# DIY Landscape Transformation Guide

## A step-by-step guide to creating water-wise landscapes

Prepared in collaboration with Brown & Caldwell

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

DENVER WATER

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# Welcome!

Welcome to your DIY guide for landscape transformation! If you are thinking about starting, are in the early phases of the project, or have already started and have questions about a specific step, you are in the right place. This do-it-yourself guide empowers Colorado residents to restore yards, replace traditional turf, and transform landscapes with attractive, water-wise, and multi-beneficial vegetation. Discover the best practices for landscape transformation that can lead to creative, climate-appropriate, and beautiful designs that can reduce outdoor water consumption and foster a resilient environment.

We're excited about your journey exploring creative and water-wise alternatives to traditional turf. Changing your landscape can be a fun and fulfilling adventure, allowing you to express your creativity while contributing to water conservation and cultivating sustainability. We understand that change can be challenging, so we've designed this guide to simplify the process, providing clear steps and helpful tips to support your efforts. Together, we can build a sustainable future, one yard at a time.

Let's get started!

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*It's how we're all connected*

# Before you start

This statewide DIY Guide was developed collaboratively with expert insight. It is intended for general informational purposes regarding DIY landscape change but cannot entirely replace professional advice or assistance. **If needed, please consult with appropriate landscape professionals and arborists for site-specific advice or irrigation updates.**

While the transformation techniques are applicable across the state, **more regional guidance may be required for plant recommendations and planting methods** due to Colorado's various climate zones. Contact your local municipality or water provider for more information on landscape change advice and learn more about **local codes and regulations, watering schedules, incentives, rebates, or educational opportunities.**

While this guide provides references to relevant legal principles in Colorado, **nothing in this guide is meant to be individual legal advice**. Please ensure you **consult with local experts on applicable regulations in your area** as you begin and continue to work on your project.

There are callout box reminders throughout the report, but **don't forget to**:

- Call 811 or visit colorado811.org before you dig to locate your underground utilities.
- Hire an ISA-certified arborist to develop a tree protection plan before undertaking turf conversion.
- Inquire about local regulations and codes to help you create more fire defensible spaces.

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# Introduction

## Purpose of this guide

The purpose of this guide is to support you in creating a water-wise landscape in your yard. The advice applies whether you are starting with a lush green lawn or you have a landscape that is more brown than green. No matter your starting point, this guide can help you transform your landscape with vibrant, thriving and low-water-use plants.

**Section 1:** Planning and design walks you through the process of selecting the area of your yard to convert and developing a new landscape plan with water-wise plants.

**Section 2:** Turf removal and landscape preparation gives you tips and practical advice on removing your lawn.

**Section 3:** Soil and mulch covers soil characteristics and outlines ways to improve your soil and select mulch for your new landscape.

**Section 4:** Planting provides you with useful advice on how to plant for success as well as how to avoid potential pitfalls when planting your landscape.

**Section 5:** Watering is a deep dive into how to water your plants to conserve water and optimize your irrigation system.

**Section 6:** Maintenance presents best practices for maintaining your new landscape.

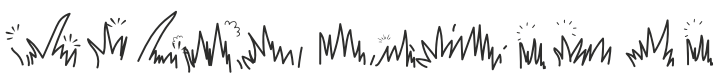
There is a checklist to help you throughout your project in Section 7 (pages i - iii)

## Why now

Water is a precious resource in Colorado, and the choices we make about our daily water use can have a cumulative impact on reducing water usage. Water-wise landscaping not only conserves water but can also support other ecological benefits of the landscape. Even if you don't have time for landscape conversions (see page 20), this guide also provides tips to save water with your current landscaping.

## Why water-wise

Colorado's population is growing. To ensure there is enough water for the future, we must use the conservation tools at our disposal, including reducing outdoor water use. State laws, including SB24-005, are shaping how new areas of development can be landscaped, including prohibiting thirsty turf grasses in certain areas. Existing landscapes can also save water and become more efficient. There has never been a better time to transform your landscape. Some municipalities and water providers across the state have developed rebate programs and incentives to help you convert your landscape into a thriving Colorado water-wise landscape.



# Section 1: Planning and design

## Develop a landscape transformation plan

Transforming your landscape is an exciting and rewarding project that can add value to your home. Swapping high-water-use turf grass with less thirsty landscaping may also significantly reduce your water use and save you money over time if you effectively execute and maintain your project. This guide is meant to help you transform your landscape, enrich your outdoor space and conserve water. If you're not ready or do not want to convert your landscape, there are plenty of other ways to reduce your water use. See Page 20 in this section for resources and recommendations.

The first step of a successful project is creating a plan to help you stay on course. This section will help you develop a landscape plan for your DIY landscape transformation project by walking you through:

- Identifying turf grass you don't use.
- Creating a vision for your new landscape.
- Evaluating and improving your irrigation system.
- Selecting plants for your new landscape.

## Identifying project goals and constraints

Sometimes, starting your project may feel overwhelming if you are not familiar with alternatives to grass lawns. Luckily, plenty of resources are available to help inspire your landscape transition. Removing turf grass is gaining momentum in many communities in Colorado, so you do not have to look far for examples. Take a walk around your neighborhood or visit a demonstration garden and gather ideas for your own outdoor space. Before you begin, research prices for labor and plants to help you set expectations for the budget and time needed for your project. If your budget allows, you may also consider consulting a landscape professional familiar with water-wise landscaping to help refine your ideas. It's a great idea to start small or take on your project in phases to make it more manageable for your time and budget.

**Start by evaluating your sprinkler system.** Whether you are considering changing your landscape or not, think about where your irrigation system could improve. Performing an irrigation audit is a great place to identify ways to reduce your water usage. Resource Central, in partnership with participating municipalities and water providers, offers Slow the Flow. This program provides a free system inspection and creates an efficient watering schedule for your yard. The irrigation audit can help you identify unused turf areas that make the most sense to convert.

### Looking for inspiration?

Get ideas to help understand your time and budget by visiting:

Inspiration Hub on WaterwiseYards.org

Plant Select design gallery

Northern Water Sustainable Landscape Templates

### Irrigation ordinances

Ensure you are following the watering restrictions and rules in your community.

## Know your rights

Colorado's legislature has passed several bills defining what HOAs can and cannot require when it comes to turf and landscapes.

- HB19-1050 established the right of unit owners to use water-efficient landscaping and prevents HOAs from requiring turf installation.
- HB21-1229 prohibits HOAs from banning water-wise plants.
- HB23-178 requires HOAs to allow up to 80 percent drought-tolerant plants in a landscape, and to have at least three water-wise landscape design templates for homeowners to choose from.

## Outdoor rebates that may be available in your area

Rebate programs refund varying costs associated with turf replacement and new equipment to improve water efficiency.

- **Turf conversion rebates:** Water providers and municipalities can offer incentives to support landscape conversions. Rebates per square foot of converted turf vary by program. Check your local utility or water provider's website for the most up-to-date information and requirements.

A summary of turf replacement programs that may offer rebates and incentives can be found on the Colorado Water Conservation Board's EngageCWCB Turf Replacement Program Funding Summary. A dropdown list of water providers and municipalities offering landscape replacement benefits and services is also maintained on Resource Central's website.

- Irrigation rebates: Rebates can help offset the costs of replacing or upgrading irrigation equipment for more efficient options. Different programs offer varying rebate amounts and may even offer free installations through water providers and their partnerships.
- Examples of irrigation equipment where rebates or free installation may be offered include high-efficiency nozzles and sprinkler heads, smart irrigation controllers and rain sensors.

Resource Central has partnered with several water providers and municipalities to offer customers smart controller or rain sensor installation at discounted or no cost. To check rebate eligibility in your area, reference Resource Central's Slow the Flow website.

Before purchasing new equipment, verify the specific requirements of the rebate program for efficiency standards or certification specifications.

**Take your time.** Converting your turf into water-wise landscaping does not have to happen all at once. Consider starting with a small section of your lawn or doing your project in phases.

Before you begin your landscaping project, it is important to research potential rules or restrictions your HOA may have on the types of landscaping plants you can install. Sometimes HOAs require that you have your landscape plan approved ahead of time. Considering these factors at the beginning of your project can help you avoid headaches later and understand hurdles that may affect your project's timeline.

Local utilities and water providers may have water conservation programs that offer rebates to help offset the cost of your landscape transformation project. Check your local utility or water provider's website for the most up-to-date information and requirements. If you plan to use rebates, review the rebate application process before you begin your project to ensure you meet program requirements.

## Avoid these common mistakes

**Don't focus exclusively on hardscape or decorative rocks.** There are a lot of misconceptions about what goes into a turf-replacement project. One common mistake is people think they need to replace all vegetation in their lawns with hardscape, rocks and gravel. While having a rock landscape can eliminate watering needs, these landscapes can have negative effects, such as increasing air temperatures around your home. Rock landscapes can also quickly develop maintenance issues from weeds growing through the hardscape. If herbicides are used to kill the weeds, they can wash away after storms and end up in local streams and waterways, potentially harming the environment.[i]

**Avoid artificial turf.** Replacing your lawn with artificial turf may be a tempting alternative, but artificial turf is made of materials that could ultimately pollute our water and the environment. Artificial turf can also degrade soil health and contribute to increased runoff and hotter temperatures in urban areas while providing no benefits to the natural habitat. Vegetated areas help cool our communities.[ii] [iii]

**Don't ignore your irrigation system.** Whether you convert your lawn or not, your sprinkler system should be tailored to meet the needs of your plants. This guide will help you evaluate your irrigation system and identify adjustments you can make to water more efficiently — whether that is changing your watering schedule or making larger irrigation system modifications. If you convert your lawn but continue to water your new landscape the same way as your turf grass, you will not save water and could harm your new plants by overwatering. Modifying your irrigation system is the most crucial step to a successful landscape transition project.

**Don't forget about your trees.** Trees play an important part in our urban and suburban landscapes by moderating temperature extremes, offsetting poor air quality, and providing long-term habitat for wildlife, among many other benefits. Plants, especially larger ones, get used to moisture and require a slow water frequency and amount change. Trees need special consideration because of their widespread root system, which can extend past their canopy. Be sure to consider how established plants like trees, shrubs and perennials will be watered if lawn and related irrigation are removed (see pages 8, 25 and 43 for more details).

## Arborists can help!

The Colorado State Forest Service (CSFS) offers comprehensive tree inventory services and grants to support Colorado communities in managing and maintaining their urban forests effectively. These services include professional tree inventories that assess tree health, species composition, canopy coverage, and potential risks. To enhance accessibility and transparency, CSFS also provides a publicly facing tree inventory platform called CoTreeView. This user-friendly and free software allows communities to view and interact with their tree data, empowering local governments, planners, and residents to make informed decisions about tree care, urban forestry planning, and climate resilience. By leveraging CoTreeView and CSFS expertise, Colorado communities can better prioritize tree maintenance, mitigate risks, and enhance the benefits that urban trees provide. CoTreeView currently has individual data for over 620,000 trees in Colorado.

## Create a vision for your outdoor space

**Identify nonfunctional turf.** Removing turf grass from your lawn does not have to be an all-or-nothing approach. Turf grass can serve a functional purpose in your landscape, especially if children or pets use your outdoor space. Turf grass has a high tolerance for foot traffic and pet waste, so keeping some grass areas in your landscape can make sense. In areas where you plan to keep turf grass, make sure to check irrigation levels throughout the season and adjust accordingly so you apply the appropriate irrigation at the right time and rate. To begin developing your new landscape plan, identify the areas of your yard where your turf grass is not serving a purpose. Think about what parts of your lawn get used and what areas may only get foot traffic when you mow your lawn. Areas you rarely use may be considered nonfunctional and you could get more purpose out of these spaces by converting to water-wise landscaping.

As you start to imagine your new landscape, you should also think about new uses for your space. Consider adding non-vegetative functional areas such as a patio, storage shed, grilling area or play area. Envision new areas of your landscape with a beautiful native plant bed or pollinator garden.

### Functional and nonfunctional turf

Functional turf is typically a high-foot-traffic area, including play space, sports fields and parks, or areas that allow for stormwater control, such as stormwater swales.

Nonfunctional turf is a water-intensive area with low foot traffic where turf does not have a greater purpose. If it only receives foot traffic when it is mowed, this may be an example of nonfunctional turf. These areas can include slopes, medians, tree lawns, side yards or decorative areas, and may be better suited for water-wise landscaping.

### Native pollinators rely on native plants!

Colorado has plenty of native pollinators, including over 1,000 species of bees, 250 species of butterflies and over 1,000 species of moths.[iv] Wasps, beetles, flies and certain migrating hummingbird species are native pollinators too!

**Plant low-maintenance turf alternatives.** Another consideration for your landscape transformation plan is the level of maintenance you are comfortable with performing. If you would like a low-maintenance landscape, identifying that goal at the beginning of your project and sticking to your plan as you select plants will prevent wasting money on plants that may not survive to the next season. Turf lawns are not maintenance-free, but plant beds, mulch and non-vegetative ground cover have different maintenance needs. Understanding these differences is important to ensure your new water-wise landscape thrives.

If you are not ready to embrace gardening as a hobby, one low-maintenance option to consider is alternative grasses, such as blue grama or buffalograss, which require about a third of water used by Kentucky bluegrass. Blue grama and buffalo grass are good to install in low foot traffic areas and require at least six hours of direct sun to thrive.[v] For higher traffic areas, you may want to consider hybrid turf species such as Dog Tuff or Tahoma31. **For more information on native and alternative turf grasses, visit the Colorado Native Grass Guide, coloradonativegrass.org.**

**Consider mulch.** Mulch reduces watering needs for plants by keeping soil cooler and retaining soil moisture. Mulch also helps protect root systems and can help deter weeds. Selecting the right type of mulch includes plant preferences, the frequency of mulch replacement and the requirements for upkeep. Native plants prefer inorganic mulches, such as rock, pea gravel and squeegee. Small rock mulch (squeegee) keeps soil cool and improves drainage and watering efficiency. Wood mulch is good for preventing new weeds and naturally adds nutrients to the soil as it breaks down. However, wood mulch must be replenished every one to three years and may blow away in the wind or with a leaf blower. Larger rock mulch will hold up well in windy areas but retain more heat than wood mulch and smaller rock mulches. Although rock mulch does not have to be regularly replaced, it will require regular weed control and cleaning to remove leaves and debris. Avoid synthetic rubber mulch products because they are flammable and can leach chemicals into the soil. Use landscape fabric with caution as it can cause wood mulch to blow away; it also has its own maintenance and environmental concerns.[i] [vi]

*Blue grama grass lawn in front of a house. Blue Grama Conversion, Colorado Springs Utilities, via www.waterwiseplants.org/landscape-gallery/folder/blue-grama-conversion.*

## Landscape fabric may not be the best solution for your weed problem

Landscape fabric is typically a short-term solution for weeds. Eventually, the weeds will grow on top or between your landscape fabric. Landscape fabric is not only a barrier to weeds but can also become a barrier to water and nutrients reaching your plants. It is also harmful to native bees that burrow into the soil to nest. The best solution to manage weeds is to mulch to the proper depth. If you decide to use a weed barrier, consider a biodegradable alternative, such as cardboard or newspaper.

**Call before you dig**

Call 811 or visit colorado811.org before you dig to locate your underground utilities.

## Assess your yard space

Plants have particular needs, so understanding the conditions of your yard is a critical step for developing a landscaping plan.

**Sun exposure:** Plants are generally classified by the light conditions they prefer, which typically include full sun, partial shade and shade, or combinations of the three. Determine which areas of your landscape fall into these three categories. Evaluate your light exposures as close as possible to summer to ensure that you can accurately assess the duration of sun exposure during long summer days. Full-sun plants thrive in the afternoon sunlight, so take note of areas of your landscape that will receive sun between noon and 4 p.m. One way to identify shaded areas is to think about the structures, such as your house, garage or trees, that may cast shadows as the sun moves from east to west throughout the day.[vii]

**Soil type:** Some plants favor certain soil types; depending on your soil, you may need to improve the soil for successful planting. Native plants generally prefer soils with lower organic content, which is often naturally occurring in Colorado. You may not need to improve your soils if you plant native plants or some types of climate-appropriate perennials. Consider getting a professional soil test to characterize your soil type.[i]

**Drainage:** Locate the downspouts on your house and the path that the water runs as it flows away from your home. Keep drainage in mind as you develop your plan and evaluate whether you want to add rock channels to control the flow and protect against erosion. Consider the areas of your space that are permeable and impermeable and the flow of rainwater runoff through your landscape. Maintaining good drainage for your house is key to protecting its foundation.[i]

**Slope:** Identify sloped areas of your yard. Sloped areas require special vegetation as some plants cannot grow on slopes. For some highly sloped areas, you may want to add a retaining wall to level out areas for a more usable landscape. Plants and grasses can also be used to control erosion in sloped areas. [i]

*Landscape with rock drainage path, Mountain Motif Xeriscape, Colorado Springs Utilities, via www.waterwiseplants.org/landscape-gallery/folder/mountain-motif-xeriscape/?returnurl=/landscape-gallery/front-yards.*

**Soil tests**

Colorado State University's Soil, Water and Plant Testing Laboratory offers soil tests that can help you characterize your soil and determine if any improvements are needed.

## Fire safety

When planning your landscape, ensure your design complies with local regulations and codes to decrease the risk of fire damage to your home. For more information on protecting your home from wildfire, visit the Colorado State Forest Service Home Ignition Zone Guide.

**Views:** Consider whether your house has views that you want to preserve or screen. Avoid adding landscaping features or structures that may block the views you want to maintain. You can block views by adding shrubs or trees, enhancing your outdoor space.[i]

**Structures and hard surfaces:** Note the location of existing hard surfaces, such as driveways or patios, as well as the footprint of structures, such as your house and garage. These structures could be impacted by root growth from shrubs and trees, and plantings should have adequate space near these structures. Hardscape can also impact your landscape's drainage. Consider using hardscape elements to route drainage in your yard or create permeable pathways to reduce runoff and capture more rainwater in your landscape.

**Existing irrigation system:** Identify the layout of your existing irrigation system. Note the number of watering zones and the types of sprinkler heads currently in your landscape. This will help you determine the changes needed to accommodate your landscape plan. If you do not want to modify your irrigation system zones, knowing the boundaries of your existing zones will shape the boundaries of the areas for turf replacement. More information on evaluating your irrigation system and making changes starts on page 38.

**Existing mature trees:** Note the location of existing mature trees and neighboring trees to avoid injuring tree roots. Placement of irrigation mainlines and changes to irrigation should be placed to do the least amount of damage to tree roots. Trees help to cool properties, provide habitat, stabilize the landscape and give height and structure to your yard.

## Protecting trees with expert knowledge

Adequate irrigation, placement consideration, duration and frequency are essential for maintaining healthy tree canopies. It is critical to separate grass and garden irrigation from tree canopy irrigation to ensure trees receive sufficient water, especially during droughts. **Additionally, hiring an ISA-certified arborist to develop a tree protection plan before undertaking turf conversion is highly recommended.** The International Society of Arboriculture TreesareGood.com lists over 500 certified arborists in the State of Colorado who are qualified to help remove turf without harming a tree. Taking this important precaution helps safeguard tree health and prevents long-term damage caused by mechanical turf cutters or other invasive practices.

# Laying out your landscape

You can draw your landscaping plan in a few ways, but the first step is to measure your outdoor space. Measure by hand or use online resources.[i] [viii] Lot lines are available from your local county assessor's website. Online sources such as Google Earth can also help you get images of your property boundary and house footprint (unless you have mature trees that obscure the image).

You can also measure your yard by hand using a tape measure or the string method. If you use a tape measure, ensure that you contact the ground for accurate measurements. With the string method, lay string around the boundary of your landscape areas and then measure the length of the string using a tape measure. If you are measuring by hand, repeat the process to verify the measurement. Having the right measurements helps you calculate the quantities you will need for materials and determine your planting plan once you have selected your plants.

## The steps for laying out your landscape are as follows

### Draft by hand

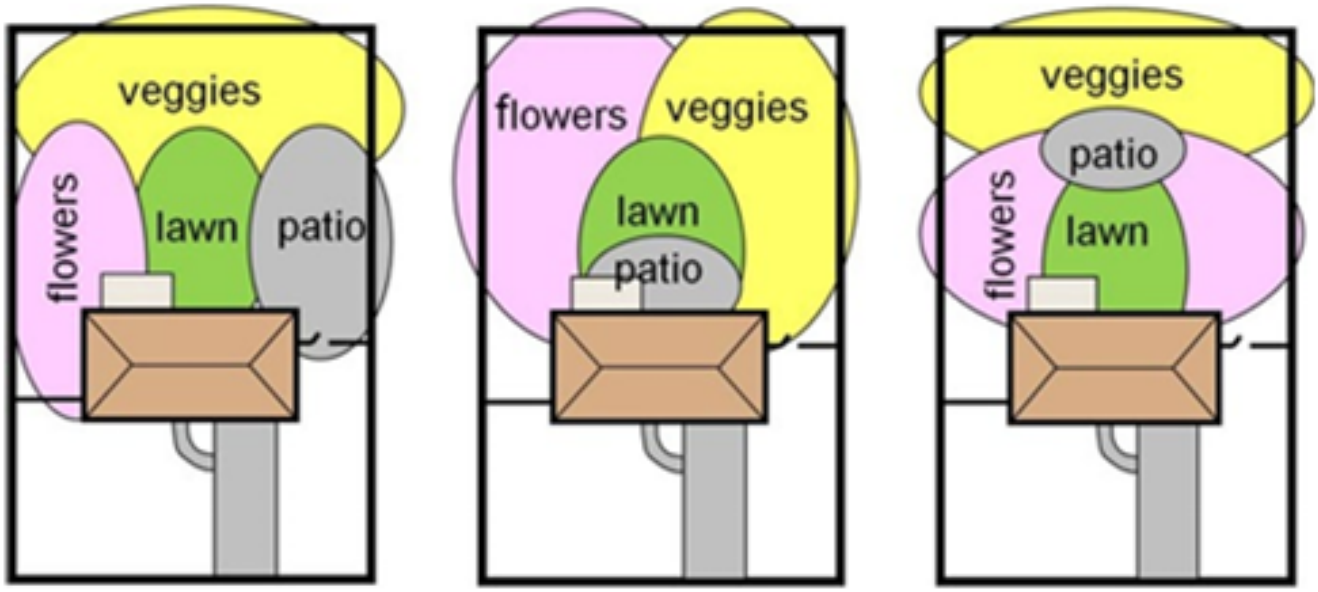
- Use a tape measure or string to take the dimensions of landscape spaces.
- Plot on graph paper to scale.
- Refine the layout of elements in your new landscape design.

### Draft digitally

- To obtain landscape dimensions for your property, use county lot line data or an alternative tool like Google Earth satellite imagery.
- Use software to sketch the landscape to scale.
- Refine the layout of elements in your new landscape design.

**Draw your landscape to scale.** Once you have site measurements, draw your landscape plan to scale. You can do this using graph paper or a landscaping software tool. You can make multiple copies of your site plan at scale to brainstorm different versions of your landscape plan. The early site plan should include your house footprint, driveway areas, and existing hardscapes. Include your existing irrigation system components by determining and drawing the boundaries of irrigation types or zones (page 13). Be sure to include existing mature trees by measuring their dripline, which is the distance around the tree that extends to the end of all the tree's branches. Then plot the tree's dripline to scale as a circle on the landscape plan. Keep in mind how trees on your landscape will continue to receive water if you change, remove or convert portions of your irrigation system.

**Create a bubble diagram.** One method to help you refine general ideas is to create a bubble diagram. After you create the list of wants and needs you have for your space, start to map out general ideas you have and define the areas for your landscape. Next, think about how much space each of the areas will require and what part of your landscape may be best for each use. Remember that you can phase your landscape transition over time. Laying out your overall plan at the beginning can help ensure each of your smaller projects fit together in your landscape.




*Bubble diagram, via https://cmg.extension.colostate.edu/Gardennotes/411.pdf*

One starting point for developing your water-wise landscape could be to divide your landscape area into thirds. For example, one-third of your space could be non-irrigated hardscape or no-water plants, one-third of your space can be irrigated functional turf if needed, and the other third of your landscape could contain plants with low-watering needs.[i] Keep in mind that if you have a large lawn or a small outdoor space, this guidance may not be the best option for dividing up your lawn. Adhere to existing community landscape guidelines before you get too far ahead in the planning and design process. Ultimately, you know your space and can adjust the layout of your landscape to suit your purposes.

Once you are content with the layout of the different areas of your plan, start to add detail and refine your design. Start envisioning pathways to create a flow between the different areas of your outdoor space.

If you are adding new structures to your yard, they should be far enough away from your existing mature trees so that you do not damage your trees when you excavate. A good rule of thumb for trees is to measure the diameter of the tree in inches at a height of 4 feet, 6 inches above the ground and multiply that number by 1.5 to get the distance in feet from the trunk where tree roots should be protected.

### Use caution when digging around mature trees on your landscape

Roots may extend farther than the dripline of a tree, which is the distance around the tree that encompasses all the tree's branches. Hand digging is recommended to avoid accidentally damaging your tree's roots. See page 24 for more resources.

# Evaluate your irrigation system

Changing your landscape is an excellent opportunity to identify irrigation inefficiencies and tailor the system to the water needs of new plants.

**Water efficiently.** Watering your plants efficiently is key to achieving water savings. Converting traditional turf to water-wise landscaping will not reduce water consumption if you do not change your watering practices. After establishment, your new landscape should require less water than traditional turf grasses. Dial back your watering days and watering amounts so you do not overwater your new landscape. Collecting water using a rain barrel can further increase your water efficiency.[ix]

**Identify and correct irrigation system issues.** Many water providers and municipalities offer free irrigation system inspections or irrigation audits in-house or through Resource Central that can help you identify problems in your irrigation system or inefficient irrigation practices. A simple step you can take is running your irrigation system and performing a visual inspection. Look for leaks, broken sprinkler heads, misdirected sprinkler heads, valve failures, uneven coverage or issues with irrigation system zones.[x]

## Examples of inefficient irrigation systems that create water waste:

### Consider adding a rain barrel

- Maximum of two rain barrels with a combined storage of 110 gallons.
- Install rain barrels at downspouts to collect water.
- May still need supplemental water to meet plant needs.

Additional information about rainwater collection in Colorado and answers to frequently asked questions about rain barrel use can be found on the Colorado Division of Natural Resources website.

# Evaluate your irrigation system goals

Your goals and capacity will help determine your past course of action to address your irrigation system. Remember that reducing outdoor water use occurs through adjusting the irrigation levels you use on your landscape. The following can help you decide what to do next.

## "I am transforming my irrigation system with my landscape"

1. Adjust your irrigation zones to align with your hydrozones.

2. Determine which irrigation type, system components and scheduling are best suited for each hydrozone in your new landscape.

## "I'm transforming my landscape but cannot transform my irrigation system at this time"

1. Evaluate your irrigation system while it is on to check for leaks, breaks or gaps in coverage. Consider requesting an irrigation assessment to receive tailored recommendations to your landscape and current system to increase water efficiency.

2. Determine which irrigation type, system components and scheduling is best suited for each hydrozone in your new landscape. Consider plugging sprinklers where they are no longer needed and substitute hand watering.

## "I don't know if I am going to transform my landscape... but I want to use irrigation efficiently in my existing landscape"

1. Evaluate your irrigation system while it is on to check for leaks, breaks or gaps in coverage. Consider requesting an irrigation assessment to receive tailored recommendations to your landscape and current system to increase water efficiency.

2. Implement identified improvements to your irrigation system.

**Identify zones to change or eliminate.** Evaluate how your current irrigation methods and zones correspond to your new landscape's water needs by area. Identify needed adjustments to your sprinkler zones or planting bed locations to keep plants thriving while improving irrigation efficiency. Irrigation zones should match hydrozones so that plants with similar water needs receive the same amount of water. Irrigation zone elimination can also be good for areas that are being converted to hardscapes, such as patios or sheds.

A **hydrozone** is a grouping of plants based on their water, soil, and sun needs to create water-efficient zones within a landscape.

**Choose the right irrigation method.** As you transition from traditional turf grass to more water-wise landscaping, select the correct sprinkler head or type of irrigation for the new vegetation. Don't forget to note existing tree root systems when choosing a new irrigation method.

**Section 5: Watering (page 38)** discusses evaluating your irrigation system, identifying and correcting issues and matching irrigation methods to your landscape in further detail.

## Plant zones and selection

Selecting plants is fun, and it can be easy to get caught up in the excitement of all the different options. However, for your water-wise landscape to be a success, it is important to select plants that are right for Colorado and your landscape.

**Select native or climate-appropriate plants.** Selecting Colorado native plants for your landscape is a win-win for your water bill and Colorado ecosystems.[xi] Using Colorado native plants removes the uncertainty regarding the appropriateness of plant selections and will set your landscape up for success. Plants that are climate-appropriate to the Colorado climate and its many local ecosystems and microclimates can also be included in your landscape to achieve water savings even if they aren't native. Be sure to select, non-invasive, climate-appropriate plants. A common misconception about native or climate-appropriate plants is that these plants are boring or lack color — this is simply a myth. Water-wise landscapes can be vibrant and visually interesting, and a wide variety of native and climate-appropriate plants are available to choose from. Some proven plants that have done well in Colorado water-wise landscapes to consider including in your landscape are shown in the table on the following page.

### Native and adapted plants — what's the difference?

Native plants are naturally occurring and have traits that evolved with their environment, making them particularly well suited for landscaping in those very environments.

Climate-appropriate are not native but are suited for the environment into which they have been introduced based on their traits.

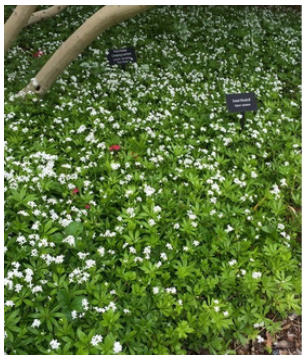
# Sample Plant Options

1 Prairie Winecups (*Callirhoe involucrata*)

2 Siberian Bugloss (*Brunnera macrophylla*)

3 Blue Grama Grass (*Bouteloua gracilis*)

4 Coral Bell varieties (*Heuchera* 'Big top caramel apple')



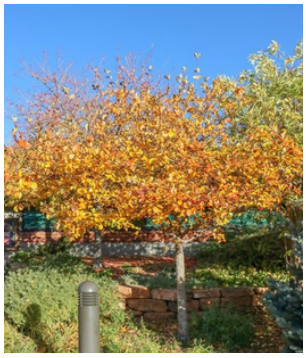
5 Sweet Woodruff (*Galium odoratum*)

6 Rocky Mountain Columbine (*Aquilegia coerulea*)

7 Prairie Coneflower (*Ratibida columnifera*)

8 'Crystal River' Veronica (*Veronica* 'Reavis')

9 Northwind Switchgrass (*Panicum virgatum* 'Northwind')



10 Thornless Cockspur Hawthorn (*Crataegus crus-galli var. inermis*)

11 Rocky Mountain Juniper (*Juniperus scopulorum*)

12 Fernbush (*Chamaebatiaria millefolium*)

13 Baby Blue Rabbitbrush (*Chrysothamnus nauseosus*)

14 Moonshine Yarrow (*Achillea 'moonshine'*)

15 Rocky Mountain Penstemon (*Penstemon strictus*)

16 Apache Plume (*Fallugia paradoxa*)

17 Blue Mist Spirea (*Caryopteris x clandonensis*)

18 Western Catalpa (*Catalpa speciosa*)

*Siberian Bugloss and Coral Bells photos retrieved from https://newsmediarelations.colostate.edu/2024/05/09/csu-perennial-trials-showcase-top-7-growers-in-rocky-mountain-conditions. Rocky Mountain Columbine retrieved from https://www.gardenia.net. Apache Plume and Fernbush photos retrieved from https://plantselect.org. All All other photos retrieved from https://www.waterwiseplants.org/find-a-plant.*

# Requirements of sample plant options

| Number | Plant Name | Full Sun | Partial Shade | Native | Moderate Water | Low Water | Pollinator Friendly | Animal Resistant | Deer Resistant |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Prairie Winecups (*Callirhoe involucrata*) | X | X | X | | X | | | |
| 2 | Siberian Bugloss (*Brunnera macrophylla*) | | X | | X | | X | X | X |
| 3 | Blue Grama Grass (*Bouteloua gracilis*) | X | X | X | | X | | | X |
| 4 | Coral Bell varieties (*Heuchera* 'Big top caramel apple') | | X | | X | | X | | X |
| 5 | Sweet Woodruff (*galium odoratum*) | | X | | X | | | X | X |
| 6 | Rocky Mountain Columbine (*Aquilegia coerulea*) | | X | X | | X | X | X | X |
| 7 | Prairie Coneflower (*Ratibida columnifera*) | X | | X | | X | | | |
| 8 | 'Crystal River' Veronica (*Veronica* 'Reavis') | | X | | | X | | | X |
| 9 | Northwind Switchgrass (*Panicum virgatum* 'Northwind') | | | | | X | | | |
| 10 | Thornless Cockspur Hawthorn (*Crataegus crus-galli var. inermis*) | X | | | | X | X | | |
| 11 | Rocky Mountain Juniper (*Juniperus scopulorum*) | X | X | X | | X | | | X |
| 12 | Fernbush (*Chamaebatiaria millefolium*) | X | X | X | X | | X | | X |
| 13 | Baby Blue Rabbitbrush (*Chrysothamnus nauseosus*) | X | X | X | | X | | | |
| 14 | Moonshine Yarrow (*Achillea 'moonshine'*) | X | | | | X | | X | X |
| 15 | Rocky Mountain Penstemon (*Penstemon strictus*) | X | X | X | | X | X | | |
| 16 | Apache Plume (*Fallugia paradoxa*) | X | X | X | X | | X | | |
| 17 | Blue Mist Spirea (*Caryopteris x clandonensis*) | X | X | | | X | X | X | X |
| 18 | Western Catalpa (*Catalpa speciosa*) | X | X | X | | X | | | X |

Ensure the plants are well suited to both the overall climate of your area and the very local climate and conditions of your property. To begin exploring all of the plant options for your yard, look at Plant Select's website or the predesigned gardens on Resource Central's website. When selecting plants, consider your USDA Plant Hardiness Zones to ensure plants are climate appropriate.[xii] Colorado residents live in a wide range of elevations. Ensure that you are selecting plants that can thrive at your altitude.

Options for preselected landscaping designs are available if you do not want to research plants on your own. Resource Central's Garden In A Box program provides you with preselected plants and a planting template. After receiving your Garden In A Box kit, all you need to do is plant them in your garden, water them in, and provide mulch as needed.

While no plant is 100% animal-proof, if you live in an area where deer or other wild animals frequent your yard, consider selecting animal-resistant plants.

Other considerations for the aesthetics of your landscape are the color, texture, shape and bloom time of your plants.

Remember to consider maintenance requirements when you are selecting plants. If you are not able to manage weeding, occasional pruning, or dead heading, then ensure the plants you select do not require regular maintenance. Depending on the level of maintenance you can do, opting for a native or low-water alternative grass may be your best option to achieve water savings.

## Predesigned landscape templates

Resource Central — Garden In A Box

Plant Select — waterwise landscape designs

Denver Water — ColoradoScape plans

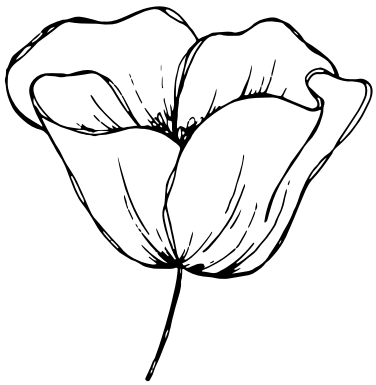
Northern Water — Sustainable Landscape Templates

### Plant Selection Exploration

Plant Select database

Colorado Springs Utilities Xeriscaping — water wise plants

Castle Rock — Plant finder



## USDA Plant Hardiness Zones

The USDA Plant Hardiness Zone Map can be used to determine which hardiness zone you live in.

Hardiness zones help determine which perennial plants are likely to succeed at different locations based on the average annual extreme minimum winter temperature. Hardiness zones do not consider altitude, so if you are on the Western slope or at a high altitude, check the elevation hardiness of the plants you're considering.

## Reminder: Prepare before heading to your local plant nursery!

Decide on your budget, level of effort and timeline for transforming your landscape. Determine your vision, intended uses for various areas of your landscape, and the characteristics they have (slopes, low points for drainage, sun exposure, irrigated or not irrigated area, and soil type).

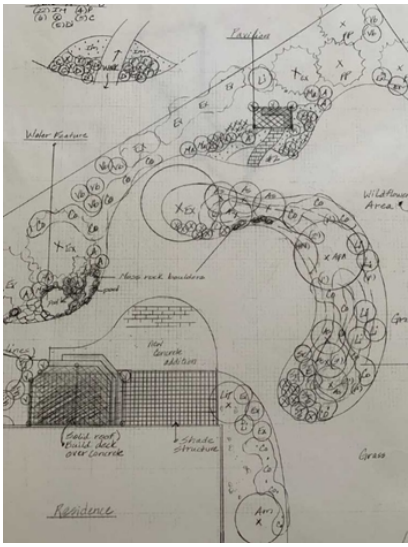
From there, your local plant nursery can help you figure out which plants match your overall goals. Even if you are further along in your planting plan, it is still a great idea to be flexible and get input from the nursery. Some plants may not be available at the nursery, or you may discover a new plant at the nursery that you want to work into your landscape.

**Add plants to your landscape plan.** Once you have identified the plants you want to use, the next step is to plot the plants onto your landscape plan at scale. Group the plants you have identified by sun exposure and watering requirements. Placing plants with the same watering requirements in an irrigation zone is called hydrozoning. Hydrozoning your landscape will ensure that you can water efficiently with your irrigation system and avoid overwatering or underwatering the plants in your landscape.[i]

Once established, water-wise plants usually only need to be watered once per week or less, depending on soil type and weather conditions, and some plants may not need any supplemental water.[xiii] Incorporating drought-tolerant native plants in non-irrigated areas of your landscape can help fill in empty pockets, and precipitation may be supplemented with hand watering as needed.

Draw plants on the landscape plan at their mature size to avoid overplanting and overcrowding. The mature size of the plant is usually given in the spacing requirements on the planting instructions. For example, if the planting guidelines say to plant at a spacing of 4 feet, draw a 4-foot diameter circle at scale to represent the mature size of the plant. If you find that you have planted things a little too close together as they mature, dig up the overcrowded plant and find it a new spot on your landscape.

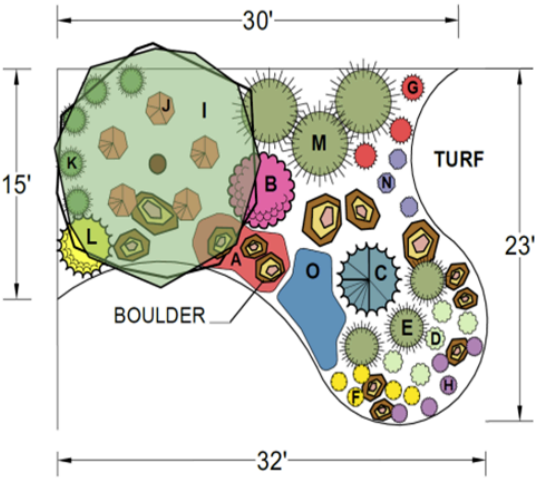
Plot the plant on your landscape plan far enough away from your house, driveway, or other structures such that the circle representing the mature size of the plant does not overlap with the structure or driveway. A common mistake is to plant young plants too close to your house for their mature size.




*Planting Plan sketch, via www.camelotdesign.net/project-gallery.*

# Project timeline and expectations

**Schedule your landscape transformation.** Once you have a landscape plan, the next step is to determine when to begin your landscape transformation project. Think about the amount of time it will take to complete the project and how much time you have to dedicate to your project. Remember, you do not have to tackle your entire yard all at once. If you have limited time and resources, starting small and transforming only one section of your lawn is a great option. There are multiple methods for how to remove your turf grass and for when to begin planting new vegetation. The rest of this section presents some timing considerations for grass removal and planting. If you are starting out with a barren space, feel free to skip **Section 2: Turf removal and landscape preparation** (page 23). If your space is more weeds than grass, the steps for weed removal are similar to the steps for grass removal, so the guidance for grass removal timing applies to weeds as well.



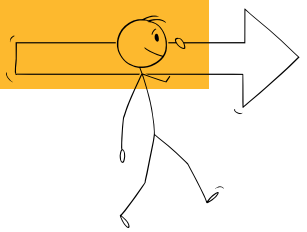

*Four Season Sensation, Plant Select, via https://plantselect.org/wp-content/uploads/2014/10/FourSeason.pdf*

**Develop a plan**

**Remove existing grass landscape**

**Adjust or install irrigation**

**Plant new plants**



**Set realistic expectations.** Your new landscape will take a couple of years to become established. The general mantra for native and climate-appropriate perennial plants is this: Year 1, they sleep; year 2, they creep; and year 3, they leap. [xvii] Your new landscape may take a few years to grow into its new home, but replacing your nonfunctional turf with vibrant water-wise plants that support local ecology will be more than worth the wait. An example of a yard over the course of the establishment period can be found in **Section 4: Planting**.

**Time your grass removal.** Whether you want to break up the project or knock out the project over the course of several weekends, you have options for tackling turf replacement. Some grass removal methods, such as sheet mulching or solarization, can be performed in the late summer and can be a good approach if you want to break up the project. Physical methods for removing turf are faster and can be completed over the weekend but require more physical labor.[xiv] This guide does not provide a comprehensive list of all lawn removal options; chemical methods can be an effective option, but their safe and responsible use is outside the scope of this guide. **Section 2: Turf removal and landscape preparation** will walk through three safe, effective, and environmentally friendly methods.

Establish new plants. Planting water-wise plants can generally be completed anytime from May to September. You can check with your local Extension Office for additional guidance if you are unsure when to plant. As you select individual plants, pay attention to their specific planting guidelines and recommendations. Different plant species and regions in Colorado have varying establishment timelines.

## Remove your grass your way

Turf removal methods are flexible, and planting can be done any time in late spring to early fall.

No matter when you choose to begin your turf removal journey, there are turf removal options available!

**Methods that require some planning ahead**

Sheet mulching typically occurs in the fall prior to planting. It can take between six and eight months to kill turf.

Solarization is the most effective in the summer and can take between six weeks to one year to kill turf.

**Quicker turf removal**

Physical removal can be performed at any time and is the quickest option. It also requires significant physical labor.[xiv]

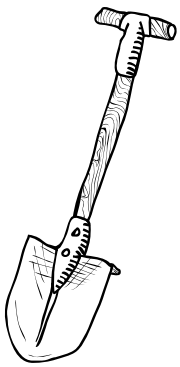
For more information on chemical application guidance, see the Colorado State University Extension Homeowner's Guide to Pesticide Use Around the Home and Garden Chemical.

More information can be found in **Section 2: Turf removal and landscape preparation**

## Sheet mulching vs. solarization

Killing turf by covering it with cardboard or newspaper and layering mulch or other organics on top is known as sheet mulching.

Solarization is the process of covering turf with clear plastic sheeting to heat up the turf until it is killed off.[xiv]



## Don't have time for landscape conversions?

Irrigation audits and assessments, rebates for smart and high-efficiency irrigation equipment and an efficient irrigation schedule can save water on your landscape without changing or converting your landscape. Regardless of what plants are in your yard, there may be ways to improve water efficiency.

### Take advantage of your local programs to improve your irrigation system.

Examples of programs your municipality or water provider may offer include **irrigation system assessments or audits** and **outdoor rebates** for equipment.

**Irrigation assessments or audits** offered involve water utility staff evaluating your irrigation equipment and watering behaviors and making recommendations on how to increase water savings by using water-efficient equipment or adjusting your irrigation system.

**Outdoor rebates** can provide cash back to customers for buying and installing certain fixtures and devices outdoors to promote water savings. Typically, the customer pays for the difference between the cost of the equipment and the rebate amount.

## Local water conservation programs and water use

**Conservation programs:** Many water providers and municipalities offer a variety of water conservation tools to support homeowners in reducing water use on their landscapes, including rebate and/or incentive programs. Checking their websites is the first step in discovering programs offered in your area.

**Check for leaks and breaks:** Evaluate your water bill monthly to make sure there are no unexplained increases, which may indicate leaks or breaks in your system.

**Track your water use:** Check your monthly bill or customer portal to see if your water provider details your water use data. Consider installing a smart water monitoring device to track your water use and detect leaks, if permitted. These devices can connect to home Wi-Fi and send alerts if a leak is detected so you can act fast.

Smart water devices range in complexity, price and installation effort; however, many can be installed by a homeowner in less than 10 minutes. Remember to verify any requirements or restrictions on smart meters with your water provider before installation.

### Efficient irrigation system components

**Pressure regulators** help provide optimal pressure delivery to your irrigation system.

**High-efficiency nozzles** or **qualified sprinkler heads** with water saving features, like check-valves, prevent water backflow.

**Garden hose timers** shut off irrigation after a designated watering cycle.

## Efficient irrigation system devices and gauges

**Smart controllers**, including weather-based irrigation controllers and soil moisture irrigation controllers, adjust irrigation based on local weather or soil moisture conditions.

**Rain sensors** detect rain and signal to the irrigation system controller to adjust watering accordingly.

**Rain gauges** measure rainfall to help you adjust irrigation manually.

**Shut-off devices** detect rain, wind, soil moisture, or freezing conditions and signal your irrigation controller to stop watering.

**Soil moisture sensors** adjust watering if there is sufficient moisture in the root zone.

## Start simple -- water less!

**Signs of overwatering:**

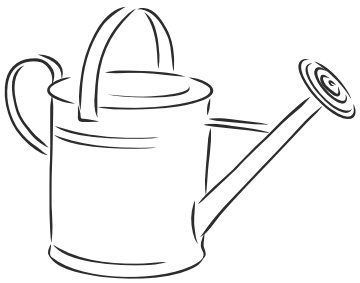
- Look for chronically wet spots or low-lying areas where water is more likely to accumulate.
- Overwatered plants turn yellow, wilt despite moist soil, or develop fungus and rot at the base of the plant.[xv]

**Irrigation technology.** Soil moisture sensors or meters determine water levels in the soil and can signal your irrigation controller to skip irrigation cycles when not required. Rain sensors can also prompt irrigation controllers to adjust scheduling if it has rained recently.

Adjust irrigation times seasonally or daily, depending on evapotranspiration rates.

Devices, tools and audits. Devices and high-efficiency irrigation system components can increase the efficiency of your landscape within your existing irrigation system. Your local water provider or municipality may offer giveaways, rebates, incentives and direct installation for efficient irrigation equipment.

In addition to equipment, water providers or municipalities may offer irrigation assessments or audits to improve your existing irrigation system and schedule.



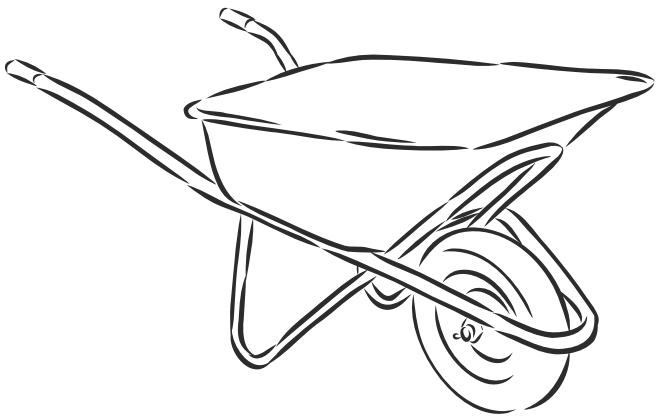
## What is evapotranspiration rate?

Evapotranspiration rate is the rate at which water is evaporated (from the soil) or transpired (from plant leaves) into the atmosphere. Factors that influence this figure include wind, air temperature and humidity.

Sprinkler heads sold in the state of Colorado are required to be WaterSense-certified [xvi] and include integral pressure regulators. Pressure-regulated sprinkler heads can prevent misting, fogging and uneven watering coverage from high pressures, making them more efficient.[xvii]

## What is WaterSense?

WaterSense is a program sponsored by the Environmental Protection Agency. Sprinklers in Colorado are required to be WaterSense certified. Products with WaterSense labels meet EPA efficiency and performance standards, use at least 20 percent less water and perform at least as well as conventional models, and conserve energy.[xvi]

# Section 2: Turf removal and landscape preparation

Now that you've developed a plan and identified the turf you'd like to remove, here's how to take the next steps and prepare your yard for a new water-wise landscape. You can remove turf using a variety of methods, each of which requires different amounts of labor, time and resources. Whether you're aiming to replace a large section of grass or a small one, whether your yard is flat or steeply sloped, whether you have weed problems or are luckily weed-free, you can use this guide to decide which approach is right for your yard. Physical removal, sheet covering, and solarization each have varying time requirements and effort levels. Consider your preferred timeline, resources, and the needs of your individual space when selecting a method.

## Methods

This guide focuses on three common, effective and natural methods of grass removal: physical removal, sheet covering, and solarization. This is not a comprehensive list of all lawn removal options.[i] [ii] [iii] For instance, chemicals are available for killing existing grass and other vegetation. However, these methods may come with environmental and health risks, and the responsible use of chemicals is outside the scope of this guide. The three methods detailed here are safe, effective and environmentally friendly. Find the one that works best for your budget, timeline and abilities!

## Physical removal

You can simply remove the grass or other plants in the area you want to transform by digging up grass using a square shovel, a grape grubbing hoe, or a sod cutter. Choose your tools wisely, though. If your area has a lot of weeds, avoid tilling the soil, as this can allow new weed seeds to germinate.

### No grass? No problem!

If you have a yard that's more weeds than lawn, this section is still for you. These techniques are applicable for preparing areas for landscape transformation, even if the focus is more on killing weeds than killing grass.

### Rome wasn't built in a day

If removing very large areas of grass seems daunting, start with a more manageable size. You can always remove more later, and the next project may seem more doable with some experience!

### Avoid the landfill!

Don't throw away your old sod! You can use these sod strips to build a berm, or a rounded mound of soil, which adds dimension to the landscape. This is a win-win: a berm improves your yard while keeping materials out of the landfill.

### Sod cutter method:

1. A sod cutter runs best on grass that's not soaking wet or too dry. Adjust your watering schedule in the days prior accordingly.
2. Rent sod removal equipment, if needed, from your local hardware store.
3. Cut sod strips out of selected area, remove strips, add 4 to 6 inches of high-quality topsoil, if needed, and plant new plants.

**Pros:** You can perform physical removal year-round unless the soil is frozen. However, removing turf within a month of planting is ideal. This is the quickest method, and removed sod makes high-quality compost.

**Cons:** This method is very labor intensive and can uncover weed seeds and allow them to sprout. It can also potentially remove topsoil and has a higher chance of turf regrowth than other methods. Using a sod cutter can significantly reduce the chance of regrowth. This technique will not work for long-rooted grasses like Bermuda grass.

**Timeline and timing:** You can do this when the soil is not frozen, and you can plant your new garden immediately afterward.


*Turf removal with a sod cutter, via https://resourcecentral.org/lawn/howto/#1702922051080-3f99dddc-c15b.*

*A berm with water-wise plants provides visual interest and contrast in an otherwise level area, via https://blog.abchomeandcommercial.com/xeriscaping-101.*

*Examples of grape grubbing hoes, via easydigging.com.*

## Tips for choosing your turf removal method

Pick your tool based on the size of the lawn area. Using a shovel may be appropriate for smaller areas or areas with an existing tree root system, but a tiller or sod cutter may be more efficient for larger areas.

Turf removal can be daunting; short-term tool rental can make that removal less labor-intensive. Factor in the cost of renting or buying the necessary tools when making your decision.

Don't want to do the work yourself? Resource Central offers a lawn removal service in partnership with some Colorado water providers and municipalities. Visit resourcecentral.org for more information.

## Protect our trees

When mechanized turf cutting is used around trees, the tiny hair-like feeder roots responsible for water and nutrient uptake are severed in the top 4-5 inches of soil. Critical roots for trees are found in the top 6 inches of soil and 2 times the width of the crown at the dripline. Cutting feeder roots forces the tree to use its stored resources to regrow these roots, often leaving it in a state of starvation. While some trees may survive this stress, many will have their lifespan reduced from 100 years to less than 5 or may die within just a few growing seasons. Turf conversion can also introduce additional stressors, such as the removal of irrigation or the heavy use of herbicides to manage turf grasses. These factors can accelerate particularly devastating effects on historic trees.

In established or mature trees, changes to the surrounding soil can have significant effects. When considering turfgrass removal, you should take the compaction of surface soil into account. Compaction of just the surface layer of soil can be detrimental because most of the tree's fine absorbing roots exist in just the first 6 inches of soil. Soil compaction from any kind of construction activity or traffic creates a host of problems for urban trees, including less oxygen, water and nutrient availability.

Colorado State University has more information on protecting your trees.

## Thinking about using chemicals?

While this guide does not promote chemical methods for killing grass and other vegetation, they can be a viable option. Spraying with glyphosate or other herbicides preserves nutrients in the soil, helps suppress weeds, and can be particularly effective if you choose to install native grasses. However, these methods may come with environmental and health risks, impact pollinators, and damage your new landscape if not used appropriately. While the responsible and effective use of these methods is outside the scope of this guide, Colorado State University's Extension service has resources. The Environmental Protection Agency also has resources found here. If you choose to spray, make sure you follow all label instructions and wear appropriate personal protective equipment (PPE) so you can be confident you're doing it right. And remember that you don't have to do it yourself. **Hiring a certified professional is the safest approach and is a great way to reduce the chance of user error.**

## Sheet mulching

Sheet mulching consists of adding a layer of organic material and newspaper, brown craft paper or cardboard on top of your lawn to smother the grass, blocking sunlight and stopping photosynthesis. Smothering can kill the underlying grass and weeds in as little as two months in the summer, but some gardeners opt to start the process in the fall and plant in the spring.

### Method:

1. Mow the grass very low, to a height of 2 inches or less, then water thoroughly.
2. Cover the grass with a few layers of newspaper or craft paper, or one layer of cardboard. Water the area thoroughly.
3. Add anywhere from 3 - 12" of wood mulch, compost, leaves, or any combination of the three on top of the paper layer.
4. Wait until the layers have decomposed to the point where the original materials are no longer recognizable, and plant directly into the new soil you have created.

**Pros:** Sheet covering is less labor intensive than physical removal and creates very rich soil for new plants. It doesn't disrupt the soil, causes minimal environmental impact and provides a useful place for grass cuttings, dead leaves, compost and other waste materials.[i] This is a great option to use when working around tree root systems.

**Cons:** If done in the spring or fall, this method can take several months to completely kill underlying grass. This can create an unsightly area.

**Timeline and timing:** If done in the summer, this method can take as little as 2 months to kill the grass or weeds and create soil that is ready for planting. For a more passive option, it can be done in the fall, allowed to compost over the winter, and then planted in the spring.

## Tips for sheet mulching

Be mindful of the newspaper and cardboard used and watch out for toxic glues and inks with heavy metals, particularly if you're going to be planting vegetables. Most newspapers use soy-based nontoxic inks that are just fine, but you can be sure by reaching out to the newspaper. Using store-bought craft paper, if you don't have these materials around, is another option that avoids the risk of any unwanted substances.

Raised sides made from stone, timbers or other materials can make the area look neater, help retain the landscape bed and can help retain the organic layers in place as they decompose.

The process of using multiple layers of paper and organic materials, called lasagna gardening is a common practice in areas with more rainfall and or when looking to create very rich soil. In our climate, using multiple layers slows down this already time-consuming method which is why just one of each is recommended.

## Solarization

This method concentrates heat from the sun to kill your grass. By covering grass with a clear plastic sheet, you can heat up the top few inches of soil, killing grass and weeds alike.

### Method:

1. Mow the grass very low, to a height of 2 inches or less, then water thoroughly.
2. Use a clear UV-stable plastic sheet to cover the mowed section of grass, pulling the sheet tight and covering edges with dirt to minimize air flow under the plastic. If necessary, place rocks in the center of the plastic to prevent wind from lifting it.
3. Leave the sheet there for six to eight weeks.
4. After the grass is dead, remove the plastic.

**Pros:** This method is not labor intensive and can preserve organic material. It kills weeds and seeds in the area as well.

**Cons:** Solarization takes six to eight weeks, and because it relies on heat from the sun, it's most effective during hot summer months and does not work well year-round. It is also not recommended for areas with steep or variable slopes or in an area with existing tree roots. It is also not ideal for areas with steep or variable slopes. Solarization can also kill healthy microorganisms in the soil and impact existing tree canopy.

**Timeline and timing:** Solarization is most effective during summer months. Starting the solarization process in late spring will leave you with time in late summer or early autumn to plant perennials in preparation for next year's growing season.

## Tips for solarization

Use clear plastic for high sun areas and black opaque plastic for low sun areas. Thicker plastic will resist cuts and tears and is more likely to stay in good condition for the entire solarization process.

Ensure the plastic is well sealed off. If gaps and air are allowed in, it is much less effective. Check regularly for rips and tears, and repair with greenhouse repair tape or clear packing tape. Avoid duct tape.

Take care in using this method near shrubs and trees. This method heats up the top few inches of soil and may impact the shallow roots of nearby plants.

# Section 3: Soil and mulch

Although it may be tempting to overlook soil, its characteristics have a big impact on the outcome of your landscape transformation. Soil characteristics can be intimidating with a lot of technical terms. You don't need to become a soil expert, but there are a few things you can learn to give your plants the foundation to thrive. In this section, we will break down soil and mulch into understandable terms.

## Soil characteristics

Plants can be particular, and that can sometimes include preferences for soil characteristics. Soils can limit the potential of your plants if there is not enough nutrients or drainage to support healthy root systems and plant growth. Soils are a combination of sand, silt and clay:

- Sand particles feel gritty and are generally created from weathered rock and minerals.
- Silt and clay particles are smaller than sand, and clay tends to feel smooth and sticky when wet.

The proportion of these three materials in your soil will determine its properties. For example, much of Colorado has soils with high clay content, which can restrict water and air.[i]

**Know your starting point.** A soil test at the beginning of your project can determine the characteristics of your soil and detail any deficiencies you may need to correct to support your new plants. Matching plant selection to soil type is easier than trying to change your soil to match the plants. If you have had a grass lawn for years, your soil may not be optimized for your new plants. Years of fertilizer application can lead to nutrient buildup in the soil that can cause imbalances that may not be optimal for your new plants. Additionally, some clayey soils will become compacted over time due to foot traffic.[i] These issues can be corrected with amendments, but it can be hard to know what issues may be present in your soil without a test.

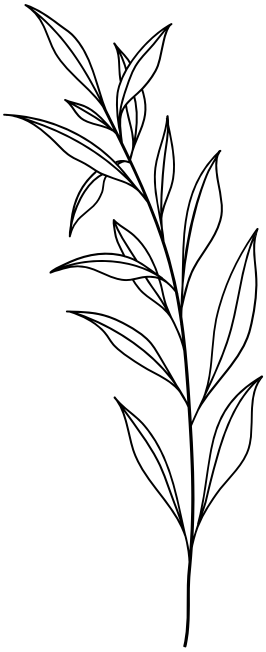
Soil tests are relatively inexpensive and accessible. Spring is the busiest time of year for soil tests; it may take weeks to get the result. For most soil tests, provide a sample along with the type of plants you intend to grow. The soil test will indicate if nutrient levels in your soil are low, high or optimum for plant growth. The soil test will provide recommendations on what soil amendments are needed to prepare your soil for the new landscape.[ii] Soil amendments are often used to improve drainage and aeration in the soil or to add nutrients.

### Soil tests

The CSU-Soil, Water and Plant Testing Laboratory offers soil tests that can help you characterize your soil and determine if any improvements are needed.

### Soil amendments

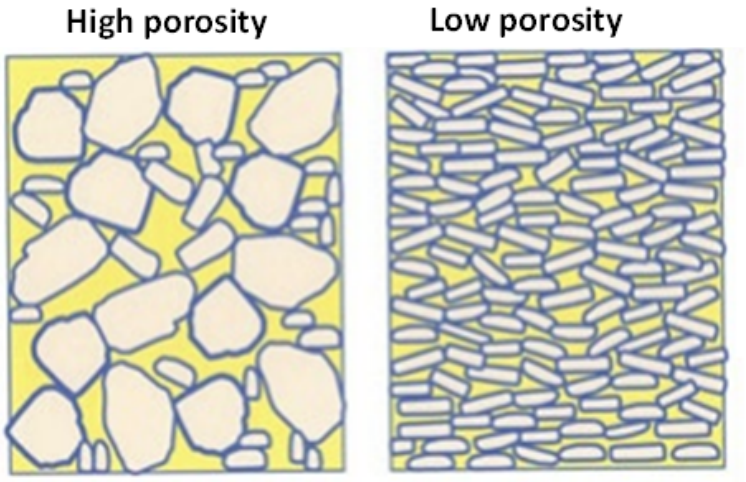
A soil amendment is a material that is added to the soil to improve its characteristics and support plant growth.



**Porosity and drainage**. Clayey soils have smaller pore spaces between particles ("low porosity") and may become compacted over time. The lack of pores can limit root growth and lead to shallow roots. The low porosity also restricts the flow of air and water in the soil. Although low porosity leads to poor drainage in clayey soils, water retention increases clayey soils' capacity to store nutrients, causing clayey soils to typically have higher nutrients than other types of soils. [i]

Sandy soils have larger pore spaces ("high porosity"), which support good drainage and airflow. However, this causes the soils often to have poor water retention and low nutrient retention. A lack of nutrient retention can lead certain plants to compete for nutrients and hinder growth. [i]

The good news is that no matter what type of soil you have, soil amendments can improve drainage, airflow, nutrient availability and root growth. Knowing your soil type can also help you water wisely and prevent overwatering your plants. More tips on watering for your soil type are in **Section 5: Watering.**




*Soil porosity diagram, Colorado State University Extension, via https://cmg.extension.colostate.edu/Gardennotes/213.pdf.*

**Soil pH**. Soil pH is a measurement of how acidic or basic the soil is and is another soil characteristic determined in a soil test. A pH of 7.0 is neutral, but soils in Colorado tend to be alkaline, with a pH of 7.0 to 8.3.[iii] Soil pH is important for plant growth because it can affect nutrient availability and soil structure. Some soil pH ranges are also associated with toxic substances and plant diseases related to soil. Thriving microorganisms are important for a healthy soil ecosystem, and soil pH can negatively impact microorganisms.[ii]

**Soil nutrients.** The three primary soil nutrients for plant growth are nitrogen, phosphorus, and potassium, sometimes referred to as N-P-K (their periodic table element symbols). If these nutrients are too low, your plants may not grow and flower. You may need to amend the soil with organic matter or add fertilizer to jumpstart your landscape.[ii]

**Organic content.** Soil's organic content affects texture, nutrients and drainage. Organic matter is a measurement of the materials in the soil containing carbon. This includes plant and animal remains and decomposing material. In general, native soils in Colorado contain 1-2% organic matter. It is recommended not to exceed 5% organic matter as it ties up microbes and throws off soil balance.[i]The ideal percentage of organic matter in your soil will depend on what you're planting. Vegetable garden beds prefer closer to 5% organic matter while plants native to our region will do well with less.[ii] Your soil test may recommend adding organic matter to improve the soil texture so that it will either improve drainage or water retention properties.[ii]

**Soil health:** Some plant health issues are soil related. Soil tests can help diagnose these plant health issues.

## Soil amendments

Soil amendments are materials that you can mix into the soil to improve its ability to grow plants.

When to amend. The characteristics of your soil will determine whether you need a soil amendment and the type of soil amendment you may need. Soil characteristics can vary widely from location to location, so making a blanket recommendation is not possible.

Amendment materials. Soil amendments can be organic, derived from living materials, or inorganic, derived from rock, mineral or manufactured materials.

- Organic amendments can be used to add nutrients and increase pore space in the soil. Increasing pore space allows for improved drainage and air flow to support root growth. Compost is a common organic amendment used to improve soil. Some organic amendments can also promote water retention in sandy soils. Examples of organic amendments are compost, worm castings, coconut coir, aged manure, biosolids, grass clippings and dead leaves.[iv]
- Inorganic amendments can also be used to improve soil drainage in clayey soils. Native plants to Colorado prefer soils with low organic content, so inorganic amendments may be beneficial for native plants to improve soil drainage without increasing organic matter. Examples of inorganic amendments include small rocks called squeegee, vermiculite and perlite.[i]

If you are planting native or climate-adapted plants, you won't need to amend your soil nearly as much as you would with other plants. Native plants are well-suited to grow in native Colorado soils, so try using an inorganic amendment or a small amount of organic amendment. [v]

*Organic soil amendment, via Colorado State University Extension https://extension.colostate.edu/topic-areas/yard-garden/choosing-a-soil-amendment/*

How to amend. You should amend the soil after removing grass or existing plants from your landscape, and before you have planted your new plants. Materials for soil amendments can be found at your local nursery, hardware store or landscape supply company. In general, apply 2 to 3 inches of amendment across the soil area you are amending.[v] If you had your soil tested, it is best to follow the accompanying recommendations instead. Use the size of the planting area to estimate the volume of material you should purchase.

For smaller planting beds, amend the soil at the same time as you are planting. For organic amendments, use a 1:3 ratio, so that the mix is one-third amendment and two-thirds soil. For inorganic amendments, use a1:1 ratio, so that the mix is half amendment. Fill the hole after you plant with the amended soil.[vi]

If you are amending a large area, spread the soil amendment across the top of the soil in a layer that is 2 to 3 inches thick. Using a rototiller or shovel, mix the amendment into the soil to a depth of 6 to 12 inches.[v] A rototiller can usually be rented from your local hardware store.

**Amendment considerations.** Amending your soil may not be practical, depending on your site conditions. If you have a sloped yard, amending your soil may cause soil erosion. Soil amendments are labor intensive, especially if the soil is highly compacted. If you are concerned about performing the labor, consider selecting native plants to avoid having to do a soil amendment. Additionally, you should avoid amending the soil near existing mature trees or shrubs to prevent unintentional root damage. If you choose not to use an organic amendment, or if amending is not possible, choosing an organic mulch in the next step will passively add nutrients to your soil as it decomposes over time. [i]

## Mulch

Mulch prevents weeds and reduces your plants' watering needs by retaining soil moisture and keeping the soil cool.[vii] You should apply mulch on top of the soil after planting. Mulch can be made from a variety of different materials and is divided into two categories: inorganic and organic. Selecting the right type of mulch includes considering plant preferences, the frequency of mulch replacement and upkeep requirements.

*Squeegee used as mulch, Denver Botanic Gardens, via https://www.botanicgardens.org/blog/incorporating-penstemon-your-landscape.*

Inorganic mulch. Inorganic mulches are made of rocks of varying sizes, including gravel, pea gravel, decomposed granite and squeegee. Plants native to Colorado tend to prefer inorganic mulch over organic mulches.[vii] Rock mulches hold up well in windy or sloped areas. However, larger rock mulches retain more heat and increase the air and soil temperature.[viii]

Selecting rock mulches with rocks smaller than 1-inch can avoid the negatives associated with inorganic mulch. Small rock mulch such as squeegee can improve weed suppression and support proper water drainage and retention.[ix] Although rock mulch does not have to be regularly replaced, it still requires some maintenance including regular weed control and cleaning to remove leaves and debris.[viii]

Avoid synthetic rubber mulch products because they are flammable and can leach chemicals into the soil.[viii]

**Organic mulch.** Wood mulch products such as wood chips and tree bark are referred to as organic mulch. These mulch products naturally add organic material and nutrients into the soil as the wood chips break down and degrade.[viii] Added nutrients from organic mulch can impact overall plant health, so it is important to understand the specific needs of the vegetation, specifically native and adapted species.[vi]

When using overhead irrigation, wood mulch absorbs and holds water, taking it away from plant roots, which can lead to plants appearing as though they aren't receiving enough irrigation or water, but actually, the wood mulch is simply absorbing it. Drip irrigation is recommended beneath wood mulch to optimize plant root water absorption. Wood mulch needs to be replaced more often than rock mulch because it breaks down over time. Wood mulch does not perform well in windy conditions, though some larger wood chips and shredded mulch may hold up. Wood mulch also may blow away if a leaf blower is used.[viii] [ix]

**Landscape fabric.** It is a common misconception that you must use landscape fabric to deter weeds. Landscape fabric is typically only a short-term solution to weeds; eventually the weeds will grow on top or between your landscape fabric.

Landscape fabric can also inhibit the growth and spread of plants, because it blocks water, nutrients and oxygen.

Water can run off the landscape fabric instead of passing through, preventing it from reaching the plants' roots. The landscape fabric also blocks the nutrients from organic mulch from reaching soil as the mulch breaks down. Since landscape fabric is often made of plastic, the barrier can starve the soil of oxygen, a vital nutrient for plant and soil health.

Instead of using landscape fabric, laying newspaper or cardboard down before mulching and planting is a great way to help deter weeds initially. From there, the best solution to manage weeds is to mulch to the proper depth.[x]

Landscape fabric is harmful to native bee populations who need to burrow into the soil to nest. Choosing alternatives to landscape fabric can help support the native bee population.

**How to mulch.** Apply mulch on top of soil after you have planted your new plants. Mulch products can be purchased at your local nursery, hardware store or landscape supply store. To calculate the volume of mulch you need, use the area of your planting bed or landscape area and the recommended depth for your selected mulch material. In general, organic mulch should be 3 to 4 inches deep and inorganic mulch should be 2 to 3 inches deep. Spread mulch in an even layer across your plant bed until it reaches the recommended depth. Be sure to keep an area of 6 inches around the base of your plant free of mulch to avoid covering the root ball. Proper mulching will ensure that your hard work in transforming your landscape pays off.[xi]

*Small rock mulch, Colorado Springs Utilities, via https://www.waterwiseplants.org/landscape-gallery/folder/hot-dry-and-happy/?returnurl=/landscape-gallery/front-yards.*

*Wood mulch landscape, via Colorado Springs Utilities, https://www.waterwiseplants.org/landscape-gallery/folder/exceptional-entrance/?returnurl=/landscape-gallery/front-yards.*

# Section 4: Planting

## Prepare to plant

### Pre-planting checklist

1. Locate your utilities
2. Remove grass or weeds (if you have any)
3. Amend the soil, if needed
4. Draft your planting plan

This is where you can make your vision for your new landscape become a reality. This section will give you practical guidance on how to plant for success and warn you about some potential pitfalls that may lead to issues for your new landscape. In general, plant between May and September to ensure you have planted after the last frost and before winter, giving plants enough time to take root and grow. This timeframe may vary based on your altitude, so research the average last and first frost dates in your area. Perennials can be planted right around the last frost date in the spring, or even a little earlier, and about 4 to 6 weeks before the average first frost dates in the Fall. Individual plants may have more specific planting recommendations, so be sure to follow those guidelines.

By now, you should have removed any grass or weeds in your planting area and prepared the soil. Any remaining vegetation competes with new plants for nutrients and water; starting with a clean slate helps your new plants succeed.

**Know what's underground.** When digging on your property, it is important to locate any utility lines that may be around your project. **Colorado has a Call Before You Dig (811) program that allows residents to have their utilities located for free.** This will help you locate water, sewer, gas, electric and communications lines that may be in your yard. For any digging greater than 12 inches deep, calling 811 is required, but it is **recommended to Call Before You Dig for any digging project**. The 811 service will not have information about the private lines on your property, such as your irrigation system, water and sewer laterals, power lines to a detached garage, etc. Locating your private utilities may be something to consider depending on the scope of your project. Colorado811 also has resources for vendors who perform private utility locates. For more information, visit Colorado811.org.

**Remember your plan.** It is easy to get caught up in the excitement of new plants and forget the plan you made at the beginning of the project. However, this step is when your layout is most valuable. Your planting layout is your roadmap for the number and types of plants you want to purchase.

A common mistake is to get carried away at the nursery and buy too many plants or a beautiful plant that may not be right for your new landscape. One recommendation to avoid this is to take a "window shopping" trip to your local nursery with your planting plan. This will help you determine if the plants you selected are available; it also allows for flexibility if you see a new plant that you want to include in your planting plan. Consider sharing your planting plan and vision with the local nursery to get input and ideas. Local nurseries can offer suggestions on what plants they have seen work best in your area. Once you are happy with your final planting plan, you are ready to purchase your plants!

Remember to draw your plants on your planting plan at their mature size to leave room for your plant to grow and reach its full potential.

# Purchasing your plants

Use your planting plan to determine how many plants to buy for each species in your planting beds. Plants will sometimes be available in different sizes, so selecting the right size plant is important for establishing plants in their new home.

**Select smaller plants.** In most cases, you will transplant plants from a pot to a planting bed. Replanting can be a stressful time for plants, and smaller plants have more success with transitioning from a pot to a planting bed because they have more resilient root systems. The roots of smaller plants will grow faster than larger plants, and they will have an easier time becoming established in their new home. The table below has size recommendations for various plant types.[i]

## Plant when perky

The planting process is stressful to plants. Plant when the plant leaves are bright and perky. If the plant looks wilted, water it and wait until it has perked back up to plant. [iii]

| Perennial Plants | Shrubs | Trees |
|---|---|---|
| Pint or quart size | Gallon size | 1.5-inch caliper |

Inspect plants prior to purchase. While plants with blooms catch your eye at the nursery, look beyond blooms to other signs of plant health. Select plants that look healthy with uniform growth and healthy roots. Roots should be fleshy and creamy white in color.[ii] Avoid plants that are “root-bound” or “pot-bound” with little or no space for growth.

Healthy roots

Root-bound plant

## Planting steps

Follow the steps below  to set up your plants for success. Repeat steps 2 through 5 for each plant.

1. Place your plants. While your plants are still in their pots, place the plants where they will be located within the planting bed. You will work plant by plant for steps 2 through 5.

2. Dig the hole. Use a garden shovel to dig a hole that is as deep and twice as wide as the size of your plant's container.

3. Remove the plant from the pot. Take the plant out of its container by carefully squeezing the sides of the pot and pulling the plant out at its base. Use your hand to loosen the soil at the base and break up the root ball to encourage the plant to grow down and out.

4. Place plant in bed. Place the plant in the hole you dug and backfill the hole to about one-third of the depth with soil. If you choose to add a soil amendment, refer to **Section 3: Soil and mulch** for more information. Hand water the plant by filling up the rest of the hole with water. Allow the water to seep into the soil.

5. Backfill the hole. Fill in the rest of the hole with soil. The soil should reach the base of the plant. Once backfilled, hand water the plant again thoroughly to encourage establishment.

6. Mulch. Once you have planted, it's time to mulch. For more details about mulching, see **Section 3: Soil and mulch**.

## Establishment period

It will take time for your new plants to become established and fill your garden. The timeline of your landscape reaching maturity is also dependent on location and specific plant material. The three following phrases often describe the way perennial plants progress and grow.

### Year 1: They sleep

### Year 2: They creep

### Year 3: They leap

**Watering during establishment.** To successfully establish your plants, water consistently to encourage plants to establish a strong root system. In the first two weeks after planting, plants require daily watering. After that, in the first year, native and climate-adapted plants may only need to be watered two to three times per week. During the second year, reduce watering by half. By the third year, your plants are considered established, and you can cut water again by half. Once your plants are established, you may even stop watering altogether if your weather and soil conditions provide enough water for your plants. [iii] While this guidance is helpful to set expectations, look for signs that your plants need more or less water. If it is a particularly rainy growing season, you may not need as much supplemental water to meet the needs of your plants. Overwatered plants may become yellow and appear wilted even though the soil is moist. On the other hand, if there is a heat wave or an extended hot, dry period, your plants may exhibit signs of stress, such as downturned or drooping leaves or stems, which is a signal to provide your plants with more water.

# Section 5: Watering

Whether you are adjusting your landscape or not, evaluating and improving ways you currently use water on your landscape can lead to water savings!

This section will help you determine whether your irrigation system is working well or help guide and inform the type(s) of irrigation systems that match your landscape transformation by covering the following steps:

- Evaluating your irrigation system.
- Identifying and correcting irrigation system issues.
- Matching irrigation methods to your landscape.
- Making sure your trees and other vegetation still receive the correct amount of water.
- Maintaining your irrigation system.

## Evaluating your irrigation system

Evaluating your irrigation system while it is running is key to identifying issues. It is difficult to identify a tilted sprinkler head or a break without seeing it in action, especially if your irrigation system is on when you are not home or are inside.

### Identify areas where your irrigation system is faltering

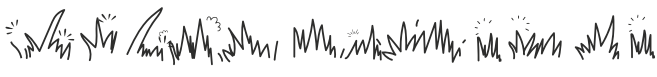
Watch for brown, dry spots or wet, spongy spots on your landscape — they may indicate that your irrigation system is not functioning well in that area.

Culprits of irregular sprinkler irrigation system coverage include clogged or misaligned nozzles and buried, tilted or partially covered sprinkler heads. If your irrigation system is underground, consider checking your water bill to identify major leaks in your system.[i] A sudden uptick in water usage could indicate an unidentified leak in your irrigation system.

Sloped, level and low-lying areas within your landscape should be watered differently. Watering too quickly for too long can cause runoff if water cannot be absorbed into the soil fast enough.[ii] This is especially true in sloped areas. Watering deeply using cycle-and-soak techniques can encourage deeper root systems and make plants more resilient. Watering for short periods of time, or too quickly on sloped areas, may encourage shallow root systems.

In level areas of your landscape, check that nozzles and sprinkler heads are evenly distributed and have enough range to provide adequate coverage and effectively reach your plants. Sometimes, a fix can be as easy as shifting a sprinkler head or adjusting a nozzle.

If you observe a sprinkler watering surfaces like the sidewalk or hardscape elements on your landscape, adjust the nozzle or remove the sprinkler head. Because sprinkler heads and nozzles are susceptible to damage, it is good practice to regularly check for misaligned, broken or tilted sprinkler heads on your landscape.



## Cycle and soak technique

Instead of watering continuously for a set period, the cycle-and-soak watering technique breaks up watering time into several cycles. Allow water to soak into the soil before watering again, reducing wasteful runoff and promoting deeper root systems.[ii]

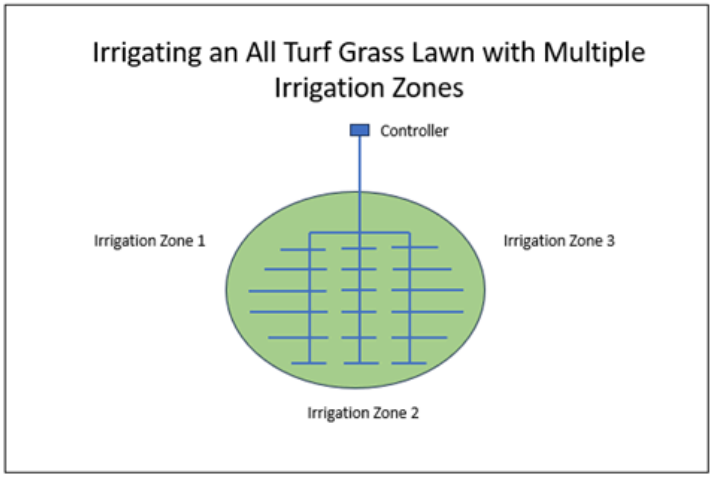
For example, if your irrigation schedule is set to water for 30 minutes, instead of watering for 30 minutes at once, break it into three, 10-minute intervals.

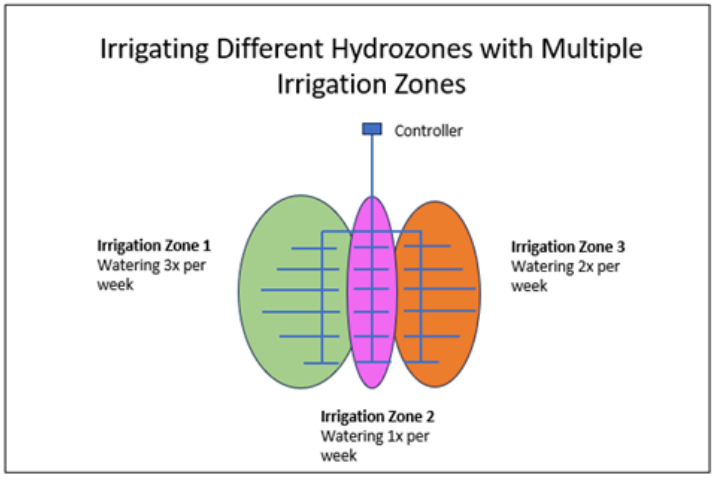
Colorado State University Extension recommends sprinklers with spray heads run no more than eight minutes at a time and have at least 30 minutes between cycles to allow water to soak into the ground for clay soils.

## Identify areas where efficiency can be increased

Once you have identified areas to improve your irrigation system, shift your focus to increasing watering efficiency.

Identifying irrigation zones on your landscape can help tailor watering schedules to plant needs. Plants with similar water demands should be grouped together and included in the same irrigation zone. For example, low-water-use plants that need to be watered one to two times per week once they are established should be on a different irrigation schedule than high-water-use plants, which may need water three to five times per week. Remember to check with your local water utility for irrigation schedules and watering rules. If significant changes to your irrigation system layout are not within your budget, adjust your landscaping layout so that plants with the same watering needs fall into the same irrigation zone.




Remember to adequately water trees and shrubs on your landscape if you change the surrounding irrigation zone. Trees require different amounts of water and application depending on their type, size and maturity. Trees should generally be irrigated using drip irrigation.

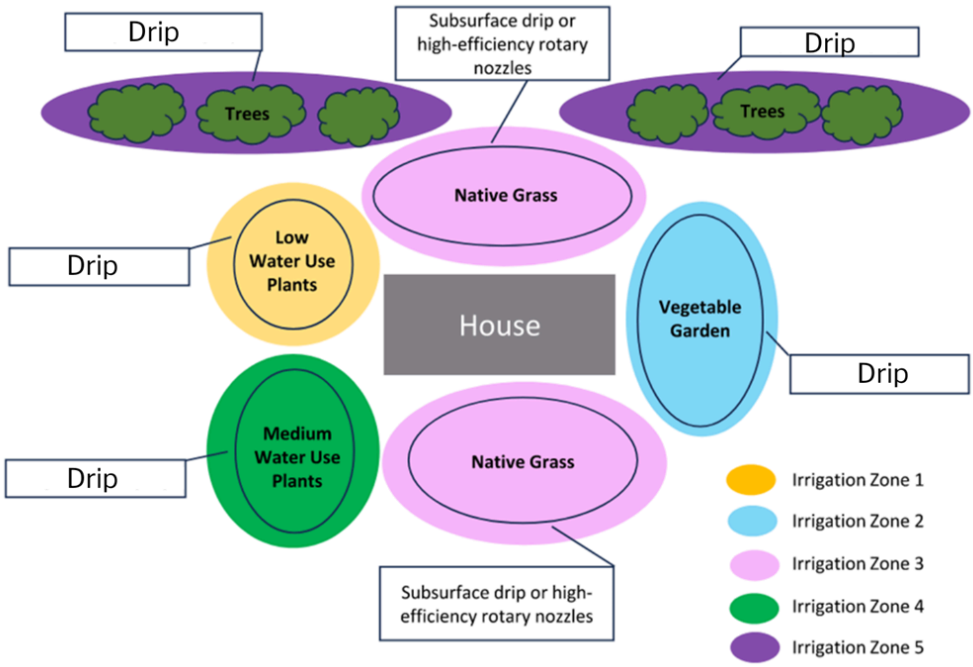
## Irrigation zones

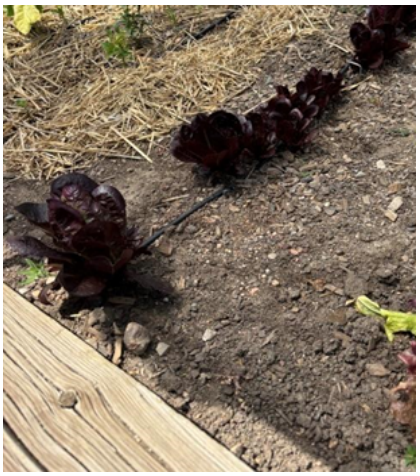
Different areas of your landscape will have different watering needs based on plant type, sun exposure and slope.

Breaking up your irrigation system into zones based on these factors with independent control valves and timers can increase efficiency, save water and improve plant health.
Hydrozones, or groupings of plants based on their water needs, may be watered with different irrigation zones.

Setting your irrigation zones based on plant needs will help save water and improve plant health! Overwatering can deprive plant roots of oxygen, causing rot and impeding root function.[iii] [iv]

In addition to plant needs, different exposure areas can have different watering demands. Exposed, sunny areas may need regular watering more than shady, low-lying areas that are more likely to hold moisture. Shady or northern exposure areas may require half the water of a sunny, level landscape. A south- or west-facing slope may need twice as much water as a full-sun, level landscape. [iii]



*A vegetable garden on a dripline irrigation system. Source:*

Soil types will affect watering schedules too. Clay soils are common in Colorado and have lower infiltration rates than sandy soils — therefore, clay soils should be watered at lower rates and use cycle-and-soak techniques as needed.

To visualize your irrigation zones, map your system with hydrozones, exposure and slopes to verify that your irrigation scheduling per zone matches the plant water and landscape needs. Consider adjusting irrigation scheduling at each zone based on your map. Whether you plan to adjust your landscape to match your existing irrigation system or adjust your irrigation system to an existing landscape, mapping your landscape is a valuable exercise.

## If you're not sure where to start

Irrigation audits or assessments are excellent options if you're not sure how to effectively evaluate your irrigation system. Irrigation audits may also include tutorials on your irrigation system controller, including how to set your control clock and adjust irrigation zones.

Sign up for an irrigation audit, also called an irrigation assessment, via your local water provider or partner organization. Your water provider may offer an audit through Resource Central's Slow the Flow program; visit resourcecentral.org/sprinklers for more information.

Irrigation audits are typically offered in the spring through fall, where a representative may perform the following tasks:

- Visually inspect your irrigation system.
- Measure how much water is being used.
- Check the water pressure and make adjustment recommendations.
- Develop a watering schedule based on the evaluation.
- Provide information based on your landscape's seasonal needs.

Remember that taking action to improve water efficiency, where needed, by following an irrigation audit is critical for water savings on your landscape.

# Identifying and correcting irrigation system issues

**Evaluate rebates before buying new equipment.** Your water provider may offer rebates to help offset costs associated with improving and adjusting your irrigation system to increase water efficiency. Some rebates may have certain efficiency requirements, so check program details before purchasing new equipment, and keep your receipt! Typically, water providers will post a list of eligible products and the rebate amount on their websites.

## Fixes can range from simple to "time to call a professional…"

Improving efficiency on your landscape may mean adjusting the nozzle of your sprinkler head to fit the shape of your landscape or prevent it from watering the sidewalk.[v] [vi] Other times, larger issues or breaks may require a professional's help. A summary of common irrigation issues and DIY fixes, in addition to larger issues that may require the help of a professional, can be found in **Section 6: Maintenance.**

To learn about other common sprinkler system issues and recommendations, visit Resource Central's Sprinkler Maintenance and Common Problems web page.

**Prioritize irrigation system corrections.** If your irrigation system has not been updated in some time, the number of recommendations following an irrigation system audit or issues identified by your self-guided irrigation system evaluation may seem overwhelming.

Focus on the issues in your irrigation system that are wasting the most water, such as fixing breaks and leaks.[vi]

# Matching irrigation methods to your landscape

## Different irrigation methods are better suited for different areas

**Types of irrigation methods.** The three main irrigation methods include overhead irrigation, microspray irrigation and drip irrigation. Overhead irrigation includes sprinkler systems and is typically less efficient than microspray and drip irrigation because of wind and evaporation. For turf grass areas (including native grasses), overhead irrigation is typically used in Colorado. For plant beds, bushes and vegetable gardens, drip and microspray irrigation methods are used for targeted watering at or near plant roots. Drip irrigation is the most efficient irrigation method and should be selected where possible. For overhead irrigation using sprinkler systems, select different sprinkler heads and nozzles to match your landscape or irrigation zone size.

Types of sprinklers and sprinkler systems. Different types of sprinkler heads include spray and rotor sprinkler heads and high-efficiency rotary nozzles. Pop-up spray sprinkler heads are better suited for short distances, while rotor sprinkler heads work well in larger areas because they spray a long distance. High-efficiency rotary nozzles are suited for medium-sized areas. High-efficiency rotary nozzles rotate in fixed spray patterns and work well when irrigating grasses.[vi]

**Converting to drip**. Sprinkler systems can be converted to driplines to increase watering efficiency on your landscape without replacing the existing infrastructure. To convert your system, connect the drip system into an existing

### Common irrigation methods

**Overhead irrigation** emits water under high pressure through sprinkler heads, into the air and onto plants.

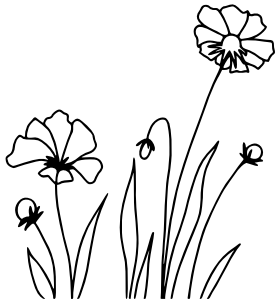
**Microspray irrigation** sprays water at a low pressure and low flow rate short distances just above the ground surface.

**Drip irrigation** applies water at low pressure and low flow rate directly to the bases or roots of plants. Subsurface drip irrigation delivers water directly to plant roots beneath the ground surface.

While overhead spray systems are 50 to 70 percent efficient, microspray irrigation is typically between 70 to 90 percent efficient, and drip irrigation can be over 90 percent efficient. [vii]

### Head-to-head sprinkler spacing

Sprinkler head water throwing ranges should reach the next sprinkler head to provide even coverage on your landscape.[v]



underground lateral line or remove a sprinkler head to expose the riser, and connect a drip conversion fitting.[xiii] Various types of drip conversion kits are available for different needs. Depending on your existing irrigation system, adapter fittings and sizes will vary. Unused sprinkler heads after a conversion can be capped per manufacturer recommendations. Capping unused sprinkler heads instead of removing them allows you to make irrigation system changes in the future. Drip irrigation systems are versatile and may be installed to target trees or shrubs previously irrigated with overhead irrigation systems.

Keep in mind that newly established landscapes typically require more water than established landscapes.[ix] Tree watering requirements also vary by maturity and size.[x] Established, large trees should be watered between the trunk and beyond the outer edge of the tree canopy. Tree roots extend 2-5 times the height of the tree, with most of the absorbing roots at the dripline and beyond. Trees newer to your landscape should be watered around the base of the trunk, also known as the root ball. After the first year, start to move the irrigation out to water the growing tree roots.

Get to know your irrigation system flow and pressure. Understand the flow and pressure required by your landscape and follow manufacturer recommendations. If the water pressure is too high, sprinklers may mist because the head or nozzle cannot handle high pressure, wasting water. If the water pressure is too low, a sprinkler head may not pop up or emit larger droplets at a smaller range than normal. Low pressure may result in uneven coverage and inefficient watering. The pressure of your irrigation system will affect the flow of water that comes out of your sprinkler heads or drip irrigation lines.

### A qualified professional may need to install and plan your irrigation system

Consultations with an irrigation professional may be a good place to start. Depending on the size and complexity of your landscape, this can help you determine the best course of action.

*Sprinkler cap , Spray Body – Capping Off Head, via www.hunterindustries.com/en-metric/node/116736*

**Consult a professional if you suspect your irrigation system is not getting the optimal pressure.**

**Timing matters.** The best times to water are between 10 p.m. and 6 a.m. because it is typically cooler, less windy and has higher humidity, resulting in less water loss to evaporation.[xi] Although these times are optimal for irrigation efficiency, regularly evaluate your irrigation system during the day for leaks or breaks.

## Common symptoms of...

### Over-watered plants

- Drooping, yellowing leaves with very moist or wet soil
- Green soil indicating moss or algae
- Lack of growth
- Rotting roots

### Under-watered plants

- Drooping or discolored leaves with very dry soil
- Dry leaves and brittle stems
- Lack of growth [iv]

Adjust your irrigation schedule seasonally for efficiency. Plants typically need less water in spring and fall and more in the summer. Smart controllers (i.e., a weather-based irrigation controller) are a great way to help you manage your irrigation levels and adjust seasonal water applications.[xii] Rain gauges and rain sensors on irrigation controllers can also help inform your irrigation scheduling. Rain gauges measure rainfall to help you understand how to adjust your watering. Rain sensors can detect rain and signal your irrigation system controller to skip watering cycles.

Consider if the irrigated areas are sloped or level when determining an irrigation schedule. Adhere to local regulations when it comes to irrigation scheduling. Watering rules may include mandatory or voluntary limits on days of the week when irrigation is permitted or during certain times of the day. For example, Denver residents are encouraged to only water Kentucky blue grass lawns twice weekly between 10 p.m. and 6 a.m. During hot and dry spells, up to three days of watering per week is permitted. Established water-wise landscapes and gardens that can thrive on watering once per week are more likely to survive periods of drought or mandatory watering restrictions.

*WR2 & WR2-48 Series Wireless Rain/Freeze Sensors, Rainbird, via https://www.rainbird.com/products/wr2-wr 1*

*Sprinkler head to drip conversion.*
*Retrofit Kit for 1800 Series Spray Body, Rainbird, via https://www.rainbird.com/products/retrofit-kit-1800-series-spray-body*

# Maintaining your irrigation system

Landscapes and soils can shift over time from activity or weather, and irrigation system components may get buried, clogged or tilt over time. Underground irrigation piping may become pinched from root growth, causing lower flows to sprinkler heads or irrigation zones.

Continue monitoring your irrigation system components to check for maintenance issues throughout the growing season. Diligently checking system components can increase water savings and prevent larger issues from building up.

Thoroughly check your irrigation system during the first use in the spring and winterize your irrigation system at the end of the season.

See **Section 6: Maintenance** for details on maintaining and winterizing your irrigation system.

## Irrigation ordinances and watering restrictions

Irrigation ordinances and watering rules specify year-round or seasonal restrictions for watering outdoors.

For example, the city of Lafayette, Colorado has permanent ordinances in place for water conservation, which include prohibiting water overflow into areas not covered with vegetation and washing paved areas with hoses. Watering outdoor landscaping is only permitted between 6 p.m. and 10 a.m. (with a few exceptions). Outdoor irrigation is limited to a maximum of three days per week.[xiii]

Typically, strict rules go into effect during drought conditions. Check with your water provider for the most updated information regarding ordinances, watering limits and drought restrictions.

# Section 6: Maintenance

## A year-round effort

After establishing your new landscape, a lot of the hard work is behind you. However, there are still things to do to maintain your landscape. Taking care of plants and the irrigation system can seem daunting, but with regular maintenance, it's not a heavy lift. In the coming months and years as you take care of your new garden, there may be occasional setbacks — a plant may fail to thrive, a sprinkler head may break, and weeds may persist. That just means you have to persist too! Be consistent, and don't get discouraged. With care and attention, your garden will bloom beautifully. This season-by-season guide will walk you through a year of taking care of your new garden.

## A unique look for every season



*Colorado Springs Utilities' Mesa Road Demonstration Garden shows the beauty of water-wise gardening in all seasons. Image via https://www.waterwiseplants.org/landscape-gallery/folder/mesa-road-garden/?returnurl=/landscape-gallery/xeriscape-demonstration-gardens.*

## Spring

As warmer weather arrives and your garden starts to wake up for the year, start to get your garden ready for the coming growing season. Some things — like weeding — can start right away. Weeding often helps prevent weeds from establishing and spreading further.[i]

Many of your other gardening tasks will likely wait until after the last frost, the timing of which can vary widely across Colorado. A spring clean that rakes up leaf debris and disturbs the soil can also disrupt the life cycles of many native pollinators if it's done too early. If you haven't put away your snow shovel yet, don't bring out your rake! Don't turn on your irrigation system until all the snow and freezing weather are behind you to avoid any burst pipes. When you do turn on your irrigation system, perform a start-of-season irrigation check.

**Start with irrigation system testing.** This is an opportunity to walk through your yard to see if each component of your irrigation system is working properly. Take your time with this, and make sure you feel confident that each part of your system is fully operational. Time spent at the start of the season can save a significant amount of water over the whole summer and preventive maintenance can save lots of time and effort. This is also a good opportunity to catch leaks or other issues that may have started over the winter[ii], and it gives you a chance to familiarize yourself with your irrigation system to address any issues that crop up mid-season.

### A word on weeds

Weeding is still a part of water-wise landscaping, just like more traditional gardens. However, water-wise landscaping can naturally discourage weeds.

Infrequent, deep irrigation makes it difficult for many shallow-rooted weeds to grow, and drip irrigation discourages weeds by only delivering water to specific areas.

Mulching around the plants you want can help discourage the plants you don't want, and close spacing in a flowerbed can crowd out weeds.

Consistency is key! Regular hand pulling keeps weeds under control and is more effective than allowing weeds to get large and established.

See CSU Extension's Weed Management Pocket Guide for more information.

*A variety of irrigation issues requiring simple maintenance: overspray, blocked nozzle, broken sprinkler head, and tilted head, via https://resourcecentral.org/sprinklers/sprinkler-maintenance.*

# Common irrigation system issues

Fixes can range from simple adjustments to "time to call a professional." Resource Central's website provides guidance on irrigation issues and DIY fixes, which have been adapted and summarized below.[iii]The following highlights issues that you may be able to fix yourself:

## Overspray

**What does it look like?** A sprinkler watering the sidewalk, rocks, or other areas that don't need the water.

**Solutions:** Change the sprinkler head or nozzle type, fix a tilted head, or adjust the water pressure.

## Broken sprinkler heads

**What does it look like?** Water pools around the sprinkler base.

**Solutions:** **Turn the water off** and get a replacement head. Dig a hole around the head, unscrew the old head, screw on the new one, and fill the hole back in.

## Tilted or low heads

**What does it look like?** A tilted nozzle can spray water directly toward the ground or up into the air; this can happen from soil compaction, foot traffic, roots growing around the heads, or even maintenance equipment driving over them.

**Solutions:** Dig around the sprinkler head, remove the surrounding plant material, and carefully clear the dirt around the head. Lift and straighten the head while packing soil under it until it is even with the ground. Make sure it clears the ground and pops up fully. Replace the plant material around the sprinkler head.

## Blocked sprinkler heads

**What does it look like?** Rocks, tall grass, overgrown bushes, or other obstacles are in the way.

**Solutions:** Adjust the object or landscape feature or relocate the sprinkler head.

## Clogged nozzles

**What does it look like?** Obstructions in a sprinkler nozzle can block part or all of the water spray, creating uneven spray patterns.

**Solutions:** **Turn the system off,** lift the stem of the sprinkler up, unscrew the nozzle and remove the filter from the stem to rinse it out. Then place the filter back in the stem and screw the nozzle back on.

## If you encounter any of the following irrigation system issues, it may be time to call a professional:

### Broken pipes

**What does it look like?** Sprinkler heads won't pop up all the way or are not spraying water normally. You may also find soggy or squishy areas on your landscape.

**Solutions:** Hire an irrigation professional to find and fix the leak.

### Uneven head spacing

**What does it look like?** A landscape without head-to-head spacing can have overly wet or dry spots.

**Solutions:** An irrigation professional can help you redesign the zone or help you move a few sprinkler heads depending on the area.

### Broken or leaking control valve

**What does it look like?** Control valves communicate with control clocks to open and close — if heads do not pop up in a certain zone or if a zone stays on past the scheduled time, a broken control valve may be the issue.

**Solutions:** The valve will likely need to be repaired or replaced by an irrigation professional due to mechanical issues, debris or wiring issues.

*Sprinkler heads that don't pop up all the way or don't spray an entire area can indicate low water pressure, possibly caused by a broken or leaky pipe.*

If you have drip irrigation, check for leaks in lines and valves; repair or replace parts as necessary. If your system uses timers, confirm that these timers are working and are set appropriately for the time of year and the water needs of the plants.

**Prioritize irrigation system corrections.** If your irrigation system has not been updated in some time, the number of recommendations following an irrigation system audit or issues identified by your self-guided irrigation system evaluation may seem overwhelming.

First, focus on the issues in your irrigation system that are wasting the most water, such as fixing breaks and leaks[iv] where water is flowing uncontrollably or bubbling out of the sprinkler head or pipes.

These start-of-season steps will set your garden up for success through the whole growing season, and light weekly maintenance is all you may need in the summer.

## Summer

Throughout the summer, weed and perform periodic irrigation system checks by walking near your garden while the system is running to make sure it's all operating as expected. Taking a walk through your garden in the morning or evening a few times a week to check on irrigation and pull a few weeds is a great way to take care of your new landscape and enjoy your beautiful creation while avoiding the summer heat.

### Deadhead after the storm

Deadheading — or removing spent flowers from plants — can help flowers bloom throughout the growing season, keeping your garden colorful and beautiful all summer long. However, this process can be stressful for the plants; try deadheading after a rainstorm when plants are well-watered and thriving.

Summertime is also a great time to practice deadheading, which is removing spent and faded flowers — and often the top few inches of growth beneath the blossom — on certain plants, allowing them to continually bloom throughout the growing season. To begin, make sure you know your plants. Deadheading can allow some plants to bloom over and over again; other plants are harmed by it, and some perennials rely on annual seeding from spent flowers to bloom the following year.[v] Only deadhead plants that benefit from it. If you remove faded flowers, use clean tools to remove the flowers, and don't prune too much from one plant on any given day — give your plants time to recover from deadheading.

Finally, make sure to monitor your water bills to help identify any leaks, especially if you have underground irrigation pipes.

## Fall

As fall arrives, think about how to put your beds to bed and prepare them for next season's growth. As temperatures drop, your garden will require less water, and you can cut back your irrigation accordingly.[vi] This is also a great time to remove any weeds and dead or dying annuals. Remove diseased plants, making sure to place them in the trash and not the compost to prevent the spread of diseases. Consider leaving healthy dead stems and flower heads over the winter because they provide seeds for birds and beneficial shelter for insects through late fall, winter and early spring. This is also your opportunity to plant any bulbs or perennials ahead of the first frost.

*A divided iris root, via https://planttalk.colostate.edu/topics/annuals-perennials/1018-perennials-how-to-divide.*

Fall is a great time to divide any fast-growing perennials to take advantage of their vigorous growth without entirely crowding out other plants in your garden.[vii] Perennials that grow in a ring around a dead center that no longer produce many flowers, or that are growing into another plant's space may need to be divided. To divide a plant, gently dig up the entire space, preserving as much of the root system as possible. Shake or rinse off most of the soil from the root, then slice the plant into several pieces using a sharp knife or pruning shears. You'll want to maintain at least two or three growing points on each new clump. Then replant each clump in new areas, watering generously to reestablish plants.

### When to divide

Spring-blooming perennials do best if divided in the fall, 4 to 6 weeks before the first freeze.

Fall-blooming perennials do best if divided early in the spring, ideally soon after their growing points emerge.[viii]

Before the first frost, you will need to winterize your irrigation system. Winterizing your irrigation system helps ensure that your irrigation pipes, valves and sprinklers are not full of water which can freeze, expand and cause breaks in your system. Most systems do not have a gravity drain, and the gravity drain method is not always effective anyway. Relying on gravity alone is not sufficient; underground pipes can shift over time, resulting in low spots that do not drain properly. Water in these low spots can freeze and cause damage.[viii]

The process of blowing out your irrigation system can be risky for a nonprofessional. The best way to protect your irrigation system is to hire a professional.

After the first hard freeze, you're almost done. There's one final step that's a great way to end a growing season: Add mulch on top of moist soil on a warm day after the first hard freeze. This layer of mulch can help keep soil temperatures more constant, lowering the risk of plants being heaved out of the ground and exposing their roots to the cold winter air.

## Winter

During the winter, it's time to relax. Monitor water bills to help identify any leaks, especially if you have underground irrigation pipes; otherwise, it's time to rest and dream about what you might want to do in your garden next year!

As you move forward with creating and caring for your new garden space, please return to this guide to check for issues that might arise. A checklist is at the end of the guide, which can help you make sure you've done everything you need to do to help your new garden grow and thrive. As your new garden grows, there might be setbacks along the way, but your persistence and creativity will guide it in the right direction. Best of luck, and happy gardening.


*Common components of an irrigation system, via https://crconserve.com/254/Fall-Landscape-and-Irrigation-Prep.*

# DIY turf grass replacement checklist

Use this tool to help you plan, design, create and maintain your new garden properly. Each item on this checklist is discussed in further depth in this guide.

Don't forget to call before you dig (page 7). Consulting with an ISA-certified arborist can help protect your trees (page 8). Check for your community fire guidance for landscapes and local irrigation and watering guidelines to ensure your new space is in compliance with local rules, ordinances, and regulations.

## Planning and design

- [ ] Set goals and identify contraints
  - [ ] Identify an area to transform
  - [ ] Estimate available budget, time and effort
- [ ] Research rebates, incentives and other programs offered by your municipality or water provider
- [ ] Create a landscape plan
  - [ ] Evaluate your sprinkler system (see Watering checklist below)
  - [ ] Identify hydrozones
  - [ ] Select plants
  - [ ] Draw your plan for your new garden
- [ ] Schedule your transformation
  - [ ] Select a grass removal option that makes sense for your area
  - [ ] Understand plant establishment guidelines and timing

## Turf removal

- [ ] Physical removal and replacement:
  - [ ] Obtain shovel, hoe, tiller or sod cutter
  - [ ] Remove grass
    - [ ] Sheet mulching:
      - [ ] Cover grass with one layer of paper (cardboard, newspaper or craft paper) and then with a thick layer of mulch. Water thoroughly.
      - [ ] Wait until layers have decomposed, and plant new plants
    - [ ] Solarization:
      - [ ] Obtain a clear UV-stable plastic sheet and materials and secure the sheet on top of the sod
      - [ ] Wait 6 to 8 weeks
      - [ ] Remove plastic after grass is dead before planting new plants

# DIY turf grass replacement checklist

## Soil and mulch

- [ ] Get a soil test
  - [ ] If needed:
    - [ ] Obtain compost, mulch, squeegee, gravel or other materials described in Section 3
    - [ ] Amend your soil

## Planting

- [ ] Call before you dig (call 811 or visit colorado811.org)
- [ ] Select and purchase plants
- [ ] Plant according to your landscape plan
- [ ] Add mulch
- [ ] Water thoroughly to help plants get established

## Watering

- [ ] Get an irrigation audit, if applicable, or do-it-yourself by:
  - [ ] Identify any areas that are overly dry or wet
  - [ ] Identify slopes and assess their impact on soil moisture
  - [ ] Identify irrigation zones for your planned garden
  - [ ] Assess your current irrigation system's ability to meet the needs of each of those zones
  - [ ] Determine if you can fix the issues yourself or if you need to call a professional
- [ ] Research rebates and obtain new sprinkler heads, drip irrigation or other equipment as needed
- [ ] Install irrigation timers or update existing ones to meet your new landscape's needs
  - [ ] Create a schedule for periodically adjusting irrigation timing throughout the growing season to meet changing irrigation needs

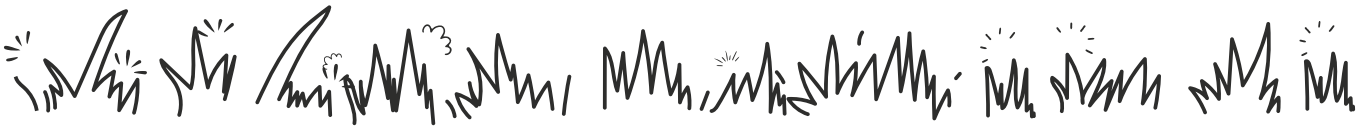
## Maintenance

- [ ] Create a plan and schedule for regular inspections and maintenance
- [ ] Spring:
  - [ ] Test your irrigation system for leaks, breaks and other issues
  - [ ] In late spring, cut back last season's dead growth as desired
  - [ ] Weed regularly

# DIY turf grass replacement checklist

## Maintenance (continued)

- [ ] Summer:
  - [ ] Keep weeding
  - [ ] Deadhead as necessary
- [ ] Fall:
  - [ ] Keep weeding
  - [ ] Divide fast-growing perennials
  - [ ] Winterize your irrigation system
- [ ] Winter:
  - [ ] Rest and plan for the year ahead



# In-text links by section

## Section 1

Inspiration Hub on WaterwiseYards.org

Plant Select design gallery

Northern Water Sustainable Landscape Templates

Resource Central Slow the Flow

EngageCWCB 2023 Turf Replacement Program Funding Summary

Resource Central Lawn Replacement Program

Colorado State Forest Service Urban and Community Forestry TreePlotter™ application

Colorado811.org

Colorado State University's Soil, Water and Plant Testing Laboratory

Colorado State Forest Service Home Ignition Zone Guide

TreesAreGood®

Colorado Division of Natural Resources Rainwater, Storm Water & Graywater

Resource Central Garden In A Box

Plant Select Waterwise Landscape Designs

Denver WaterDenver Water ColoradoScape plans

Northern Water — Northern Water Sustainable Landscape Templates

Plant Select database

Colorado Springs Water Wise Plants

Castle Rock Plant Finder

The USDA Plant Hardiness Zone Map

Colorado State University Extension Homeowner's Guide to Pesticide Use Around the Home and Garden Chemical

## Section 2

Colorado State University Extension Protecting Trees During Construction

Environmental Protection Agency Pesticide Safety Tips

## Section 3

Colorado State University Soil, Water and Plant Testing Laboratory

## Section 5

Resource Central Sprinkler Maintenance and Common Problems

## Section 6

Colorado State University Extension Weed Management Pocket Guide

# Citations

## Section 1

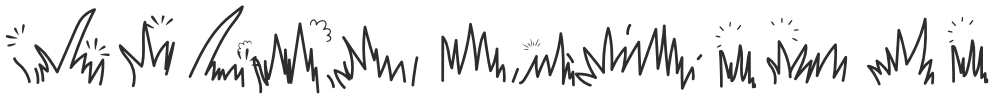
[i] Colorado Springs Utilities Water Wise Landscape Design with 7 Principles
[ii] NY Times Why We Don't Recommend Artificial Grass for Most People
[iii] Western Resource Advocates
[iv] Colorado Department of Agriculture Native Pollinators
[v] Colorado Native Grass Guide
[vi] Colorado State University Extension: Mulches for Home Grounds
[vii] Resource Central Determining your Yard's Sun Exposure
[viii] Colorado State University Extension Water-Wise Landscape Design: Steps
[ix] Colorado State University Rainwater Collection in Colorado
[x] Aurora Water Conservation District Outdoor Water Assessment Guidebook
[xi] Resource Central. (2024). Waterwise gardening and native plants
[xii] U.S. Department of Agriculture USDA Plant Hardiness Zone Map
[xiii] Colorado Springs Utilities Designing a Drought Resistant Landscape
[xiv] Resource Central Turf Removal & Replacement 101
[xv] Signs You May Be Overwatering Plants: How to Fix & Prevent
[xvi] United States Environmental Protection Agency: About WaterSense
[xvii] United States Environmental Protection Agency: Spray Sprinkler Bodies

## Section 2

[i] Colorado State University Extension Service: Renovating the Home Lawn
[ii] Colorado State University Extension: How to remove all (or part) of your lawn
[iii] Resource Central Turf Removal & Replacement 101

## Section 3

[i] Colorado State University Extension: Managing Soil Tilth: Texture, Structure, and Pore Space
[ii] Colorado State University: Interpreting a Soil Test Report. Retrieved from Colorado State University Department of Soil and Crop Sciences
[iii] Colorado State University Extension: Soil pH
[iv] Colorado State University Extension: Choosing a Soil Amendment
[v] Resource Central: Soil Amendment Basics
[vi] Denver Botanic Gardens: Western Best Practices
[vii] Resource Central: Mulch: The Fifth Principle of Xeriscape
[viii] Colorado Springs Utilities: Choosing and Using Mulch
[ix] Colorado State University Extension: Mulches for Home Grounds
[x] Resource Central: Preparing to Plant Your Garden
[xi] Resource Central: Plant & Care Guide



# Citations continued

## Section 4

[i] Denver Botanic Gardens: Western Best Practices
[ii] Colorado State University Extension: Perennial Gardening
[iii] Resource Central: Plant & Care Guide

## Section 5

[i] Colorado Springs Utilities: Water Leaks
[ii] Colorado Springs Utilities: Cycle and Soak
[iii] Colorado State University Extension: Operating and Maintaining a Home Irrigation System
[iv] 10 Easy Ways to Tell Overwatering Vs Underwatering (With Solutions)
[v] Colorado State University Extension Irrigation: Inspecting and Correcting Turf Irrigation System Problems
[vi] Aurora Water: Outdoor Water Assessment Guidebook
[vii] Colorado State University: Drip Irrigation for Home Gardens
[viii] DripWorks Sprinkler to Drip Irrigation Conversion Guide
[ix] Colorado State University Extension: Water Wise Tips for Colorado Landscapes
[x] Colorado State University Extension: Watering Mature Shade Trees
[xi] Colorado State University Extension: Watering Established Lawns
[xii] Environmental Protection Agency: Weather-Based Irrigation Controllers
[xiii] Lafayette's year-round water conservation requirements

## Section 6

[i] Colorado State University Extension: Weed Management
[ii] Castle Rock Water Wiser: Sprinkler Maintenance
[iii] Resource Central: Common Sprinkler Problems
[iv] Aurora Water: Outdoor Water Assessment Guidebook
[v] Bob Villa: The Dos and Don’ts of Deadheading Flowers
[vi] Resource Central: Fall Maintenance and Cleanup Tips
[vii] PlantTalk Colorado Perennials: How to Divide
[viii] Colorado State University Extension Home Sprinkler Systems: Preparing Your Sprinkler System for Winter