Colorado Guide to

NATIVE AND WATER WISE GRASS

Installation and Maintenance

Introduction

Native and water wise grasses are a valuable landscaping option to maximize the livability, environmental benefits, and climate resiliency of Colorado communities. When used as a replacement for high-water turfgrass in large commercial and municipal landscapes, these grasses save a significant amount of water. They are an integral part of the water wise and sustainable landscapes of the future.

This document describes the best practices for installing and maintaining native grasses in urban and suburban landscapes in Colorado. Some information about water wise, non-native grasses is also included. It distills the best practices from industry experts into actionable procedures and offers usable resources for landscape owners/managers and professionals.

The objectives of this guide are to:

- Document guidance from experienced professionals and describe the best practices to maximize project success.
- Identify common causes of failure, potential risks, and provide guidance to improve outcomes.
- Provide usable tools for landscape professionals, project managers, program managers, and associated parties involved in decisions and oversight of grass projects.

- Include case studies to showcase options, costs vs. benefits, and water/maintenance savings.

Native and water wise grasses can be used in a variety of ways, including as:

1. A low-water substitute for traditional lawn turfgrasses for low-traffic sites.
2. A low-water, low-maintenance groundcover for large, low-use areas.
3. An integral part of Colorado-friendly, western-style landscapes that embrace the beauty of native plants and the natural environment
4. A way to create habitat for wildlife, birds, and insects in urban areas.
5. Ecological restoration of disturbed sites.

Because native grasses can be used to accomplish different objectives, there are a variety of ways they can be installed and maintained. This manual includes methods specifically for urban and suburban landscapes to achieve quick seed germination, rapid soil cover, minimal weed competition, and active growth during summer months.

These practices differ in many ways from dryland range planting and ecological restoration techniques. In an urban/suburban setting, the visual and usability expectations can be significantly different and irrigation systems are often available. The recommended practices in this resource can be modified to lower input options if slower establishment or a more natural appearance is acceptable.

This manual will be updated as best practices and industry knowledge evolve.

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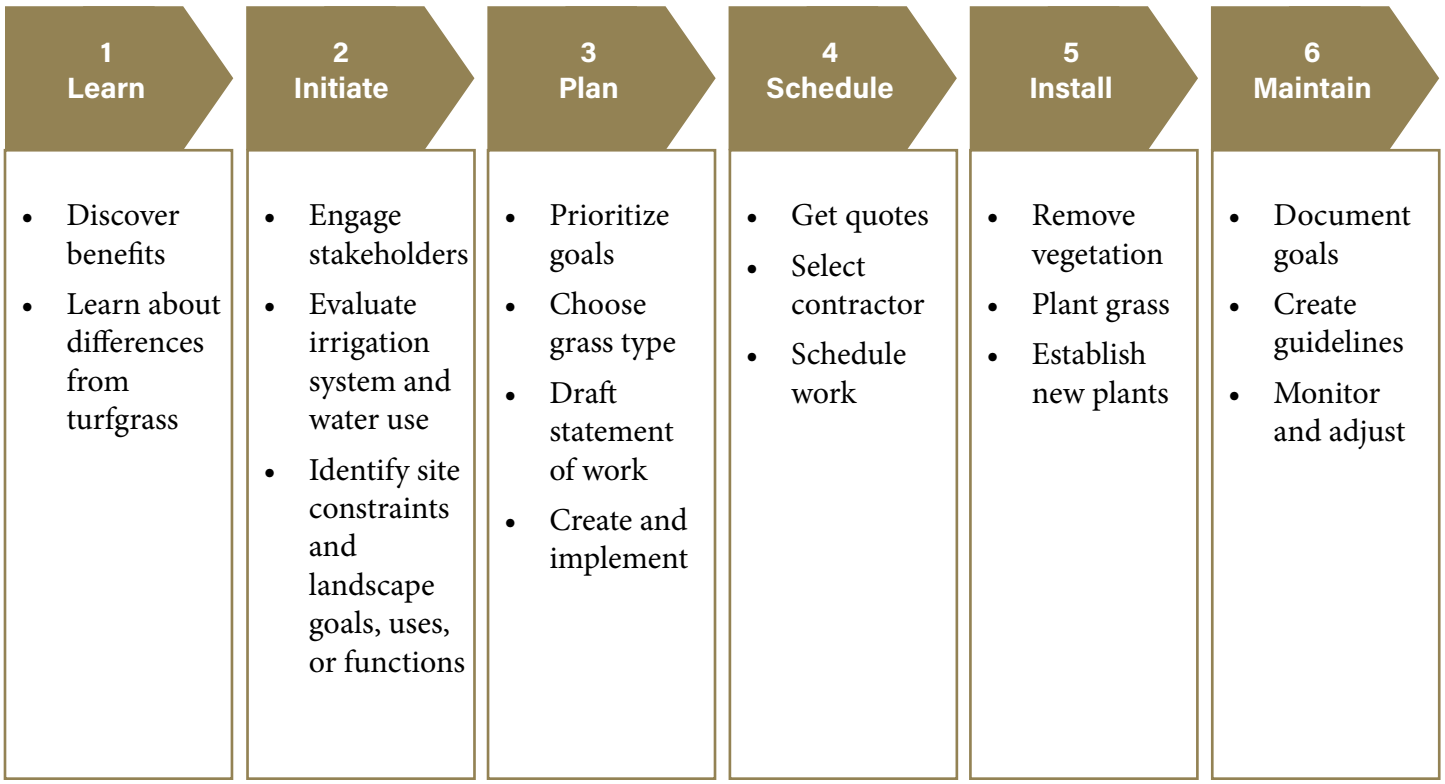
Grass Conversion Project Phases

This planning framework can help grass conversion projects be more successful. Working through these six phases will ensure the project is planned and implemented well, with fewer issues.



We've organized the information in this guide according to these six project phases to help you systematically consider, plan, and implement a successful project. Not all the information or options may apply to your situation. Use the relevant information to help you make wise decisions and transform your landscape.

As you work through the six phases, use your goals to focus your efforts.

While all the project phases are important for a successful project, your interests will determine where to focus. What's your top interest?

1. If your top interest is reducing landscape water use, focus on irrigation efficiency first. Grass and vegetation changes can be considered after the irrigation system and managment is optimized.
2. If your top interest is more resilient grass type to replace a struggling or unhealthy lawn, focus on matching a grass option to the property's site constraints, fixing underlying irrigation system problems, and developing a sound long-term maintenance plan.
3. If your top interest is maximizing the environmental benefits of the landscape, focus on grass species choices, functional landscape design and maintenance practices that support wildlife lifecycles.

With this in mind, let's get started with the six phases of successful native grass projects, specific to urban and suburban Colorado landscapes.

Learning about Native Grass Projects

While it can be tempting to jump straight to choosing a grass type, building your foundational knowledge about the benefits of native grasses and how they differ from traditional turfgrasses is important.

This information can help you determine if native grasses are suited to the project you're considering and how they will look and perform over time.

1. Using native and water wise grasses in landscapes has proven benefits.

    a. Water savings. Conversion projects can yield significant water savings, often ranging from 25-75% compared to traditional turfgrass. Along Colorado's Front Range, Kentucky bluegrass requires about 24 to 30 inches of supplemental irrigation, or more if the irrigation system is less efficient.

    b. The water-saving potential of a project depends on the difference between the current and future water use. The following are major factors:

        1. Current water use
            a. How much irrigation does the existing landscape vegetation require?
            b. How efficient is the existing irrigation system?
            c. How is the irrigation system scheduled and managed?
            d. How much irrigation is being applied?

        2. Future water use
            a. How much irrigation does the native grass require?
            b. How much irrigation will be needed to water the shrubs, trees, turgrass, and any other vegetation that is retained?
            c. How much water will be saved through better irrigation equipment, layout, and management, as well as leak repair?

    c. To maximize water savings, use a grass type with a low irrigation requirement (8-10 inches of supplemental irrigation per growing season). Also, complete irrigation updates that will reduce water waste to ensure good seed germination, establishment, and appearance during dry periods.

    d. Drought tolerance. During drought conditions or watering restrictions, native grasses don't have to be irrigated. This allows irrigation to be redirected to other landscape areas. If they're not watered in summer, native grasses may go dormant (turn brown), but will often regrow when irrigation or rainfall returns, even years later. Their drought tolerance can prevent having to relandscape after watering restrictions are lifted.

    e. Maintenance savings. Most native and water wise grasses require less mowing and fertilization. For example, naturalistic prairie grass mixes or blue grama areas can be mowed as little as once per year in late winter and fertilized only during establishment. Buffalograss and cold-hardy Bermudagrass can be mowed once every 4-8 weeks and fertilized once or twice in mid-summer. For comparison, Kentucky bluegrass is typically mowed weekly (or 26 times per year in Colorado) and fertilized three to four times per growing season. To maximize maintenance savings, choose a grass option that can be mowed and fertilized infrequently.

f. Environmental benefits. Native grasses provide valuable habitat and food sources for insects, birds, and wildlife. Many animal species are dependent upon native grasses to reproduce. To maximize the environmental benefits for insects, birds, and wildlife, choose a mixture of native grasses that are naturally found in your area. The reference plant community in the NRCS Ecological Site Description can be a helpful resource. Choose species that are commonly found in the area in similar ecological conditions. Incorporate native flowers, shrubs and forbs if feasible.

g. Livability benefits. Including grasses in urban landscapes can improve water and air quality, sequester carbon, manage stormwater, and moderate urban heat.

h. Community benefits. Native and water wise grass projects can contribute to an organization's sustainability and climate resiliency goals. If education is included, it can create an opportunity for community members to be better informed about resource stewardship, local ecology, and the value of natural resources.

2. Key differences from traditional turfgrass

a. Foot traffic tolerance. Kentucky bluegrass and other cool-season turfgrasses have excellent foot traffic tolerance due to their rapid growth and spreading habit. Many native and water wise grasses have less traffic tolerance due to their bunching growth habit and are best used where traffic is infrequent, like front yards or peripheral areas. A few spreading native and water wise grasses, like buffalograss and cold-hardy Bermudagrass, have moderate to high traffic tolerance and can be used where some sustained use will occur.

b. Appearance. Native and water wise grasses can look different from traditional turfgrasses due to their color, active growth season, seedheads, height, and uniformity. Much of Colorado is naturally a grassland. Native grasses can help create landscapes that reflect the beauty of Colorado's natural environment in urban areas.

1. Leaf color. Some native grasses have lighter green or blue-colored leaves in summer. The leaves of many native grasses turn beautiful yellow, orange and red tones in fall, which can create an attractive fall landscape.

2. Active growth period. Warm season native and water wise grasses grow best in midsummer. They come out of dormancy and turn green later than cool-season turfgrasses (mid-May) and go dormant or turn brown earlier (early October). This shorter growing season can result in significant water savings due to less irrigation required in spring and fall. Warm season grasses grow well in the height of summer (June, July, and August) when many traditional turfgrasses show browning or slow growth due to midsummer heat.

3. Seedheads. Many native and water wise grasses will produce noticeable seedheads in mid to late summer. These can either enhance their ornamental quality and wildlife value or be removed by mowing to create a more manicured look. Like traditional lawn grasses, some cultivars of buffalograss ('Legacy' and 'Prestige') do not produce seedheads.

4. Height. Buffalograss and Bermudagrass are shorter than traditional turfgrass and require less mowing. Select short grasses where a mowed appearance is desired. Many native grasses are taller than traditional turfgrass and perform best when mowed infrequently, no shorter than six inches tall. Naturalistic landscapes, areas adjacent to open space, peripheral areas, and large areas with defined walkways or sidewalks can be ideal areas to use taller grasses.

5. Uniform appearance. Traditional turfgrass has a shorter, uniform height. Areas with a single type of native or water wise grass will be more uniform in height, color, and texture than native grass mixes. Native grass mixes, which usually incorporate five to fifteen species, will display a variety of leaf colors, taller heights, and seedheads.

c. Public perception. Because many native and water wise grasses are taller than traditional turfgrass, have seedheads, or appear less uniform in height, color, or texture, the public may perceive the area as "weedy." Later spring green up can also cause concerns from community members. Education and outreach throughout the planning, implementation and maintenance of the project is a critical component of project success. Communicating the project's long-term goals and benefits can help with public acceptance. Check local ordinances to determine where taller grasses are allowed.

d. Maintenance needs. Caring for native and water wise grasses requires different techniques and timing than traditional turfgrass. Using a typical weekly turfgrass maintenance schedule for native or water wise grass can prevent the expected project savings from being realized and lead to unhealthy native grass. Develop a maintenance plan that outlines irrigation scheduling, mowing frequency, mowing height, fertilizer timing, weed control, and recommended equipment to be used to ensure the project goals and grass health are achieved. Find a customizable maintenance template at coloradonativegrass.org.

e. Suitable locations. Native and water wise grasses work best in low-use or low-maintenance areas. They can work especially well in areas where turfgrass may be difficult to maintain, like medians, tree lawns, slopes, and stormwater management areas. Low-traffic or peripheral areas of parks, campuses, and business landscapes can also be ideal.

f. Wildfire concerns. While dry grasses are flammable, they can be managed to reduce the risk from wildfire. Use these strategies in combination with a site-wide fire mitigation plan.

1. Choose shorter species. Where wildfire risk is high, select shorter grasses to minimize the fuel load.

2. Water periodically. Green, actively growing grasses are generally not a fire concern. To prevent grasses from turning brown in summer, irrigate periodically during the growing season to prevent them from going dormant in hot, dry weather. Consistent moisture (watering one to four times per month) will lessen the chance they will catch on fire. Watering consistently throughout the summer is a more effective approach than watering dormant grasses heavily when fire concern in high. It can take several weeks for grasses to come out of dormancy and is not an effective emergency approach.

3. Mow grasses in fall. Fall mowing can reduce the fuel load for the winter when grass fires may occur. Mow grasses no shorter than six inches tall. Mowed grass areas may be more susceptible to weed invasion and will require more monitoring and weed control. An alternative to mowing the entire stand is to mow firebreaks at strategic locations and allow some areas of grass to remain unmowed until early spring. Grasses can also be mowed around wooden fences or structures to reduce risk.

4. Manage ladder fuels. Shrub and tree branches close to the ground may catch fire if they are in close contact with burning native grasses. Consider pruning lower tree and shrub branches to prevent fire from moving into the tree canopy. Mow grasses under trees and shrubs, or separate native grasses from tree and shrub areas. Keep taller grasses away from flammable structures.

3. Checklist for success.
    a. Clearly define the reasons for a native or water wise grass project.
    b. Decide if their appearance and traffic tolerance will meet requirements and expectations.
    c. Decide if the project benefits justify the investment required.
4. Additional resources
    a. Visit the Colorado State University Extension Lawn Conversion Resources Page.
    b. Explore the native grass project case studies (coming soon).
    c. Learn from the grass profiles.

Initiate

Now that you've learned about the benefits of native grasses and learned about their differences from turfgrass, let's move on to how to start a successful project. Finding people to serve on the project team, reaching out to stakeholders, and fixing any irrigation system issues should be done early in the process. These steps will lay a strong foundation for a native grass conversion project.

1. Engage stakeholders and form a project team.

    a. To set the stage for success, determine the stakeholders of the project. This could include anyone potentially impacted by the project, including the community residents, property owner or manager, project manager, governing Board members, municipal planning department, landscape contractors, irrigation and maintenance personnel, facility managers, and members of the larger community.

    b. By making a plan to inform stakeholders of the project's purpose, scope, budget, and schedule, they can provide input and advocate for the project's success.

    c. If possible, form a project team that will be responsible or accountable for project tasks. Include members who will contribute to the project in some way or want stay informed about the project's progress. Meet regularly to discuss progress, challenges, and solutions. These project champions can find ways to overcome roadblocks and solve problems.

2. Consider irrigation efficiency and repair early in the planning phase. Transitioning to sustainable landscape water use is important for all Colorado communities. If water savings is a project priority, address the irrigation system before converting the grass to a different species. Investing in irrigation efficiency through fixing leaks, modernizing the controllers, more frequent maintenance checks and repairs, better management, and equipment upgrades can often achieve 25% water savings (or greater) even without vegetation changes.

    Another benefit of investing in irrigation efficiency is that savings can be realized as soon as irrigation changes are made. Savings from vegetation changes often take longer to realize since regular watering is required during seed germination and establishment. If a conversion project is already planned, it is important to invest in irrigation repairs and upgrades before planting to ensure its success. Without good irrigation coverage, seed germination may be irregular or fail altogether.

3. Here are steps to address irrigation efficiency.

    a. Assess past water use. If past water use records are available, gather several years of water use data. Past utility bills and consumption records can contain this information. Compare the actual irrigation use to the recommended amount for the type of turf or vegetation and geographical location. Determine if the property has been underwatered or overwatered on average. Some water providers have staff who can provide this service. Irrigation efficiency or water management professionals may also be able to help.

    b. Define a water use goal. Once the current irrigation use is quantified, define a future water use goal. This can be a percentage reduction or an average annual gallons per square foot goal. It will help define a water management strategy, identify design options, and measure success. A cost-benefit analysis of potential landscape projects based on the water use goal can help determine which projects to fund.

c. Have an irrigation system evaluation performed. Landscape professionals and irrigation specialists can evaluate the existing conditions of a sprinkler system to determine beneficial upgrades and repairs. Through an onsite inspection of the system, they can identify leaks, scheduling improvements, and opportunities for savings through equipment and controller replacements. Ask for a prioritized list of work or a site walk-though so that repairs and improvements can be implemented in a systematic way. Rebates for repairs and equipment upgrades may be available from the local water provider.

d. Try irrigation efficiency or reduction measures first. If the site has been overwatered historically and there is an opportunity to gain savings through repairs, better irrigation management, or equipment changes, determine if irrigation reductions or efficiency measures can meet the water use goal without vegetation changes. A cost-benefit analysis of options may help. Another approach is to try simply reducing the frequency of watering days or run times to see if water savings can be accomplished while maintaining an acceptable appearance of the grass. These low-cost options sometimes achieve the organization's goals without having to undertake major conversion projects.

e. Map irrigation zones to conversion sites and areas where turf will be retained. Often, landscape managers will choose to retain some turfgrass at a site and convert other areas to native or water wise grass. Because native grass should be watered on a different schedule from traditional turfgrass or preserved trees/shrubs, it is important to define and separate grass conversion areas based on existing irrigation zones. By ensuring that irrigation zones are matched to the water needs of the vegetation to be supported, the native grass can be watered less often than the remaining turfgrass, trees, or shrubs through irrigation scheduling. If an irrigation system map is available, identify irrigation zones for potential grass conversion and turfgrass retention. If an irrigation map is not available, the person performing the irrigation evaluation can help identify the location of potential conversion areas. Sometimes the irrigation system will need to be reconfigured to accommodate the grass conversion or retain portions of turfgrass. Future site-wide water use can be calculated once the future vegetation type is identified.

f. Implement, refine, and monitor. Once a plan has been implemented, monitor water use and refine actions as needed to meet the community's goals.

4. Checklist for success:

a. Identify stakeholders and form a project team to support the project.

b. Repair, upgrade, and manage the irrigation system first to gain water savings and create a foundation for successful grass establishment.

c. Define a water use goal for the property to guide investments and evaluate progress. A list of desired project benefits can also aid decision making.

d. Define the areas that will be converted to native or water wise grasses by irrigation zone.

e. Once a project is implemented, monitor the benefits and water use to correct course, if needed.

Choosing a Grass Type

After exploring native grass benefits, forming a project team, and addressing irrigation problems, the next step is to explore what grass types are best suited for your project. It's important to identify feasible options before getting too far into the planning process.

The best way to make this decision is to learn which grasses match the site's characteristics, then rank the options based on the community's preferences. This will ensure the grass will grow successfully and the residents will be satisfied with the result. If you would like to preview the most commonly-used native and water wise grass species and mixes used in Colorado's Front Range, see Table 1.

1. Steps to choose a grass. Work through the following six steps to find suitable grass option(s). Consult with stakeholders to gain agreement and record the information.
    a. Identify standards and requirements, if applicable.
    b. Define project objectives.
    c. Map how different areas will be used.
    d. Identify site conditions and constraints.
    e. Record visual preferences.
    f. Choose from suitable options.

2. Identify standards and requirements. Research if there are any landscape standards or specifications from codes, covenants, or other requirements. Determine if your project will need to be reviewed by any local governing entities during the planning stage. If review is required, incorporate this task into your project schedule. This step may not be important for projects without standards or requirements.

3. Define project objectives. Because there are many different ways to plan and implement native grass projects, it's important to determine what the stakeholders want to achieve. Decide which of the following objectives are important, and rank them from the most important to least important if more than one options is chosen. Keep these objectives and ranking close at hand to guide decision making and filter options.

    a. Maximizing cost savings from less mowing, fertilizer, and watering.

    b. Stewarding the environment more by using less water, energy, fertilizer and chemicals while maximizing ecological function.

    c. Improving landscape appearance by using vegetation better adapted to the local climate and conditions. This may be a priority on sites where the grass has struggled. Try to learn why the grass has declined to see if any irrigation improvements, landscape changes, or maintenance adjustments might be needed before changing the grass type.

4. Map how different areas will be used. Identify on a site map any of the areas that will be used for the following. Gaining agreement will help find grass types that will support the intended use and define suitable locations.

    a. Play areas or regular use

b. Pathways where the grass needs be short within a six-foot buffer

c. Pet use (urine)

d. Slope stabilization

e. Stormwater management

f. Locations for piled snow in winter

g. Identify site conditions. Many grass species grow better in certain conditions than others. By learning about and mapping the conditions at your site, you can choose a grass type that has the best chance of thriving with the site's constraints. Important site conditions to note include:

1. Sun/shade
2. Soil type
3. Presence of valuable trees/shrubs
4. Elevation
5. Slopes
6. Site drainage
7. De-icing salts in winter
8. Notes where the irrigation system in good working condition or will need improvements or modifications.

h. Record visual appearance preferences. Determine if the native grass areas should have a uniform and tidy appearance or if a more naturalistic look is acceptable. Height and uniformity are the most important components to gain agreement on with stakeholders. Visual appearance characteristics include:

1. Height
2. Uniformity
3. Active growth season
4. Presence of seedheads in fall/winter
5. Color
6. Density

i. Choose from suitable options. After determining the project objectives, landscape uses, site conditions, and appearance preferences, use Table 1 and Table 2 to determine the feasible options. If

the desired qualities or site characteristics are significantly different across the property, section the property into different areas and match the grass option to the area. This may result in two or more grass options being used at the property.

j. Confirm the availability of seed, plugs, or sod. Once you've selected a grass type, have the landscape contractor or project manager confirm that the seed, sod, or plugs are available for sale. Contact the suppliers several months before the materials are needed. Sometimes crop failures, changes in production levels, and business closures can affect availability.

k. Project timing. Some grasses are best planted in June and July. Determine if staff and contractors can execute the project at the ideal time or workarounds will need to be developed.

5. Suggestions for special circumstances.

a. Native grass lawn. Few Colorado native grasses will achieve a traditional lawn-like look. Buffalograss may be the best option, but is best suited to elevations below 6,800 feet. It does not grow well on very sandy or gravelly soils. Allowing the grass to grow taller than a traditional lawn inbetween mowings will allow for greater grass type choices. Choose a single species or the buffalograss/blue grama grass mix for a more uniform appearance.

b. Maximizing ecological function. Support wildlife, birds, and pollinators with Colorado-friendly native grasses. Include a variety of grasses by using a mixture of species to add Colorado-style beauty, color and texture. The native prairie mix or a customized native grass mix are good options. Preserve seedheads for winter interest by not mowing in fall. Taller grass species like little bluestem, big bluestem, switchgrass can be included in a mix for more ecological value. Add wildflowers or shrubs (potted plants or seeds) at time of grass seeding to benefit pollinators if broadleaf herbicides will not be broadcast across the site.

c. Pathways. If mowing along pathways will be continual, consider seeding with only a short grass, like buffalograss, three to six feet on either side the pathway in the "beauty band." Taller grasses can be seeded beyond the "beauty band" zone. Continual mowing of taller grasses close to pathways will cause them to turn brown, stop growing, and be more prone to weed invasion.

d. "Naturalized" Low-input Kentucky Bluegrass with infrequent watering, mowing, and fertilizing can result in a low to moderate turf quality that mimics a native grass area. Seedheads can give the area a "natural" appearance. By changing the management practices, it may be possible to achieve the project objectives without changing the grass type. This option is worth testing before a grass conversion especially if near-term cost reduction is the primary goal.

6. Checklist for success

a. Work with the project team to identify site condition constraints and prioritize project goals.

b. Choose a grass type that will tolerate the site's constraints and meet as many of the goals as possible.

c. Confirm availability of selected seed, plugs, or sod before making a final selection.

Table 1: Common Native and Water Wise Grass Types for Colorado Landscapes; require 8-10 inches of irrigation per growing season or less along Colorado's Front Range (50-80% irrigation reduction compared to cool season turfgrass).

Grass Type	Uses	Notes
Buffalograss	• Lawn replacement • Groundcover for low to moderate traffic areas • Good groundcover for Front-Range, Colorado-style landscape designs	• Short grass; grows to 3 to 6 inches tall. • Minimal mowing required. • Best for full-sun sites up to 6,800 ft in elevation with clay content in the soil. • Not suitable for very sandy soils. • Spreading habit makes it valuable for stabilizing slopes and tolerating moderate traffic. • Can tolerate occasional flooding in stormwater infrastructure.
Blue grama grass	• Best used as a groundcover for low-traffic areas • Good groundcover for Colorado-style landscape designs	• Grows 6 to 18 inches tall (with seedheads). • Best for full-sun sites up to 8,500 ft in elevation. • Tolerant of many soil types and growing conditions. • Grows best when mowed three times per year or less. • Not traffic tolerant.
Buffalograss/blue grama grass mixture	• Groundcover for low-traffic areas • "Low-grow," low-maintenance native grass mix for natural landscapes or restoration • Good groundcover for Colorado-style landscape designs	• More uniform appearance than native shortgrass prairie mixture. • Can be mowed for a lawn-like appearance or left unmowed for a more natural look; moderate traffic tolerance • Grows 6 to 18 inches tall (with seedheads). • Best for full-sun sites up to 7,000 ft in elevation. • Tolerant of many soil types; good choice when soil type is variable or unknown
Native shortgrass prairie mixture (Often includes grasses like buffalograss, blue grama, sideoats grama, western wheatgrass, green needle)	• G for low-traffic areas • Can provide wildlife, bird, and pollinator habitat • Groundcover for ecological restoration	• Standard mixture of common Front Range warm and cool-season grasses provides a low-grow variety of color and texture. Not suitable for frequent foot traffic. • Grows 12 to 18 inches tall (with seedheads). • Best for full-sun sites up to 7,000 ft in elevation. • Good choice for areas where irrigation will be turned off long-term.
Customized native grass mixture (Several different grass species are included based on site conditions, ecological function, and visual look.)	• Groundcover for low-traffic areas • Can provide wildlife, bird, and pollinator habitat • Groundcover for ecological restoration	• Grasses can be customized for any elevation, height, part shade, and site conditions. • Taller grasses can be included to maximize wildlife, bird, and insect value. • Flowers and shrubs can be included to support pollinators, birds, and wildlife. • Good choice for areas where irrigation will be turned off long-term. • Not suitable for frequent foot traffic.
Cold-hardy Bermudagrass (not native to Colorado)	• Lawn turfgrass replacement	• Considered experimental; winter hardiness is being evaluated in Front Range sites. May spread into natural areas, especially riparian sites. • Traffic tolerant. Cold hardy to 6,500 ft in elevation; not native to Colorado. • Mow to 1-2 inches for manicured look; unmowed it will grow to 4 inches tall. • Slow vertical growth rate results in less mowing.

Table 2: Grass Characteristics by Species or Mixture Type.

Compared to Table 1, several more options are included to address specialized site constraints. Once a species is identified, confirm that the species, subspecies or cultivar will perform as expected. Within a grass type, some species, subspecies, or cultivars vary in their requirements or growth habits.

Characteristic	Buffalograss	Blue Grama Grass	Buffalo/Blue Grama Grass Mix	Native Priaire Mix	Customized Native Grass Mix	Western Wheatgrass	Cold Hardy Bermudagrass	Fine Fescue
Requires 50-80% less irrigation water than a traditional lawn.	●	●	●	●	●	●	●	
Tolerates shade (less than 6 hours of sun per day).							●	●
Can be used for a low-water lawn (uniform look and short height).	●						●	
Suitable where a uniform appearance is desired.	●	●	●			●	●	●
Will have variation in height, leaf color, and leaf width.				●	●			
Grows best when mowed infrequently and allowed to grow 12 -24 inches tall.		●	●	●	●			
Active growth is May through early October; grows best in midsummer heat.	●	●	●				●	
Active growth is April - November; slows in midsummer heat.				●	●	●		●
Suitable for elevations above 6,800 ft.		●			●	●		●
Tolerates sandy or gravelly soils.		●	●	●				●
Tolerates frequent salts from pet urine or de-icing salts.						●	●	
Tolerates periodic flooding.	●				●	●		
Stabilizes slopes and prevents soil erosion.	●		●		●	●		
Native to Colorado; supports pollinators and birds	●	●	●	●	●	●		
Suitable for six-foot pathway buffers or “beauty bands.”	●							
Can tolerate broadcast applications of weed control products.	●	●	●			●	●	●

Planning

1. Engage stakeholders, project team, and wider community in the planning process. It's important to figure out how the team will accomplish the tasks required for a successful project.

   a. Organize the project team. The project team consists of the people who will contribute to the project planning, execution, and maintenance phases. Once team members have been identified, draft a high-level timeline and determine how often you'll meet, communication needs, and each person's role and responsibilities. Identify decision makers and outline how decisions will be made and recorded, as well as how conflicts will be resolved. Develop a plan to communicate within the project team to ensure progress and success.

   b. Involve stakeholders. Stakeholder engagement is critical for a project's success. Identify stakeholders that could be impacted by the project. Determine how and when to involve them and develop a communication plan to inform them, gain feedback during the planning phase, identify issues, and manage expectations. Clearly communicate the project's objectives such as minimizing maintenance costs, reducing or eliminating irrigation, encouraging wildlife, etc. Communicate the changes in appearance, cost, process, and timeline so stakeholders understand the goals and have realistic expectations throughout the project.

   c. Plan consistent communication. Reaching out to stakeholders at regular time intervals or project milestones is very important. Expect the residents to be curious and interested in providing feedback. Placing signs in the area before the project starts and at major milestones has proven to be an effective method in combination with other communication channels. Regular communication can help prevent native grass areas being watered, fertilized, and mowed like lawn areas in an attempt to make them look more manicured.

   Plan how to respond to common community concerns, should they arise, such as:

      1. It will look more unkept and messy than traditional turfgrass
      2. It may turn brown
      3. Native grass areas will be weedy
      4. It might become a fire hazard
      5. Tall grass attracts unwanted wildlife like snakes, rodents, predators or problematic insects.
      6. Native grasses will invade lawns and gardens

   Reduced Maintenance Grass Areas for HOAs by Dr. Tony Koski, Turfgrass Extension Professor at Colorado State University, provides information about how to address these concerns.

   d. Identify key personnel. There are a few important roles for a native or water wise grass project. In smaller projects, an individual may play more than one role. In larger projects, most roles will be filled by one or more people. Some roles may be filled through the bidding and contracting process. Identify or designate decision makers.

      1. Project manager – identify, organize, and manage the resources needed for the project.

2. Communication manager – Communicate messages and decisions to other team members. Manage education and outreach to stakeholders.

3. Irrigation professional – assess the irrigation system's current conditions, provide recommendations, and make improvements. Manage irrigation during establishment and long-term maintenance (if applicable).

4. Landscape installation contractor – kill and/or remove existing vegetation, acquire seed/sod/plugs, plant new grass, manage weeds and irrigation through the establishment process. Irrigation may be managed by either the landscape installation or the irrigation professional.

5. Landscape maintenance contractor or in-house maintenance staff– mow and fertilize grass over the long-term. Proactively manage weeds and irrigation (if applicable).

2. Identify financial resources to pay for the project. In the planning phase, begin to figure out where the money will come from and the process to secure funds.

   a. Estimate project costs. Research similar projects or find cost-per-square-foot estimates to develop a cost estimate range for initial planning. Ask landscape experts for guidance.

   b. Access in-house funding. Talk with the financial managers in your organization to see if funding is available. Learn how budget is allocated and the steps required to reserve money.

   c. Grants and rebates. Financial assistance may be available through municipal, water provider, state, federal, or private entities. Turf replacement, xeriscape rebates, and turfgrass to native grass programs may be applicable. Check the program rules, process, lead times, and requirements to ensure your project is eligible for funding. Savings from irrigation repairs, improvement, and management may also lead to lower water bills that can help offset project costs.

3. Select the site(s).

   a. Start with low-risk areas to build capacity. Gaining the skills to be successful with native grass seeding projects can be a learning process. There may be bumps along the way that put the project at risk of being cancelled. Consider starting with low visibility, low value areas, including those where the existing vegetation may be in poor condition and improvement will be valued. If challenges arise, the project team may be able to course correct without negative feedback from stakeholders. It may be wise to save high visibility, high value areas for a later phase when the team is more experienced and stakeholders have had greater exposure to native grasses. This can lead to more successful projects thoughout the site over the long-term.

   b. The best areas for native or water wise grass projects are sunny, low traffic, and have few valuable large shade trees.

      1. Full sun conditions. When choosing areas to convert, look for areas that receive at least six or more hours of sun per day. Most native and water wise grass species require full sun conditions to grow well.

      2. Choose low-traffic, low-use areas. Many native and water wise grasses cannot withstand consistent foot traffic from people or pets. Look for areas to convert where concentrated play, traffic,

and use are infrequent for best success. Adding gravel or concrete pathways can help make large native grass areas more usable. Buffalograss and Bermudagrass can tolerate more traffic and may be suitable options depending on the site conditions.

3. Avoid snow pile locations. Native grasses can be killed by concentrated salts. Don't plant native grasses in areas where plowed snow with salt or sand will be piled. Concentrated high-salt runoff can also cause damage.

4. Look for areas without large, valuable shade trees. Native and water wise grass conversion areas will be watered less. Consider the impact of less irrigation on existing trees over the long term.

a. Large, healthy shade trees growing in irrigated turfgrass are likely to experience stress when the water is cut back, leading to decline and death. If preserving trees is a high priority, then the area may not be suitable for native or water wise grass, or irrigation modifications will be needed to ensure the tree's water needs are met.

b. For large or closely spaced trees, identify a suitable mulch or groundcover to be used under the entire tree canopy where native grasses are not suitable.

c. Pine and evergreen trees often require less water than deciduous trees and can be compatible with native grass, especially if the area will be watered periodically. Low water shade trees, like oaks and hackberry, may also work.

d. If a conversion area will not be irrigated over the long-term, it will be challenging for existing or newly planted trees to survive without extra water.

e. In new construction, trees can be irrigated with drip irrigation in native grass areas to provide extra water. This option may represent added costs for existing landscapes. It may be expensive to add a dedicated drip irrigation zone to trees. The cost will depend on the existing site conditions and should be evaluated for feasibility.

f. If existing trees are not providing much value due to their poor condition, it may not be worth considering the project impacts on tree health.

c. Part-shade to shade situations. Because most water wise and native grasses require six or more hours of direct sun per day during the growing season, part-shade and full shade areas are not suitable for native grass conversions. To reduce the amount of irrigation in shady areas, consider removing grass and installing wood chip or shredded wood mulch. Another option is to overseed with fine fescue grass for limited water savings. Fine fescue can tolerate shade under deciduous trees and can be watered twice per week on average along Colorado's Front Range (~30% reduction compared to a traditional lawn).

d. Green infrastructure. If a native grass area will serve a green infrastructure function, like stormwater detention and infiltration, take these requirements into account during the planning process. If the grass will be submerged on occasion, consider selecting species that can tolerate periodic flooding like buffalograss, green needle, western wheatgrass, or switchgrass. If parking lot or sidewalk runoff will be diverted into the area, choose grass species that are also salt tolerant to prevent death from deicing salts.

Steep slopes and swales with rushing stormwater may need species with rhizomes or deep roots to withstand erosion. In addition, these areas may need soil stabilization measures, like erosion blankets, during the establishment phase. While green infrastructure landscaping may be designed to handle

temporary flooding, it is also be important to install irrigation to water the grass during extended hot, dry conditions. Irrigation is especially important in areas with reflected heat from concrete, asphalt, and bricks. Stormwater rules may dictate certain species or installation techniques. Check with your city or stormwater entity for more guidance.

4. Irrigation system considerations during the planning phase

a. Temporary irrigation. If an area will not be irrigated long-term, consider using a temporary irrigation system for better germination and establishment.

1. A temporary irrigation system is built above ground, left in place for one or more years, then eventually dismantled and removed.

2. Irrigating will dramatically improve the likelihood of good seed germination, seedling growth, and soil cover. Projects with no irrigation may take five to ten years to establish because of variations in natural rainfall and weather conditions.

b. Permanent irrigation systems. Using an existing in-ground irrigation system can be a tremendous asset for a native or water wise grass project. It can be used to ensure successful seed germination and establishment. Once the grasses reach maturity, the area can be watered less often (one to four times per month) or only during hot, dry periods. To maximize water savings and plant health:

1. Zone native grass separate from turfgrass. Native and water wise grasses should be watered on a different schedule than turfgrass. Be sure to plan the project so entire irrigation zones are converted to native grass rather than parts of zones. Do not convert only part of a zone unless the existing vegetation can tolerate being watered less often.

2. Modify irrigation zones. If site conditions make it challenging to convert an entire irrigation zone, it may be possible to modify the existing layout of the irrigation system by changing one or more zones. This may involve separating, connecting, or adding irrigation zones. If other irrigation modifications are necessary, consider adding a drip zone(s) to maintain the health of existing trees.

3. Change to taller heads. Where native grasses will not be mowed, install or replace existing heads with taller ones (at least 6 inches) to allow the irrigation water to spray over the grass seedheads without being blocked.

4. Protect valuable trees and shrubs. Modifying an irrigation system may involve trenching. Avoid damaging the roots of existing trees and shrubs by only trenching outside of the dripline.

5. Upgrade to high-efficiency equipment. A native grass project can be an ideal time to upgrade irrigation equipment. This may involve replacing existing heads, nozzles, and controllers with more modern or high-efficiency models. Newer equipment can improve plant health, save water, and make landscape management easier. Many water providers offer rebates for high-efficiency irrigation equipment.

6. Install flow sensors. These devices monitor the water flow and alert maintenance staff if the flow is significantly different from expected. They help identify leaks and irrigation problems that

can result in over or underwatering.

5. Develop a project statement of work. Once the project has been defined, record the scope of the project, the location, key tasks, and measures of success in a statement of work. This document can be used both as a communication tool and to ask for price bids from potential contractors. See coloradonativegrass.org for a sample statement of work.

    a. Outline services required beyond seed planting, such as site preparation, irrigation repairs/upgrades, weed control, irrigation management, and post-planting inspections. Contracting these services for two to three years can ensure the project has a successful outcome.

    b. Specify the desired warranty period.

6. Municipal review process, if applicable. Some municipalities and counties require native grass projects to be reviewed and approved before the project starts. Check with your local government or regional building department for details.

7. Receive bids from installation contractors. Use the statement of work to ask potential contractors for price bids and when they can schedule the work. Try to get more than one bid to compare offerings from different businesses. Many contractors will want to walk through the site and ask clarification questions before submitting a bid.

    a. Select a contractor. Compare prices and schedules to determine the best offer. Take into account a contractor's knowledge and experience with native and water wise grass installation projects and weigh their value-added services. If seed will be used, look for a business with experience in grass seeding projects. Ask for references from projects similar in size and scope to verify the contractor has the skills and judgement needed to be successful. Ensure they have the desired seeding and mowing equipment (one that can mow at 6 inches or greater). When a contractor has been selected, notify them and schedule the project within an acceptable window of time for the installation. Draft a responsibility matrix to clarify roles and determine communication protocols to resolve issues. See coloradonativegrass.org for sample list of tasks for a responsibility matrix.

8. Create a plan for transitioning between project phases. Often, the installation contractor is not the same personnel that will maintain the native grass over time. By creating a transition plan with clear tasks, guidelines, and expectations for the maintenance personnel, a project is much more likely to achieve its objectives. Arrange a meeting with the project team and maintenance personnel both prior to and at handoff time to ensure success. Coordination with the person managing the irrigation system is critical.

9. Community and neighborhood outreach. Before the project starts, communicate with stakeholders and the larger community about the project plan, the goals and objectives, and what they can expect to see

over the next few months. It is important to communicate that native grasses often take longer to grow and establish than turfgrasses to set expectations appropriately. Emails, newsletters, temporary signs, and in-person or virtual meetings can all be effective delivery methods. Proactive communication can greatly reduce negative comments from the public and residents.

10. Checklist for success.

    a. Engage stakeholders, project team, and wider community in the planning process.

    b. Find the money to pay for the project, select the site(s) for conversion, and develop a statement of work.

    c. Get bids from contractor, select one, and schedule the work.

    d. Plan for transitioning the project to the maintenance personnel.

    e. Conduct community outreach.

Installation Process

The process used to install the grass is critical to the project's success. This section covers options and recommendations for site preparation and planting. Choose which options will be best for your project based on the site conditions, the type of grass to be planted, and the availability of equipment. Planting at the right time of year is also important.

1. Plant propagule type (seed, sod, plugs, or sprigs). Native and water wise grasses can be installed by seed, sod, plugs or sprigs. Be sure to plan your project with the correct propagule type.

    a. Seed – most native grasses are planted by seed.

    b. Sod – Bermudagrass is the only option currently sold as sod.

    c. Plugs – plugs are small plants sold in trays. The plants are planted 12-18 inches apart and fill in over time. Buffalograss and Dog Tuff Bermudagrass are two grass types commonly sold as plugs. Buffalograss plugs contain only the female plants, so the grass looks more uniform due to the absence of the male plant flower stalks.

    d. Sprigs – Sprigs are pieces of ground up sod used for planting Bermudagrass only (see "Sprigging").

2. Timing projects. It is important to seed at the right time of year, which varies based on the type of grasses being installed.

    a. Seeding single species projects with irrigation

        1. Warm season species like buffalograss, blue grama, and Bermudagrass are best planted from June 1 to July 31, depending on the weather. They will germinate and root best when the soil temperature is warm in mid-summer. Seeding too late in the year may result in small seedlings that are likely to be killed by winter weather.

        2. Cool season species like western wheatgrass and fine fescue can be seeded from April 1 to June 15, or August 1 to September 15.

    b. Seeding mixes of cool and warm season species like the native prairie or customized mixture with irrigation

        1. Seed mixes are best planted between May 1 and August 31.

    c. Seeding non-irrigated projects

        1. Seed is best planted between November 1 and May 1. By planting after the growing season ends in early winter, the seed will be chilled by cold weather to break dormancy and is more like to work its way down in the soil. When the temperature and moisture conditions are favorable in the spring, seed will germinate and begin to grow. If there is a lack of precipitation, the seed may not germinate. Non-irrigated projects are not guaranteed to be successful in Colorado's climate where precipitation is erratic and unpredictable.

d. Plugs, sod, and sprigs of Bermudagrass or buffalograss

1. Best planted between June 1 and August 1, when warm season grasses are growing rapidly.

3. Vegetation and weed removal. It is important to kill any existing grass and weeds before planting to achieve a uniform appearance, minimize the growth of existing weeds and grasses, and ensure water saving is achieved. This can be done through applying a non-selective herbicide like glyphosate or using a sod cutter.

a. Herbicide – Weed and grass killers can be effective in killing persistent species and preserve valuable organic matter/topsoil. Water the existing plants prior to treating with herbicide since many formulations will only work on well-watered, actively growing vegetation. Two to three applications may be needed to fully kill the existing vegetation. Control problematic weeds and tree suckers before planting, perhaps by tank mixing two or more types of herbicides. If weeds are present after three herbicide applications, consult an expert for other herbicide recommendations that can be more effective. Make sure enough time is built into the project schedule for several applications, if needed. Follow all directions on the herbicide label.

b. Sod cutter – Live grass can be removed with a sod cutter. This is the quickest method to remove existing grass, but also removes the valuable organic matter and topsoil. The removed material will need to be disposed of or recycled. Also, the existing turfgrass may regrow from the roots after the new grass is installed. This method won't remove many persistent types of weeds since they often regrow from root fragments deep in the soil. Removal of existing grass may trigger stormwater and sediment control measures, which can add permitting requirements, cost, and time to a project.

c. Cardboard method – For small projects, it may be possible to wet the soil thoroughly and then cover the area in cardboard and mulch for a year to shade out existing grasses and weeds. Plan on planting the year after the area is mulched. Rake off the mulch and any cardboard that hasn't broken down before planting to expose the surface of the soil.

d. Silage tarps – These large, light-proof tarps are commonly used in organic agriculture for pre-planting weed control. Although highly experimental, they may be worth considering if the site conditions and schedule are favorable.

4. Soil Preparation

a. Test the soil. Most native grasses do not need soil amendment (compost, manure, or topsoil) added to the soil prior to planting unless the soil organic matter is below 1-2%. Early in the project, send a soil sample to a professional soil testing lab to determine what soil preparation may be needed, if any.

b. Decide if the soil needs tilling. Tilling may not be necessary if the existing soil is not compacted. Some seeding methods can plant seed directly into dead grass and weeds, which minimizes weed seed germination and avoids disrupting the soil structure. Plugs can also be planted into dead material. However, if the soil is compacted, then tilling is an important step prior to planting. Alleviating soil compaction will help air and water move into the soil, creating a healthier rooting environment for the new grass. Tilling is also important to do before installing Bermudagrass sod since the sod

needs direct contact with the soil surface to establish. After tilling, fine grade the soil to break up clumps and level the surface through harrowing, dragging, or raking.

c. Core aeration. In areas where tilling is not possible, like around the roots of mature trees, core aeration can help alleviate soil compaction to a limited extent.

5. Irrigation system modifications or temporary irrigation

   a. Address any upgrades, repairs, and changes prior to planting. See Section 4 for more information.

   b. Build the temporary irrigation system (if applicable) after rough grading and soil preparation.

6. Planting methods and equipment. Grass seed needs to be in contact with the soil to germinate well. Common seeding methods are described below. Most native grass seed grows best when planted 0.25 to 0.5 inches deep in consistently moist soil. If a project site has areas with different characteristics, more than one seeding method may be needed.

   a. Drill seeding – This planting method uses a machine that plants the seed directly into the soil at a specified depth. Because the seed is protected by the soil, better germination results and less seed can be planted. A drill seeder can also plant into existing dead grass and vegetation, so the area does not have to be tilled first, potentially saving on soil preparation costs. Drill seeding works best in areas accessible by machines and where the soil is not compacted. Use a machine with a seed box designed to continually agitate and mix native seed mixes. Make at least two passes in different directions, if possible, to prevent stripes or rows of seed.

   b. Slit seeding – A slit seeder or slice seeder is a machine that uses blades to cut slits in the soil roughly one inch apart and plants the seed in the slits. Walk-behind models can be used in small areas. A slit seeder plants the seed directly into the soil, which can improve germination rates. It is not necessary to remove the dead grass and vegetation before slit seeding. Slit seeders work best for single-species projects since the hopper is not designed to continually mix the seed, which is required for native grass mixes.

   c. Hand broadcast and rake – Native grass seed is often unusually shaped, large, or fluffy, which makes it difficult for it to pass through a traditional spreader uniformly. For small areas with prepared soil, spreading seed by hand can work well. To determine how much seed to use, find the seeding rate in the grass profiles and calculate the amount of seed needed for the square footage of the area. Hand broadcasting seed can also work for sloped areas but is too labor intensive for large spaces. Rake the area after spreading the seed to mix it into the top half inch of soil.

   d. Core aeration and hand broadcasting – For areas where the soil is not compacted, it may be not necessary to rototill. Core aerate the area heavily so the holes are several inches apart. Hand broadcast the seed evenly throughout the area. The seed that falls into the aeration holes is more likely to germinate. If the aeration holes are closely spaced, the new grass will fill in the area over time. By not tilling the soil, this method reduces the amount of weeds in the new grass and preserves the soil structure

   e. Hydroseeding – This planting method is where grass seed, fertilizer, tackifier and fibrous mulch are mixed with water into a slurry and sprayed over an area onto the soil surface with a machine. This can be a cost-effective way to cover a large area. It can be used for steep slopes where other planting methods are not practical. Make sure the tank has been cleaned prior to seeding to remove the type of seed previously used.

Hydroseeding is generally not used for small areas. The downside of hydroseeding is that the seed remains on the soil surface, rather than being planted into the soil, and is more exposed to birds, wind, and animals. An alternative is to spray the seed and fertilizer first, then spray the mulch and tackifier in a separate application. This can result in more evenly spread seed and better mulch cover.

Often, the seed germination percentage in hydroseeded projects is lower. If hydroseeding is used, double the seeding rate to compensate for the lower germination percentage.

f. Laying sod – If sodding, remove any existing live grass with a sod cutter or till dead grass and weeds into the soil before planting. Remove clumps and fine grade the soil. Lay the pieces in an overlapping pattern and ensure good contact between the sod and the soil surface.

g. Sprigger – A sprigger is a machine that grinds large rolls of Bermudagrass sod and plants the pieces of roots, rhizomes, and stolons into the soil. The rhizomes and stolon pieces are watered frequently and can establish in a few weeks or months. Sprigging is a way to plant large areas with Bermudagrass without having to sod the whole area. It is best suited to large areas accessible to machinery.

7. Seeding specifications and protection

a. Seeding rate and planting depth. Check the specifications for the species to be planted in the grass detail pages or with a knowledgeable seed supplier.

b. Starter fertilizer. Apply an organic or starter fertilizer to the soil at the recommended rate prior to planting. For buffalograss projects consider using a starter fertilizer with mesotrione to prevent weeds from germinating (not for use on other grass types).

c. Mulch. Hydromulch, crimped straw, or pelletized seed mulch can help protect the seed on non-irrigated projects. Wood chip mulch is not used for grass seeding projects.

d. Topdressing. In general, do not topdress the lawn with sand, soil, or peatmoss after seeding.

e. Erosion blankets. Erosion blankets may be helpful to stabilize the soil on steep slopes or in areas where moving water might cause erosion. Erosion blankets are meant to hold the soil temporarily until the grass can establish and stabilize the soil with its rhizomes. Choose a biodegradable blanket type with the specifications needed for the slope or potential water volume and velocity. Biodegradable blankets, rather than blankets with plastic netting, break down over time when the grass has matured. Blankets can be removed after germination, but this process can damage young seedlings and is best performed with care when the grass is dormant.

8. Project signage, community outreach

a. Once the project activities have started, consider posting signage to educate stakeholders about what is happening, the project goals, and what to expect.

b. Let the community know what to expect through relevant communication channels to help garner support of the project and minimize complaints.

Establishment

1. Watering schedule. Before planting, check with your water provider to see if a temporary watering permit for new seed or sod is required. Once the seed, sprigs, plugs, or sod is installed, use a watering schedule similar the guidelines in Table 3.

2. Use this information as a starting point. Check the site daily for the first few weeks and adjust the run time of the sprinklers if the soil is too wet or too dry. Actual run times can be reduced based on irrigation head type, soil type, slope, and exposure. Monitor the soil moisture in several locations periodically and adjust the schedule as needed.

Table 3: Sample Watering Guidelines for Grass Seeding Projects

Weeks After Seeding	Application Rate per Watering Cycle	Frequency	Minutes per Cycle (fixed spray nozzles) 	Minutes per Cycle (rotors) 	Minutes per Cycle (high efficiency nozzles)* 	Notes
0-2	0.1 inches	Two to three time per day	4	9	12	Keep soil surface consistently moist but avoid runoff and puddling.
3-4	0.2 inches	Once per day	8	18	24	Moisten soil daily to prevent new seedlings from dehydrating.
5-6	0.3 inches	Every other day	12	27	36	Allow soil surface to dry out between waterings but maintain consistent moisture farther down.
7-8	0.3 inches	Three times per week	12	27	36	Top inch of soil can dry out between waterings. Moisture in soil profile will encourage healthy roots.
9-12	0.5 inches	Twice per week	20	45	60	As seedlings grow longer roots they can gradually be watered less often.
13-16	0.5 inches	Once per week	20	45	60	Water regularly to encourage health of new seedlings.
Year 2 and beyond	0.5 inches	Once per month or as needed	20	45	60	Schedule water to achieve project goals and desired grass appearance.

Courtesy of Jarod Clayton, Colorado Springs Parks and Recreation Department. If runoff occurs, use cycle and soak scheduling. Break up the total watering time into 2-3 segments and wait one hour between segments to allow the water to soak into the soil.

3. Fertilization. Fertilizing new seedling stands helps them grow quickly so the leaves fully cover the soil. Apply a controlled-release or organic fertilizer at planting OR fertilize regularly with a very light dose of quickly available fertilizer. A light dose of fertilizer can be applied as often as weekly, but at a significantly lower rate than standard lawn fertilization. Apply 0.1-0.2 pounds of nitrogen per 1,000 square feet each time the area is fertilized during the establishment period. Do not fertilize after mid-August.

4. Weed control. It is common for weeds to grow during the germination and establishment phase. Control weeds early to reduce competition for moisture and nutrients, improve grass seedling growth, and reduce stakeholder complaints. If most tough to control weeds were killed prior to planting, most of the resulting weeds will be easy to control with specialized herbicides. Proactive weed management during establishment will result in healthy grass stands with minimal weed issues over time and is highly recommended.

   Use herbicides labeled as safe for the grasses planted. Do not use traditional lawn weed killers like 2,4-D on native or water wise grasses. One common approach is to use carfentrazone (Quicksilver) to control broadleaf weeds and quinclorac (Drive) to control grassy annual weeds a few weeks after the seed has germinated. Both herbicides can be used as soon as the weeds begin to germinate and will not harm most new grass seedlings. Other herbicides may be needed for more mature weeds. Early and frequent herbicide application (if needed) is key to successful projects. Hand weeding is an option for smaller projects or where resources allow.

5. Mowing. Mowing is optional during the establishment phase. Leaving the grass taller, and potentially even unmowed for the first year, if allowed by your HOA or city ordinances, will allow it to grow deeper roots. If the grass grows tall enough to look unsightly or cause concern, mow it as high as possible, ideally so the grass is four to six inches tall after mowing. This may require specialized mowing equipment or a mowing subcontractor, as not all mowers can be adjusted this high. A weed eater can be used for smaller areas. A hedge trimmer attachment can be helpful.

   Try to mow so that no more than one-third of the height of the grass blades, on average, are cut off during mowing. In other words, avoid letting the grass grow extremely tall and then mowing it short. Do not leave clumps of clippings laying on top of the mowed grass. Mowing the grass too short can cause it to go into shock and may take several weeks to begin growing again. While turfgrasses often have growing points close to the soil surface and can tolerate low mowing, many native grasses have growing points four to six inches above the soil. They cannot tolerate low mowing like turfgrasses.

   If weeds have not been controlled with herbicides, mowing or string trimming when weeds are flowering can be used as a weed management strategy to prevent them from producing seeds. Mowing can also encourage lateral growth on some grasses. String trimming around sprinkler heads occasionally can also help reduce blocked irrigation spray.

6. Weather considerations. Unexpected weather events can affect project scheduling and grass establishment. It may be necessary to delay activities or implement corrective actions if weather negatively affects a project.

7. Steps to rehabilitate less successful projects. Weather, irrigation failures, and weeds may impact project success. Many projects can be improved even if they don't initially have a successful start. Here are a few corrective actions that can be used.

   a. Control weeds. If weeds are not controlled soon after germination, the new stand of grass will

become weedy. This can cause the perception that a project has failed. In these cases, determine if desirable grass seedlings are present and estimate how much of the soil surface is covered by plants. If there is 35% or more soil coverage by desirable grass seedlings, try controlling the weeds before reseeding. Spray weeds with an herbicide that will eliminate the weeds without harming the grass. If the weeds are taller than 6 inches, mow the area first and then spray the weeds. Controlling the weeds will allow the grass seedling to receive more water, light, and nutrients, which can greatly increase how quickly the grass seedlings will establish.

b. Modify irrigation to improve seed germination. If the seed didn't germinate well, the cause is often times that the area doesn't have enough soil moisture to cause successful germination. Assess if the irrigation system is covering the area sufficiently and make any needed repairs or adjustments. If it is functioning properly, increase number of start times per day or increase the run times, using the schedule in Tables 3 and 4 as guides. This approach can work if the seed has not yet germinated. If the seed has germinated then dried out and died, increasing the irrigation will not correct the project. Reseeding will be required.

c. Fertilize. If the grass has germinated but has not grown large enough to cover the soil, consider fertilizing with an organic or slow-release fertilizer. If the grass doesn't begin to grow quicker, then test if soil compaction is limiting growth. If compaction is an issue, then core aeration or tilling and reseeding may be necessary.

d. Reseed. If there are bare or thin areas, try seeding the problem areas again within the recommended seeding date range. If germination or establishment was not successful at all, the project will need to be redone, potentially from the vegetation removal stage. Identify the most likely cause of failure and make the needed corrections before trying again. If the soil is compacted, it may be important to till the area before replanting.

8. Checklist for Success

a. Kill and/or remove the existing weeds and grass before planting. Expect two or more herbicide applications.

b. Plant into dead grass and weeds if the soil is not compacted. If the soil is compacted, rototill before planting.

c. Create a weed management plan before planting.

d. Plant the seed, plugs, sod or sprigs at the right time of year with appropriate equipment, using the right seeding rate and planting depth.

e. Water frequently to germinate and establish the grass using Tables 3 and 4 as guides.

f. Proactively control weeds and mow if needed.

g. Take corrective actions if required.

Long-term maintenance

1. Importance of a management plan. The long-term success of a native grass area depends on employing a sound management plan. The care of native grasses is significantly different than the protocols used for turfgrass maintenance. In many cases, if there is not a separate management plan, native grass areas will end up being cared for like turfgrasses. Water and maintenance savings are not achieved, and the health of the native grass can suffer.

2. Training staff and contractors. If the maintenance staff and contractors are not familiar with the methods used for native grass areas, it's important to invest in regular training, project site visits, and communication. Identify and communicate expectations so that everyone has a clear understanding of how the area should look, the maintenance inputs, and what to do if an issue arises. Support a close relationship between the installation contractor and maintenance staff to promote the best possible hand off from installation to maintenance. Train new or seasonal staff soon after they begin work.

3. Watering. Native grass areas can be watered in a variety of ways. Most native grasses do not require winter watering to prevent winterkill.

Table 4: Long-Term Watering Guidance Based on Project Objectives

Watering Level	Description	Notes
Not irrigated	Grass is watered with temporary irrigation for the first two growing seasons, then not watered again.	Maximizes water savings. Grass will be green during periods of active growth and sufficient precipitation. Grass will go dormant and turn brown during dry periods with no rain. Reduces irrigation maintenance; test the system at startup and once per month.
Irrigated periodically	Grass is watered consistently for the first two growing seasons. For season three and beyond, grass is watered only during hot, dry periods or when a greener appearance is desired.	This approach minimizes the amount of water needed to maintain the grasses' health. Allows flexibility to use more water on occasion or conserve water during times of shortage or drought.
Irrigated consistently	Grass is watered one to four times per month on average.	Keeps the grass green during its growing season. May be needed where aesthetics are important. Even with consistent watering, two-thirds water savings can be achieved compared to traditional turfgrass watering. Continued irrigation maintenance will be needed

4. Fertilizing. Most native grass areas can be fertilized less often than traditional lawns. While they don't need to be fertilized at all, periodic fertilization will lead to a thicker, denser stand of grass that may have a better appearance and have fewer weeds. Fertilization can also cause the grass to be greener. For areas where native grass is used as a lawn replacement or a low-water groundcover, fertilize warm season grasses once or twice in June or July when the grass is growing rapidly. Native grass mixes of warm and cool season grasses can be fertilized once in May. Low-input, naturalized, or restored areas do not need to be fertilized at all, but may be less dense and develop some spaces between plants over time.

Table 5: Long-Term Fertilization Guidance Based on Project Objectives

Landscape Type	Grass Type	Frequency	Timing
Lawn replacement or solid groundcover	• Buffalograss • Blue grama grass • Buffalograss and blue grama mixture • Bermudagrass	Once or twice per growing season	June and/or July
Irrigated native grass mixes	• Native grasses mixes of warm and cool season grasses	Once per growing season	Mid-May
Unirrigated naturalized areas, restoration projects	• Native grasses	None	None

5. Weed control. Long-term weed control is an important task to keep native grass areas looking acceptable. Ideally, with proactive weed control early in the project, long-term weed control efforts can consist of spot spraying troublesome plants throughout the area. Do not use traditional lawn weed killers like 2,4-D on native or water wise grasses. Pre-emergent weed control products can be helpful in preventing new weeds from growing. Since pre-emergent products will also prevent new grass seed from germinating, use only in established grass stands where overseeding or germination of additional grass seed is not planned. Identify the weed species occurring in the area and include specific weed control strategies for those types of weeds. Only use products labeled as safe for the grasses in the area.

6. Mowing. Like watering, a variety of approaches can be used for mowing native grass areas. Check with your HOA or city ordinances to determine if mowing height rules apply to your site. The more often an area is watered, the more mowing it can tolerate. Non-irrigated areas should be mowed no more than once every 90 days. Irrigated areas can be mowed as frequently as every 30 days. Mow the grass as high as the equipment will allow, ideally to a height of at least four to six inches after mowing. Mowing high will minimize the shock to the grass, allow it to continue growing steadily, and prevent weeds from invading. If fire concerns are not an issue, avoid mowing grasses at the end of the growing season in fall to reduce soil erosion and weed invasion. Do not mow native grasses weekly like traditional turfgrasses.

Table 6: Mowing Options for Long-Term Maintenance

Mowing Frequency	Description	Notes
Minimal mowing	Mow once in February or March to remove dead grass blades.	Mowing yearly, which not required for plant health, will remove all the brown material and make the stand look healthier and greener in the summer. This mowing replaces periodic burning or grazing grasses experience in natural settings. In areas where pollinator reproduction is a key objective, consider mowing once every two or three years.
Infrequent mowing	Mow once in February or March to remove dead grass blades. Mow once around June 1 and again around August 1.	This approach removes all the brown material in late winter and makes the stand look healthier and greener in the summer. Mowing 1-2 times in summer will make the grass more even in height for a more uniform appearance, but still retain the natural beauty and seedheads of the grasses.
Regular mowing	Mow once in February or March to remove dead grass blades. Grass is mowed once every 30 days through mid-October or when growth slows.	Results in the most uniform appearance. Best used for short grasses like buffalograss and "beauty bands" adjacent to sidewalks. Grass mowed this often will not produce seedheads. Taller grasses may have a browner appearance when mowed frequently and may benefit from less frequent mowing.

7. Remove litter and trash regularly. Native grass areas need regular cleanup of trash, litter, and other debris to retain a clean appearance. If regular policing of trash is neglected, the native grass may look forgotten and can become a source of complaint even when the grass itself is healthy and thriving.

8. Sample long-term maintenance plans. See coloradonativegrass.org for a sample maintenance plan that can be modified as needed. Communicate the plan to new Board members, contractors and maintenance personnel.

9. Management for fire mitigation. While dry grasses are flammable, they can be managed to reduce the risk from wildfire. Mow grasses where they are close to low tree branches and could potentially be a ladder fuel. Prune lower tree branches to prevent fire moving from grasses to the tree canopy. Mowing a firebreak at strategic locations can also be a good strategy and can allow some areas of grass to remain unmowed. Choose shorter grasses in areas where wildfire risk is high. Many native grasses cannot tolerate frequent, short mowing. Avoid mowing as the only strategy to mitigate fire risk.

10. Long-term signage. Having long-term signage in the area can communicate the project benefits to new community members and stakeholders. Well-designed signage can be an important interpretive tool to inform residents and visitors about native grasses and their advantages. It can help stakeholders perceive native grass areas as a community asset that contributes to sustainability and resilience.

Buffalograss Overview

Buffalograss is an excellent native grass option for lawn replacements, low-maintenance groundcover areas, and green infrastructure projects.

Benefits

- Short, uniform appearance works well in more manicured settings.
- Low maintenance. Mow 1-3 times per summer. Left unmowed, it will grow 3-6 inches tall. Fertilize once in mid-summer and water once per week or less.
- Drought tolerance. Goes dormant during drought or water restrictions and starts growing when moisture returns.

Water Savings

- Requires about one-third the water of a traditional lawn.
- Water once per week or less, May to October. Winter watering is not required.
- Newly-planted seed or plugs require regular watering for several months after planting as it forms new roots.

Considerations

- Needs at least six hours of sun to thrive.
- Grows up to 6,800 feet in elevation.
- Turns green later in spring (mid-May) and turns brown earlier in fall (early October) than a traditional lawn.
- Grows best on soils that have clay content. Will require significant water if planted on sandy, rocky, or gravelly soils.
- Tolerates moderate foot traffic, but not well-suited to high recreation areas.

Installation

- Use a cultivated variety (cultivar) for a greener color and more uniform growth habit. The cultivars 'Sundancer,' 'Prestige,' and 'Legacy' have proven success on Colorado's Front Range.
- 'Sundancer' is installed by seed, while 'Prestige' and 'Legacy' are installed by plugs. June 1 – July 31 is the optimal planting time.

Buffalograss Characteristics

- Botanical name: Bouteloua dactyloides
- Typical annual irrigation requirement: 8 - 10 inches or less
- Irrigation savings compared to turfgrass: 66%
- Warm or cool season: Warm
- Tolerance to foot traffic: Medium
- Salt tolerance: Poor
- Slope stabilization: Good
- Tolerance to temporary flooding: Good
- Leaf height: 3-6 inches:
- Height with seedheads: 3-6 inches
- Uniformity of appearance: Uniform appearance
- Active growth season in Colorado's Front Range: May to October
- Leaf color: Blue-green
- Density: Very dense
- Mowing requirement: One to three times per year
- Fertilizer requirement: Once in midsummer
- Ecological benefit for wildlife: High
- Shade tolerance: Poor
- Soil type limitation: Grows best on clay soil
- Elevation limit: 6,800 ft
- Native to Colorado: Yes
- Native location: Central Great Plains, from Texas to Nebraska and Wyoming
- Installation methods: Seed or plugs, sod can be used if commercially available
- Cultivars and notes: 'Sundancer' is a good cultivar for seeding projects. 'Prestige' and 'Legacy' have proven to be cold-hardy cultivars installed as plugs.
- Seeding depth: 0.25-0.50 inches
- Seeding rate for landscape projects: 3 lbs per 1,000 sf
- Plug spacing: 12 -18 inch centers
- Herbicide recommendations: Do not use traditional lawn weed killers on buffalograss. Use herbicides labeled as safe for buffalograss.

Blue Grama Grass Overview

Blue grama grass is a great option for hot, sunny, and dry areas where maintenance will be limited.

Benefits

- Well adapted. Once established, it will thrive in hot, dry, sunny locations on a variety of soil types.
- Low-maintenance. Blue grama works well for large, sloped or low-use areas. Fertilize once in mid-summer and water once per week.
- Drought tolerance. Goes dormant during drought or water restrictions and starts growing when moisture returns.
- Taller than buffalograss and grows attractive seedheads in fall. Works well with naturalistic and informal landscape designs.

Water Savings

- Requires about one-third the water of a traditional lawn.
- Water once per week or less, May to October. Winter watering is not required.
- Newly-planted seed requires regular watering for several months after planting as it forms new roots.

Considerations

- Needs at least six hours of sun to thrive.
- Grows up to 8,500 feet in elevation.
- Turns green later in spring (early May) and turns brown earlier in fall (late October) than a traditional lawn.
- Not tolerant to foot traffic, so does best in front yards or areas where people and pets do not walk repeatedly.

Installation

- Plant by seed. The ideal seeding time is June 1 to July 31 when soil temperatures are 65 degrees or greater.

Photo Credit: Loretta Mannix, The Horticulture Consultant

Blue Grama Characteristics

- Botanical name: Bouteloua gracilis
- Typical annual irrigation requirement: 8 - 10 inches or less
- Irrigation savings compared to turfgrass: 66%
- Warm or cool season: Warm
- Tolerance to foot traffic: Medium
- Salt tolerance: Poor
- Slope stabilization: Fair
- Tolerance to temporary flooding: Poor
- Leaf height: 6-12 inches:
- Height with seedheads: 12-24 inches
- Uniformity of appearance: Uniform appearance
- Active growth season in Colorado's Front Range: May to October
- Leaf color: Blue-green
- Density: Less dense
- Mowing requirement: One to three times per year
- Fertilizer requirement: Once in midsummer
- Ecological benefit for wildlife: High
- Shade tolerance: Poor
- Soil type limitation: Adaptable to most soil types
- Elevation limit: 8,500 ft
- Native to Colorado: Yes
- Native location: Western US
- Installation methods: Seed
- Cultivars and notes: 'Hachita' is common, successfully-used cultivar in Colorado landscapes. 'Alma' also works and grows taller leaf blades than 'Hachita.'
- Seeding depth: 0.25 inches
- Seeding rate for landscape projects: 1 to 1.5 lbs per 1,000 sf
- Herbicide recommendations: Do not use traditional lawn weed killers on blue grama grass. Use herbicides labeled as safe for blue grama grass

Buffalograss and Blue Grama Grass Mixture Overview

Buffalograss mixed with blue grama grass is a great option for hot, dry sites where the soil type, growing conditions, and mowing regime vary.

Benefits

- This mixture is a good option where the soil type is varied or unknown.
- Suitable for sites where the denser growth habit of buffalograss is desired with the taller seedheads and longer green season of the blue grama.
- Can be a good option where part of the area will be mowed and the other part left unmowed.
- The blue grama grows attractive seedheads in fall. Works well with naturalistic and informal landscape designs.
- Well adapted. Once established, it will thrive in hot, dry, sunny locations on a variety of soil types.
- Low-maintenance. Buffalograss mixed with blue grama works well for large, sloped or low-use areas. Fertilize once in mid-summer and water once per week.
- Drought tolerance. Goes dormant during drought or water restrictions and starts growing when moisture returns.

Water Savings

- Requires about one-third the water of a traditional lawn.
- Water once per week or less, May to October. Winter watering is not required.
- Newly-planted seed requires regular watering for several months after planting as it forms new roots.

Considerations

- Needs at least six hours of sun to thrive.
- Grows up to 6,800 feet in elevation. Above 6,800 feet, mix blue grama with a different grass since buffalograss will not thrive.
- Turns green later in spring (early May) and turns brown earlier in fall (late October) than a traditional lawn.
- Moderate foot traffic tolerance, but not suited to areas where recreation will be intense or constant.

Installation

- Plant by seed. The ideal seeding time is June 1 to July 31 when soil temperatures are 65 degrees or greater.
- Mixing 'Hachita' blue grama and 'Sundancer' buffalograss has successfully been used in Colorado projects.
- Blue grama seed is significantly lighter and smaller then buffalograss seed. A 50-50 mix by seed count may be 20% blue grama and 80% buffalograss by weight.

Buffalograss and Blue Grama Grass Mixture Characteristics

- Botanical name: Bouteloua dactyloides and Bouteloua gracilis
- Annual irrigation requirement: 8 - 10 inches
- Irrigation savings compared to turfgrass: 66%
- Warm or cool season: Warm
- Tolerance to foot traffic: Medium
- Salt tolerance: Poor
- Slope stabilization: Good
- Tolerance to temporary flooding: Moderate
- Leaf height: 6 - 12 inches
- Height with seedheads: 12 - 24 inches
- Uniformity of appearance: Uniform appearance
- Active growth season in Colorado's Front Range: May to October
- Leaf color: Blue-green
- Density: Very dense
- Mowing requirement: One to three times per year. Can be mowed monthly if required.
- Fertilizer requirement: Once in midsummer
- Ecological benefit for wildlife: High
- Shade tolerance: Poor
- Soil type limitation: Adaptable to most soil type
- Elevation limit: 6,800 ft.
- Native to Colorado: Yes
- Native location: Western US and Great Plains
- Installation methods: Seed
- Cultivars and notes: Mixing 'Hachita' blue grama and 'Sundancer' buffalograss has successfully been used in Colorado projects.
- Seeding depth: 0.25-0.50 inches
- Seeding rate for landscape projects: 3 lbs per 1,000 sf
- Recommended herbicides: Do not use traditional lawn weed killers on buffalograss and blue grama grass mixtures.

Native Shortgrass Prairie Mixture Overview

Native shortgrass prairie mixtures include shorter grasses that are naturally found east of the foothills, and can be a low-water, low-maintenance groundcover.

Benefits

- This type of grass mix can be used to create a sustainable landscape for naturalistic or informal areas where natural variations in color and texture are desirable.
- The variety of grasses maximizes the value to insect, birds, and wildlife. Flowers can be included for additional value if broadleaf weed killers will not be spread throughout the area.
- They can be a great landscaping option to create a transition between more formal landscaped areas and natural vegetation.
- The mix of different grass types allow it to adapt to varying weather conditions and different site characteristics.
- Shorter grasses can be mowed less often and cause less fire concerns than taller grasses.

Water Savings

- Shortgrass prairie mixes can be watered once per week during the growing season, during dry periods only, or not at all. Great option where water will be turned off long-term.
- During watering restrictions, shortgrass prairie areas can be left unwatered so irrigation can be redirected to higher value landscape areas.
- Requires regular watering for several weeks after planting while it establishes new roots.
- Does not require winter watering.

Considerations

- Native grass mixes have variation in texture, color and height that result in a less uniform appearance. Use in areas where the variation will be considered a benefit.
- Don't use in areas that will not be mowed regularly. Most of these grasses will turn brown and their growth will stagnate if mowed frequently.
- Where "beauty bands" are desirable, seed buffalograss in a 2 to 8 foot band adjacent to pathways and transition to the native prairie mix farther away.

Installation

- Native grass mixes are installed by seed.
- Be sure to purchase a mixture of true natives for the most long-lasting result. Avoid introduced or turfgrasses marketed as "low-grow" mixes.

Native Shortgrass Prairie Mixture Characteristics

- Botanical name: Various
- Typical annual irrigation requirement: 8 - 12 inches
- Irrigation savings compared to turfgrass: 66%
- Warm or cool season: Warm and cool
- Tolerance to foot traffic: Low
- Salt tolerance: Fair
- Slope stabilization: Good
- Tolerance to temporary flooding: Moderate
- Leaf height: 6 - 12 inches
- Height with seedheads: 12 - 24 inches
- Uniformity of appearance: More variation
- Active growth season in Colorado's Front Range: April to November, with some grasses often less active (brown) throughout the growing season
- Leaf color: Green to blue-green
- Density: Less dense, some bare soil between plants is acceptable
- Mowing requirement: One to three times per year
- Fertilizer requirement: Once in midsummer
- Ecological benefit for wildlife: Very High
- Shade tolerance: Poor
- Soil type limitation: Adaptable to most soil types
- Elevation limit: 7,000 ft.
- Native to Colorado: Yes
- Native location: Western US
- Installation methods: Seed
- Cultivars and notes: Most grass mixes will include pre-determined cultivars. Specific cultivars may be requested or custom mixes by most seed suppliers.
- Seeding depth: 0.25 to 0.50 inches
- Seeding rate for landscape projects: 2-3 lbs per 1,000 sf
- Herbicide recommendation: It can be challenging to find herbicides safe for both warm and cool season grasses. Spot spraying may be required.

Customized Grass Mixture Overview

Different species are selected for a customized grass mixes based on site conditions, ecological function, and desired visual look. This is a great option for insect, bird, and wildlife habitat and to restore disturbed areas.

Benefits

- Grasses can be customized for any elevation and site conditions.
- Taller grasses can be included to maximize wildlife, bird, and insect value.
- Flowers and shrubs can be included to support pollinators, birds, and wildlife.
- Good choice for areas where irrigation will be turned off long-term.
- Not suitable for frequent foot traffic.

Water Savings

- Custom native grass mixes can be watered once per week during the growing season, during dry periods only, or not at all. Great option where water will be turned off long-term.
- During watering restrictions, they can be left unwatered so irrigation can be redirected to higher value landscape areas.
- Requires regular watering for several weeks after planting while it establishes new roots.
- Does not require winter watering.

Considerations

- Native grass mixes have variation in texture, color and height that result in a less uniform appearance. Use in areas where the variation will be considered a benefit.
- Don't use in areas that will not be mowed regularly. Most of these grasses will turn brown and their growth will stagnate if mowed frequently.
- Where "beauty bands" are desirable, seed buffalograss or another short grass in a 2 to 8 foot band adjacent to pathways and transition to the native prairie mix farther away.

Installation

- Native grass mixes are installed by seed.
- Be sure to purchase a mixture of true natives for the most long-lasting result. Avoid introduced or turfgrasses marketed as "low-grow" mixes.

Characteristics

- Will depend upon grass species selected.