup>3</sup> or 1% MSO <sup>4</sup> ; follow label instructions.<br><br>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.   |
| Sethoxydim                                      | Poast, Vantage, Ultima 160                                | 1.5–2.5 pints                              | 1–1.5%   | Warmer days of spring or fall, preferably when less than 6–10" high.  | Sethoxydim is a selective metabolic inhibitor that targets most grasses; it is absorbed by foliage and translocated to growth points in roots and shoot. Addition of 1% MSO <sup>4</sup> increases activity; see label for details.  |

<sup>1</sup> 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 lovegrasses.

<sup>2</sup> 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.

<sup>3</sup> NIS is used as an abbreviation for nonionic surfactant.

<sup>4</sup> MSO is used as an abbreviation for methylated seed oil.

grazing during this time, weeping lovegrass provides its own shade for suppressing germination.

### ***Classical Biological Control***

No classical biocontrol agents (insects, pathogens, etc.) are available for use against Lehmann or weeping lovegrass.

### **Chemical Control**

The primary herbicides used for Lehmann and weeping lovegrass control in the United States are glyphosate and imazapyr. All herbicides listed in table 2 will provide lovegrass control when properly applied. However, these are nonselective herbicides and may also impact non-target species. Therefore, precautionary measures should be taken if non-target plants (including woody species) need to be protected. Aquatically approved herbicide formulations and surfactants must be used in or near water. Each herbicide product has different requirements and restrictions. Thus, it is important to read the label carefully and follow all instructions and guidelines when mixing and applying any herbicide.

### ***Herbicide Application***

When spraying Lehmann or weeping lovegrass, the foliage should be at least 50 percent green; however, better control is obtained when plants are actively growing and are more than 80 percent green. Lovegrasses tends to green up 2 to 4 weeks before native grasses in the spring and often stay greener later into the fall and winter. This offers a narrow opportunity for spraying lovegrasses while minimizing damage to other desirable species. However, each site scheduled for treatment must be closely evaluated before spraying to determine if the potential harm to the surrounding plant community is acceptable.

To limit impacts to desirable plants from spraying, a backpack or hand-held sprayer may be used to spot spray lovegrass directly. Since herbicide uptake and activity occur mainly through the foliage, enough spray should be used to wet leaves but avoid dripping off the plant. Adding a blue or red dye to the solution will aid in identifying treated plants. A team of applicators walking together side-by-side (about 10 feet apart) is an effective way to spray a defined area systematically; this method is particularly effective for treating smaller, less dense infestations. For

large 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. After careful evaluation, an aerial application may also be considered as a method for controlling large, monocultural tracts of lovegrass on a landscape basis. Any equipment used to spray herbicide should be calibrated. Before spraying, always consider the need for reseeding with desirable native grasses following herbicide application.

### **Integrated Control Methods**

The following combinations of control methods should be considered to contain and reduce lovegrass dominance:

- **Manual removal–herbicide** – For small or isolated populations of lovegrass on otherwise healthy sites, remove by hand using simple tools such as a shovel, hoe, digging bar, or Pulaski. Take care to remove as much of the root as possible. While hand removal can be done at any time of the year, it is easiest when soil is moist, temperatures are cool, and plants are in their early growth stage. Monitor previously treated sites following significant warm season rains and provide follow-up treatment by hand pulling or spot spraying seedlings with a 2 percent mix of Roundup®.
- **Mechanical–herbicide** – Tillage with a deep plow is quite suited as a control method in areas previously planted with lovegrass, such as old fields or pastures. Mowing during hot, dry weather and then spraying the regrowth at a later time is suited for roadsides and rights-of-way. Monitor previously treated sites following significant warm season rains and use truck-or ATV-mounted sprayers to apply herbicide during active growth in the fall (as indicated by the appearance of bright green, shiny leaves).
- **Grazing–herbicide** – In pasture and rangeland settings, graze Lehmann or weeping lovegrass intensively to eliminate top growth and to stimulate new plant growth. Follow with a chemical treatment during the active growth stage, preferably before seed set. Monitor treated sites after significant warm season rains and provide follow-up treatment by pulling or spot spraying emerging seedlings.

- **Prescribed burn–herbicide** – In areas with a near monoculture of Lehmann or weeping lovegrass, consider a prescribed burn to eliminate top growth and litter. After rain and with 4 to 6 inches of new green growth, use a broadcast herbicide treatment. Monitor and use follow-up treatments on the burned area. Where feasible, consider reseeding with adaptable native species.

## Management Strategies

Considerable information is available regarding how best to plant and manage lovegrasses for various beneficial purposes including grazing, soil erosion prevention, roadside stabilization, and mine site reclamation.

However, there is much less experience and information available about controlling these grasses in areas where native grass restoration is a primary management objective. In many situations, it may be impractical to replace lovegrasses where they have become widespread and well-established in native plant communities. Rather, accepting lovegrass as a minor component in the vegetation mix may be a more practical management strategy. In any case, control and restoration efforts will require long-term planning, integrated management, and follow-up monitoring.

Any approach designed to control these grasses and restore native plants in specific communities must be adapted to local conditions. While information in the literature is limited, there is agreement that two or more steps taken over a relatively long time horizon will be needed to control and replace Lehman lovegrass with desirable native plants in areas where it now occurs. A study in Arizona suggests that lovegrasses should be treated first (such as burning) to cause germination of seed in the soil seed bank, which can then be followed up with additional treatment (such as herbicide treatment) to kill seedlings and adult regrowth. If needed, areas may be reseeded at a later time with adaptable desired native species.

In most cases, at least two or more consecutive years of field treatments will be necessary to eliminate or substantially reduce lovegrass infestations and seedbanks.

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 especially important that resources are also available to respray or retreat the treated area as necessary. Previously treated areas should be monitored continuously to control recovering patches of lovegrass.

## Adaptive Management

Available information and research currently underway suggest that there probably will not be one overarching process or method for effective control of Lehmann or weeping lovegrass. Therefore, an adaptive management approach should be used in most cases to control these grasses with the overall goal of restoring desirable native vegetation to the greatest extent possible. 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 the 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/\\_a/A613.pdf](http://aces.nmsu.edu/pubs/_a/A613.pdf)

Herbicide labels online: <http://www.cdms.net>

Invasive Plant Atlas of the United States:  
<http://www.invasive.org/weedus/index.html>

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**For more information or  
other field guides, contact:**

USDA Forest Service  
Southwestern Region  
Forest Health  
333 Broadway Blvd., SE  
Albuquerque, NM 87102

**Or visit the Southwestern Region's  
website for invasive species:**

*<http://www.fs.usda.gov/goto/r3/invasivespecies>*



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The use of trade or firm names in this publication is for reader information only and does not imply endorsement of any product or service by the U.S. Department of Agriculture. Recommendations made here for pesticide use are not obligatory, nor do they imply that discussed uses have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be applied.



**CAUTION:** Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife—if they are not handled or applied properly. Use all pesticides carefully and lawfully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.