
ALPENSCAPES

Landscaping

Guidelines

Big Sky, Montana
Summer 2024

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Introduction

Welcome to the Alpscapes Landscaping Guidelines for Big Sky, Montana.

As a community deeply connected to our natural surroundings, we are committed to preserving the natural beauty and ecological integrity of our region and inspiring the creation of livable landscapes for a more sustainable, resilient Big Sky for both people and nature.

These guidelines serve as a comprehensive resource for residents, property owners, owners associations, property managers, developers and others looking to align their outdoor spaces with Big Sky’s distinctive environment and climate challenges.

Use these guidelines for developing landscapes that are water-wise, wildfire-resistant, and wildlife-friendly, centered around native plants. If these practices are not yet adopted by your owners association, leverage this tool to influence your owners association for positive change.

We are dedicated to helping nature and the Big Sky community not only coexist, but flourish alongside one another.

Thank you for joining us,

The Alpscapes Partnership



Understanding the Local Environment

Big Sky's Unique Environment & Core Issues

Before embarking on any new landscaping project or updating existing landscaping, it's important to consider Big Sky's unique environment and understand the key challenges and opportunities that this area offers.

Zoning & Land Use

Our unique location and rich landscape require community-wide stewardship to maintain these natural resources for future generations. Big Sky stretches across the Madison-Gallatin County line without a formal municipal incorporation, positioning it at the crossroads of vast public lands, including national parks, national forests, and wilderness. The way we design and manage landscapes varies widely across the community and is largely determined by homeowners association design guidelines.

Climate Variability

Big Sky has a climate of extremes. Our winters are cold, prolonged, and snowy, while our summers are short-lived, brittle, and dry. This variability plays a critical role in shaping our ecosystem. From water availability to plant life and wildlife behavior, Big Sky's climate requires adaptive landscapes and conservation strategies to protect our lands and ensure the sustainability of our water supply.

Water Resource Management

An abundant water supply is essential to protecting our rivers, riparian areas, wildlife, and drinking water and is our defense against wildfire. Our community and downstream water users rely on our snowpack, meaning efficient water use and management is essential to sustain a dependable water supply to all users.



Wildfire Preparedness

Fueled by longer fire seasons, overstocked, fuel-loaded, and historically logged forests, wildfire risks demand that we proactively establish defensible space, fire-resistant species, and land management practices that mitigate risks to our homes and communities. One of the most impactful safety measures to reduce the likelihood of structure destruction in the event of a wildfire is ensuring ample defensible space.

Nutrient Pollution

Nutrient pollution can negatively impact the health of our local rivers. Many inorganic fertilizers commonly found at garden supply stores contain nutrients that can leach into our waterways and harm fish and other aquatic life. Native plants require little to no fertilizer, so prioritizing native plants is beneficial not only to the local ecosystem but also to the quality of the runoff.

Noxious Weeds

While sometimes visually appealing, noxious weeds threaten native flora and fauna, reducing local biodiversity and forage availability for wildlife and sometimes increasing erosion. It is crucial that we actively manage noxious weed species to protect biodiversity and vital habitats.

Site Assessment

Soils and plant communities should be inventoried before excavation to plan for future landscape content with the overall goals of supporting the greater ecosystem and preserving native vegetation. The stockpiling of topsoil should be the first part of any excavation. The stockpiled topsoil provides an endemic plant growth media and plant species seed bank to accelerate the re-establishment of the post-construction backfilled landscape.

Moving Forward Together

This guide provides a roadmap to minimize the threats to the local diversity and resource availability within the Big Sky community. Join us as we implement best practices for landscaping that will protect your home, enhance your property, and preserve Big Sky's natural beauty for generations to come.



Fire-Resistant Landscaping

Firewise, Water-Efficient and Native-Centric

We understand that being firewise might be a top priority for you, but it's important to know that being focused on mitigating wildfire risks does not mean having to give up being water-wise or using native and sustainable plants. Your landscape can be firewise, water-efficient and native-centric as well as beautiful. This section of the guidelines digs into firewise specifics.

Understanding Wildfire Risks to Your Home

Home and building loss during wildfires occur due to some part of the building igniting from one or more of the three basic wildfire exposures:

1) direct flame contact, 2) embers, and 3) radiant heat.

Embers cause the majority of wildfire home ignitions by directly igniting your home, vegetation, or materials near your home. Once the fire makes contact with your home, the exposure to the flames and high heat (radiant heat) may break glass windows and other fragile materials. If embers come in contact with a structure, they will quickly catch fire.

Like snow, embers accumulate and can ignite plants, mulch, dry leaves, and lawn furniture. Embers often land on the roofs, decks, and porches and depending on the condition of the home, can enter the house through gaps, attics, vents, and open windows.

When embers land in a house, they can easily ignite any flammable materials and burn the house from the inside out.

8 Fire-Resistant Landscaping Best Practices

1. Follow Home Ignition Zone guidelines
2. Choose fire-resistant materials
3. Opt for fire-resistant, native plants
4. Create defensible space
5. Maintain proper spacing between plants
6. Incorporate hardscaping
7. Create breaks in vegetation
8. Regularly clear all dead fuels to create a low fuel-spread potential environment

For more information on how to create defensible spaces, visit the [Big Sky Fire](https://www.bigskyfire.com) website.





3 Easy Ways to Reduce Fire Hazards

1. Use non-combustible materials to create firebreaks
2. Keep your landscape maintained, mow the lawn, and prune trees and shrubs
3. Store combustible materials at least 30 feet away from your home

Defensible Space

Defensible space begins at your home's foundation and extends to the edges of your property. Creating defensible space around your property is one of the most important measures homeowners can take to protect their property from wildfires. This space is critical to slowing or stopping wildfire spread and safeguarding your home from embers, flames, and heat. It also gives firefighters a safer area to defend your property.

Remember that everything from landscaping to vehicles to the home itself can be fuel for the fire. By implementing fire-resistant landscaping practices, you reduce these risks.

Home Ignition Zone and Landscape Zones

The Home Ignition Zone (HIZ) extends from your home out 100-200 feet, depending on the surrounding landscape's characteristics. Its purpose is to reduce wildfire risk by maintaining a zone that is green and well-kept. Reduce flammable materials near the home and properly space vegetation to create a fire-resistant landscape.

The Immediate Zone: 0-5 feet

Non-Combustible Zone: No flammable materials or vegetation should be placed within 0 to 5 feet of structures. These areas are required to be exclusively reserved for non-combustible materials like gravel, concrete, or brick.

*Section 23.10 of the Gallatin County Big Sky Zoning Regulations states, "All Structures shall have a minimum of five (5) feet of fire resistant ground cover around all exterior walls."

Plant Materials & Guidelines: Only use fire-resistant plants and inorganic mulches near your home, and avoid stacking firewood in this zone. Trees, shrubs and ornamental grasses should not be planted in this zone to avoid direct flame contact and radiant heat exposure. Make sure to keep this area maintained by pruning trees and foliage, raking dead leaves, and moving anything that could burn away from the home.

The Intermediate Zone: Within 5-30 feet of the structure

Low-Fire Potential Vegetation: Landscape this zone with low-growing, well-spaced and drought-tolerant plants that are regularly pruned to remain lean and green. Dead fuels must be cleared to create a low-fire spread potential environment.





Choose native species that are both beautiful and offer an array of benefits including being crucial for ecological health, enhancing property values and reducing maintenance costs. They also enhance biodiversity, improve air quality, and combat pollution in our water sources.

Avoid unnecessary disturbances to soils to minimize weed germination. Add additional hardscape elements like patios and boulders, and break up slopes with rock terrace gardens. Minimize lawn areas to reduce water usage, and limit lawns to flat areas for efficient irrigation. Try native shrub borders for hard-to-irrigate or narrow areas. Add mulch to provide a protective cover that moderates soil temperature, holds in moisture and prevents weeds from reaching the surface.

Specific Recommendations: Maintain grass under 4 inches tall. Trees should be pruned to maintain a distance of 6-8 feet from the ground or up to a third of the tree's height if the tree is less than 15 feet. Space trees so that their crowns are at least 18-20 feet apart, increasing the distance with the slope percentage.

The Extended Zone: Within 30-100+ feet of the structure

Spacing & Pruning: Maintain well-spaced trees and shrubs with at least 10 feet between crowns to minimize the chance of crown fires. Native vegetation that's low or moderately flammable is recommended.

Landscaping & Maintenance: Focus on moving all dead plant material, thinning plants to reduce density, and ensuring that shrubs are spaced and pruned. This zone is all about disrupting the fire's path and eliminating ladder fuels, which are any fuel that could spread a ground fire into the forest canopy.

Choose native vegetation in this zone that's low or moderately flammable. Consistently check your property to catch and manage new weed growth.

Forest Health and Intentionally Thinning Trees

For landowners with more acreage, it's also important to consider maintaining a healthy forest on their property, which includes paying attention to the forest's overall health and thinning trees as needed. Residual trees will have less competition for resources and will be more resistant to insects, disease, and drought. Leaving a diversity of species will promote a more resilient forest. Whitebark pine should be promoted wherever possible as it is a listed threatened species under the Environmental Species Act.

Plants

When considering which plants to incorporate into your landscaping, look for the following characteristics.

- Native species





- High in moisture content, saponins (soap), pectin, and/or latex
- Small in size
- Minimal amounts of volatile oils and resins
- Ability to withstand drought
- Minimal horizontal spread

Trees

Trees provide significant fuel for fires and can ignite nearby vegetation and structures through flying brands and radiant heat. Deciduous trees such as aspens are generally preferred over coniferous trees (high resin content) near the home because of their low resin content, higher moisture levels, and chemical composition. Generally, the best species to plant are those already growing on the site.

- Do not plant trees near structures.
- Ensure that trees are spaced at least 10 feet apart to accommodate growth.
- Within the intermediate zone (5-30 feet), remove trees and shrubs that may be creating continuous fuels and create 18 feet of spacing between the tree's outermost limbs.
- On steep terrain, place trees farther apart.
- Initially, plant smaller trees 20 to 25 feet apart, but be prepared to thin them to maintain this spacing as they grow.
- Create 6-8 feet of clearance between the ground and the tree's limbs, being careful to not cut more than a third of live limbs.

Shrubs

While adding color and diversity to landscapes and supporting wildlife, shrubs pose wildfire risks because they significantly increase fuel loads and act as "ladder fuels". Ladder fuels can carry relatively easy-to-control surface fires into tree crowns, making a wildfire nearly impossible to control.

- To mitigate their fire-spreading potential, plant only low-growing and non-resinous shrubs, spaced widely apart and not directly beneath windows, vents, or where they might spread beneath wooden decks.
- Do not plant shrubs under tree crowns or use them to screen propane tanks, firewood piles, or other flammable materials.
- Maintain shrubs by mowing surrounding grasses, annually pruning dead stems, and removing lower branches and suckers to raise the canopy away from possible surface fires.

Grasses

Grasses are highly flammable and quickly carry fire towards homes and other structures.





- To effectively manage risks, once grasses are becoming dormant, keep grasses to a maximum of 3 inches within 30 feet of your home.
- Keep grasses mowed low around garage decks, firewood piles, shrubs, and specimen trees with low-growing branches. This practice limits the available fuel for wildfires and acts as a critical barrier against the spread of flames.
- As always, avoid mowing ecologically sensitive locations such as those near riparian areas.

Groundcovers

Groundcovers play a vital role in fire-resistant landscaping by offering an alternative to traditional grass lawns that can fuel wildfires. These low-growing plants enhance the beauty of your lawn and reduce the risk of fire spread by covering the soil with a moist living barrier.

- Use groundcover plants in areas that are difficult to mow and maintain. Groundcovers should also be used on exposed land and on steep slopes.
- Select species with a high moisture content that will spread and form a dense mat of roots and foliage, helping to reduce soil erosion and suppress weeds.

Mulch

Mulch helps control erosion, conserve moisture and minimize weed growth. Non-woody and non-combustible mulch can also enhance wildfire defense.

- Choose inorganic, non-combustible mulches like gravel, rock, and decomposed granite, especially near structures.
- Use these materials over a weed barrier to provide durable, fire-safe covering.

Where organic mulch is preferred, choose options with larger chip sizes, such as compost, bark chips, or screened wood chips. Apply the mulch in thin layers no more than two inches deep to prevent smoldering and make them easier to extinguish if they are exposed to fire. It's important to maintain a safe distance of 5 feet from house foundations to avoid direct fire hazards. Also, avoid using highly flammable material like pine needles from native conifers and materials like shredded tires, that are difficult to extinguish and can release toxic fumes.

Wildflowers & Flowerbeds

Montana's wildflowers bring color and variety to the landscape from May until frost. When planting, avoid transplanting directly from the wild. This practice is often unsuccessful and promotes the spread of weeds. Instead, support local nurseries that provide garden-ready specimens.



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- Plant wildflowers in widely separated beds within your property’s defensible space to reduce fire hazards. Consider implementing gravel walkways, rock retaining walls, and irrigated grass areas to separate wildflower beds and keep them distant from other fuels.
 - Do not plant flowers next to structures unless they are diligently maintained – watered, weeded, and cleared of dead vegetation right after the first frost.
 - All plants can be fuel for a fire, so be thoughtful when planting to mitigate your home’s risk.

For more information on fire-resistant landscaping, visit the Big Sky Wildfire Hub - <https://bigskyfire.org/wildland> - and the Wildfire Risk Reduction site - <https://fire-adapted-big-sky-wildfire-hub-bsfd.hub.arcgis.com/>.



Water-Wise Landscape Guide

Water-Wise, Native-Centric and Fire-Resistant

If your top priority is having a water-wise landscape, keep in mind that reducing water usage also complements using native and sustainable plants and being firewise. Your landscape can be water-efficient, native-centric and firewise, plus aesthetically pleasing. This section of the guidelines digs into water-wise specifics.

Water Supply Drivers

The water supply in Big Sky is influenced by a variety of interdependent factors. Each component plays a critical role in water availability and the quality of our drinking water.

Understanding these influences is essential for developing effective water management and sustainable landscaping strategies.

1. **Climate Variability:** Climate fluctuations such as temperature and precipitation influence rain and snowfall which in turn contribute to the health of our water sources.
2. **Seasonal Snowpack:** Snowpack is essential to Big Sky's water supply. When snow melts, it fuels our rivers, lakes, and groundwater during the summer months.
3. **Geographical Features:** Mountains, valleys, and rivers directly influence how water flows and is stored. How these features interact with the current climate can increase or limit our water supply.
4. **Population Growth:** More people means a higher demand for water. With residential and commercial developments going up to meet the parallel demand for housing, additional pressure is being put on our local water supply.
5. **Agricultural Demand:** Agriculture is a major consumer of water, particularly for irrigation. Depending on agricultural practices, crops planted, and irrigation techniques, the amount of water required varies greatly and impacts water availability.

Water Conservation: For Now & Later

Water conservation is the most eco-friendly, economical, and easiest way to extend Big Sky's existing and future water supply. The most efficient way to cut down on Big Sky's water use is through water-wise landscapes. If all landscapes switched to water-wise practices, Big Sky could save over 40 million gallons of water annually!



Designing Your Landscape

Thoughtful planning and design will save resources and enhance the landscape's natural beauty.

Design Tips for a Water-wise Landscape

- Minimize lawn areas to reduce water usage.
- Keep lawns in flat areas for efficient irrigation.
- For areas not needed as lawn space, use native and drought-tolerant plants or add hardscape elements like patios and boulders.
- Break up slopes by incorporating a rock terrace garden.
- Try shrub borders for hard-to-irrigate or narrow areas.
- Add mulch to provide a protective cover that moderates soil temperature and holds in moisture.
- Always keep in mind not only being water-wise but also firewise by creating a defensible space around buildings and structures using rock, pebbles, and gravel.

Make a Plan

Step 1: Sketch Out Your Site

Before planting, start with a comprehensive plan to ensure water efficiency and landscape. Draw the major elements of your landscape to scale, including your house, driveway, sidewalk, patio, existing trees, etc. As you walk around the site, note the sun, shade, slopes, and vegetation.

Step 2: Consider Your Goals

Consider your goals for each landscape area, considering curb appeal, play areas, or relaxation spaces.

Step 3: Evaluate What's There

Inventory pre-construction indigenous vegetation prior to excavation to provide insight into post-construction landscape plant composition. Evaluate existing conditions, including soil



health and current species on site, especially noxious weeds, seeking advice from local experts like Grow Wild. Do your best to keep healthy native vegetation already present on the site.

Step 4: Finalize Your Landscape Plan

Choose plants suited to Big Sky's climate, focusing on native, drought-tolerant, and cold-hardy species for effective water use and ecosystem support. Group plants with similar sunlight and water requirements to simplify irrigation and select grass species that thrive in local conditions to minimize lawn size and maintenance needs.

Considering Your Soils

A healthy soil base is critical to a water-wise landscape.

Soil Properties & Water

Soils and plant communities should be inventoried prior to excavation to plan for future landscape content. Stockpiling topsoil should be the first part of excavation because it provides an endemic plant growth media and plant species seed bank to accelerate the re-establishment of the post-construction backfilled landscapes.

Soil texture and organic matter are two important factors influencing how soils store water. Pay attention to these factors to understand how water naturally moves through your soil and learn how to improve them for successful plant health and growth.

Soil texture relates to the relationship of sand, silt, and clay-sized particles that make up the mineral part of soil. Loam soils are a combination of sand, silt, and clay. Soil composition informs physical properties like particle size and relates to how soils store water and exchange nutrients.

Sandy soils have a greater number of larger spaces between particles. These soils are well-drained, but water may move through so quickly that plant roots cannot absorb it.

Clay soils have a greater number of smaller spaces between particles. These soils hold moisture longer, but clays absorb water very slowly and can only take brief watering periods before runoff and ponding.

Loamy soils are the best for plant root growth because they readily absorb and store water.





Organic matter is a mix of living and dead materials usually found in the top 10" of soil, called topsoil. It helps provide nutrients, improves moisture storage, and insulates soils against cooling and heating. Adding compost or peat moss is a simple way to increase organic matter in your soil.

Big Sky Soils

Meadow and Mid-Mountain (Elevation Range: 6000-7500 ft.): Soils vary from clays to loams to sandy/rocky soils.

Upper Mountain (Elevation Range: 8000+ ft.): Well-drained, sandy/rocky soils are most prevalent.

Soils vary in Big Sky, and it's not uncommon to find multiple soil types on the same property. Different soil types and their respective health conditions may be present within the same site, especially if grading or backfilling activities were done to construct the property.

Building and construction activities can compact soils and increase erosion, degrading soil health and landscape production. Compacted soils make it difficult for water to infiltrate and limit plant roots growth, impacting the success of your water-wise landscape.

Preserve healthy topsoils during these activities by stockpiling them and returning them to the site after final grading. Turn and loosen compacted soils.

Being Water-Wise When Planting

To match Big Sky's climate patterns, choose plants that are cold hardy and tolerant of dry weather. Specify plants that will meet your site's particular soil and light needs. Shop local for plants, and look for labels like "drought-tolerant," "native," and "firewise."

Incorporating trees on the landscape can provide extra shade areas, reduce runoff from stormwater, stabilize soils, and protect against winds. Aspen trees are a local favorite, but they prefer plenty of water. Planting smaller trees can be a good option because they require less water, establish faster, and grow sooner. Make trees a water-wise choice by placing them in areas where water naturally drains. Allow soils to dry out slightly before watering again.

USDA Plant Hardiness Zones Suitable for Big Sky



Trees & Shrubs: Zone 2 & 3

Hardy from -45 to -35°F

Perennials & Grasses: Zones 2-5

Hardy from -45 to -10°F

Tips for New Plantings

The best times to plant are spring and fall. For new sites, complete any site grading and soil preparation work in the spring and begin planting in the fall.

Keep in mind that new plantings will often require supplemental watering to get established, which usually takes 1 to 3 growing seasons.

Are you planting a vegetable garden? Look for hardy and quick-to-mature vegetables such as spinach, kale, peas, onion, lettuce, radish, and chard. Check your local nursery for specific varieties.

Minimizing Lawns: the biggest culprit for high water use.

Lawns are a central element of a typical landscape, but not many places in the US have the climate to sustain them – Montana is one of them. To address this, aligning lawn choices with the site's environmental conditions is crucial, opting for native, low-maintenance, and drought-tolerant species over intensive varieties like Kentucky Bluegrass.

Reducing lawn size and incorporating alternative landscaping elements such as native plants, patios, and rock gardens can significantly conserve water, saving 15-50% more than traditional lawns.

When preparing to install a lawn, prioritize site preparation, including grading and soil improvements, to ensure the success of native or drought-tolerant grasses. Seeding should be dense to encourage a robust stand, and the best time for it is around Labor Day, allowing grass to establish before the summer heat. Lawns should be placed in manageable areas, avoiding rugged slopes or irregular shapes where maintenance becomes challenging.



Consider low-maintenance ground covers for steep areas and drought-tolerant shrubs for borders. Ornamental grasses like Blue Oat Grass and Sheep Fescue can add aesthetic value with reduced water needs.

Watering Best Practices

Efficient Water Use in Landscaping

- Efficient irrigation is crucial for minimizing water waste. Plan your landscape to maximize water conservation benefits.
- Note: Avoid watering non-targeted areas like sidewalks or driveways to prevent runoff—split watering times to reduce this risk.

Irrigation Options

- **Drip Systems** are a form of low-volume irrigation. They deliver water slowly and directly to the root zone, minimizing water loss. You might recognize them as the black tubing surrounding trees and shrubs. Emitters can be added to the tubing to get the water to go only where you need it. Drip Systems are great for smaller areas, mulched areas, trees, shrubs, and perennial beds.
- **Spray Systems** deliver water to the foliage of plants and take time to properly calibrate to reduce the chance of runoff or loss from evaporation. Two popular spray heads are rotors and pop-ups. Rotors rotate as they distribute water and pop-ups use a fan-like spray. Remember to install a check valve regardless of which head you choose to avoid backwash contamination. Spray systems are great for large flat areas and lawns.
- **Hand Watering** is the traditional hose or watering can method you might use to water your landscape. It's the simplest way to water and the easiest way to avoid overwatering. Hand watering is great if all you need to water are decorative pots and garden beds.

Lawn Watering Efficiency

- Measure your system's output with cans to ensure even lawn coverage. Adjust watering duration based on the average output.
- Schedule watering for early morning (4 am - 8 am) to reduce loss and disease risk. Adjust seasonally and observe local restrictions.
- Utilize water meters and moisture sensors to monitor and optimize water use.

Special Considerations for Efficient Irrigation





- Be mindful of slopes to prevent runoff. Consider the plant's signs of thirst and adjust watering accordingly.
- After applying herbicides or pesticides, refrain from watering to avoid runoff into water sources.

Water Conservation Techniques

- Aim for deep, infrequent watering to promote root health and water retention.
- Install water-saving devices and consider smart controllers to adjust watering based on weather conditions, potentially saving 5-10% of water usage.

Implementing these practices can significantly reduce water usage in your Big Sky landscape, contributing to the sustainability and health of the local ecosystem.

After Planting: Effective Mulching Practices

Importance of Mulching

- **Purpose:** Mulching conserves soil moisture, moderates soil temperature, slows evaporation, and inhibits weed growth.

- **Application Recommendation:** Apply a 2-3 inch layer of mulch around trees, shrubs, and planting beds. For newly seeded lawns, a thinner layer is advisable.

How to Apply Mulch

1. **Preparation:** Clear the area of weeds and moisten the soil.
2. **Application:** Incorporate a thin base layer into the soil, then add a top layer of 2-3 inches of mulch, spreading evenly around the plant's drip line.

Types of Mulch

- **Inorganic Mulches:** Made from rocks, like pea gravel, these mulches create a weed barrier but do not enhance soil quality and can persist in the environment. Avoid any inorganic mulches that may have harmful chemicals or dyes such as rubber and plastics.

- **Organic Mulches:** Include materials like shredded bark, compost, wood chips, and sawdust. They break down over time, enriching soil structure and requiring annual replenishment.



However, they are not firewise friendly and shall not be placed near structures (at least 5 feet away from structures). Choose organic products from local suppliers whenever possible to support sustainable practices and ensure the mulch is appropriate for the Big Sky region.

Ongoing Water-Wise Care

Maintenance

- Run each irrigation zone for 2-3 minutes at the start of the watering season. Use the “test” setting if you have an automatic controller.
- Dress non-native lawns and planting beds with compost. Native plantings do not need fertilizer or compost.
- Only mow when grass is dry.
- Set mower blades to the highest setting and return nutrient-rich clippings to the lawn.
- If you notice sprinkler heads are watering sidewalks, driveways, and roads, adjust as needed.
- Identify weeds when they spring up and manage accordingly.
- Prune at the end of the season or early fall when plants are dormant.

Important Note on Lawn Maintenance:

Maintenance practices that favor lush lawns may harm the environment and nearby water resources. Overwatering and fertilizer application require special attention. Use slow-release, organic fertilizers and only apply as much as the soil results recommend.

Improve Drought Tolerance

Gradually reduce the amount of water you apply to your water-wise landscape once your plants are established. Your plants will adapt to the amount of water given as long as they can remain healthy. Try removing one or two minutes from each irrigation zone. If everything is still healthy, try removing another couple minutes.

Regularly check for irrigation system leaks and repair any as soon as possible.

Look Out For:

- A surprise increase in your water bill
- Overly green/soggy areas



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- Hissing sounds near hoses or tubing
 - Overgrown lawns
 - Broken, clogged, or misaligned heads
 - Cracks in hoses

For a complete overview of water-wise landscaping practices, check out Gallatin River Task Force's Big Sky Water Wise Landscape Guide found here:

https://gallatinrivertaskforce.org/wp-content/uploads/2022/09/2209_GRTF_NativePlantingGuide_5x8_WEB.pdf



Promoting Native and Managing Noxious Weeds & Invasive Species

Native-Centric, Fire-Resistant and Water-Wise

If you're focused on using native plants and managing noxious weeds and invasive species, remember that this approach also supports being firewise and water-wise. Your landscape can still be firewise and water-efficient while also being native-centric and aesthetically pleasing. This section of the guidelines digs into the specifics around native plants.

Plant Native

Native species have evolved over hundreds or thousands of years in a region or ecosystem. Planting native species should always be your first choice when designing your landscape. Their ability to survive long winters and adapt to local environment conditions allows them to thrive in our mountain climate, making them both a sustainable and practical choice for protecting and beautifying your home.

They also offer an array of benefits that are crucial for ecological health and property value. Not only are they beautiful, but they also preserve natural heritage, enhance biodiversity, create habitats for wildlife, improve air quality, and combat pollution in our water sources. Their reduced maintenance needs and associated costs also make them a cost-effective choice since they don't require fertilizer or pesticides.

Weed Management & Invasive Species

A noxious weed is any plant designated by federal, state, or local government officials as harmful to public health, agriculture, recreation, wildlife, or property. Noxious weeds threaten the health of local ecosystems, wildlife, and the public. It's imperative that you make managing them a priority. Once established, noxious weeds can cause significant damage and are legally required to be controlled to prevent their spread.

Invasive species are non-native and can establish on many sites, grow quickly, and spread to the point of disrupting indigenous biological communities or ecosystems.

Some of our most common noxious weeds in Big Sky are:

- Canada thistle
- Hoary alyssum
- Houndstongue



- Musk thistle
- Oxeye daisy
- Yellow toadflax
- Spotted knapweed
- Common tansy



Canada thistle



Hoary alyssum



Houndstongue



Musk thistle



Oxeye daisy



Yellow toadflax



Spotted knapweed



Common tansy

Prevent the Spread

Regularly inspect your property, especially disturbed areas, for noxious weeds, and replant with native vegetation to discourage weed growth. Carefully remove these plants when they are in bloom or bearing seeds and dispose of them. Always check your vehicles, clothing, and pets for seeds after moving through potentially infested areas, and only use certified weed-free seeds.

Steps to Manage

1. Identify the weed species
2. Learn about weed biology – it's lifecycle and how it spreads Manage existing weeds and prevent establishment

Integrated Weed Management

When planning your weed management, consider using one or more of the control strategies listed below, which are effective, economical, and environmentally sound.





Mechanical Control: This includes the physical methods used to remove weeds, such as mowing before flowering, cultivation, and hand pulling for tap-rooted plants.

Biological Control: Biological control focuses on using natural enemies of weed populations to suppress them, but it does not eliminate them. Other methods include introducing competitive plants, pathogens, and plants nearby animals graze on. Because of Big Sky's elevation and climate, biological control is often unsuccessful. If you decide to give biological control a try, use it in combination with other methods and be aware of limitations such as climate compatibility and disease transmission. Research efforts are ongoing, and if new agents become available, Grow Wild will be a source for information.

Cultural Control: This involves modifying the landscape to create conditions that are less favorable for weeds and more favorable for desired plants. Some methods of cultural control include crop rotation, tillage practices, planting and seeding rates, mulching, weed management, and maintenance practices such as preventing soil disturbance and revegetating disturbed areas. Planting and supporting healthy plant communities is key to combatting noxious weeds and invasive species.

Chemical Control: This refers to the use of herbicides to manage and reduce weed populations. To be effective, the specific chemistry for the specific weed must be used at a specific time in the plant's life cycle. Roundup is NOT effective nor recommended for noxious weed management. Herbicides can be a highly effective tool if used properly but can have negative consequences if not. Connect with experts about herbicide selection, timing and safety precautions to ensure success.

Managing Noxious Weeds: Top 10 Things to Consider:

1. **Proper Identification:** Learn to correctly identify weeds and take action.
2. **Understand Weed Biology:** Get to know the lifecycles of noxious weeds and how they spread (roots, seeds, or both) as that dictates how they are managed.
3. **Implement Integrated Weed Management:** Combine methods of management for best results.
4. **Use Herbicides Appropriately (possible sub = wisely):** Get educated about the selection, proper use, and timing of herbicides to ensure success.
5. **Regular Monitoring:** Check your property annually to catch and manage new weed populations.
6. **Proper Disposal:** Safely dispose of noxious weeds, flowers and seeds by bagging them.
7. **Prevention Strategies:** Use weed-free materials for landscaping and avoid disturbance.
8. **Encourage Healthy Plant Communities:** Select plant species that support the ecosystem and can compete with weeds.



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- 9. Limit Soil Disturbance:** Avoid all unnecessary disturbance to soils that facilitate weed establishment and spread.
 - 10. Barrier Installations:** Use physical barriers such as fabric or other mulches, considering firewise guidelines, to prevent weeds from reaching the surface.

For more information on promoting native plants and managing noxious weeds and invasive species, check out Grow Wild's 2023 Landowner Stewardship Guide:

https://www.growwildmt.org/files/uqd/82f826_9759fd75c3a42b88d9a1bc4db6b06fd.pdf





Keystone Plants For Big Sky

KEYSTONE PLANTS FOR BIG SKY

What are keystone plants? These native plants form the backbone of our local ecosystem. They are highly productive, supporting the highest number of species and playing a critical role in maintaining or restoring native biodiversity. Landscapes that don't have one or more of these keystone plants will not have a thriving food web, resulting in imbalances in its ecosystem.

Help support the Big Sky ecosystem by incorporating one or more of these native plant species into your landscape.



QUAKING ASPEN
Populus tremuloides
(*Populus*)



CHOCKECHERRY
Prunus virginiana
(*Prunus*)



DOUGLAS-FIR
Pseudotsuga menziesii
(*Pseudotsuga*)



BEBB WILLOW
Salix bebbiana
(*Salix*)



GOLDENROD
Solidago missouriensis
(*Salidago*)



SHOW FLEABANE
Echinacea pallida
(*Erigeron*)



SILKY LUPINE
Lupinus sericeus
(*Lupinus*)



**LITTLEFLOWER
PENSTEMON**
Penstemon procerus
(*Penstemon*)



**ONEFLOWER
SUNFLOWER**
Helianthella uniflora
(*Helianthus*)



**PALE PURPLE
CONEFLOWER**
Echinacea pallida
(*Echinacea*)

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Landscape Installation

Objectives for Landscape Design and Plant Materials

- **Preserve Existing Plant Communities:** Maintain and enhance existing vegetation while minimizing site disturbance and providing defensible space against wildfires.
- **Support Sustainable Firewise and Water-Wise Landscapes:** Improve and maintain a healthy, diverse, and sustainable landscape, incorporating firewise practices.
- **Minimize Irrigation:** Select plants that are well-suited to Big Sky's climate to decrease the need for intensive irrigation, benefitting the region's flora and fauna.
- **Regular Maintenance and Inspections:** Conduct routine checks of erosion control measures, particularly after weather events, to ensure they remain functional and effective.
- **Compliance:** Adhere to local regulations as well as owners association covenants, conditions and restrictions.
- **Community Engagement:** Engage with local initiatives and resources such as the Gallatin River Task Force, Grow Wild, Big Sky SNO or Big Sky Fire for support and guidance.

Top Ten Design Elements to Consider

1. **Fire-Water-Native Integration:** Combine firewise techniques with water-wise strategies and native plantings to create a sustainable landscape.
2. **Firebreak Features:** Incorporate non-combustible barriers, such as rock gardens or concrete paths, that serve as aesthetic and functional breaks.
3. **Native Plant Gardens:** Design gardens that predominantly use native species to reduce water use and support local wildlife.
4. **Zoned Planting:** Use strategic plant zoning to enhance moisture retention and mitigate fire spread.
5. **Edible Landscaping:** Consider developing an aesthetic landscape with the practical benefits of growing food, such as herbs, fruits, and vegetables - but also be aware of attracting wildlife.



6. **Permeable Paving:** Utilize materials for pathways and driveways that increase water absorption and reduce runoff.
7. **Rain Gardens:** Design rain gardens to capture runoff and enhance groundwater recharge.
8. **Buffer Zones:** Create buffer zones using low-irrigation and fire-resistant plant species around property perimeters.
9. **Wildlife Corridors:** Incorporate elements that support wildlife movement and surrounding habitats.
10. **Pollinator-Friendly Landscapes:** Design landscapes that attract and support local pollinators to enhance biodiversity.

Planting Best Practices

Soil Preparation

- **Soil Testing:** Conduct soil tests to determine pH levels, texture, and nutrient content. Amend soil based on test results to provide the best foundation for your plants.

Planting Techniques

- **Proper Timing:** Plant in the early spring or fall when temperatures are cooler, or rainfall is more abundant. This helps young plants establish roots without excessive watering.
- **Water Wisely:** After planting, water deeply but infrequently to encourage deep root growth. For efficient water use, utilize drip irrigation systems or MSMT nozzles.
- **Non-woody, Noncombustible Mulch:** Apply a 2-3 inch layer of non-woody, noncombustible mulch around plants to retain soil moisture, regulate soil temperature, and suppress weed growth. Keep mulch a few inches away from plant stems to prevent rot.

Erosion

Erosion poses significant challenges. It threatens landscapes, water quality, and wildlife habitats. The region's unique climate and topography make it particularly susceptible to erosion. Soil erosion diminishes the natural beauty and impacts the ecological balance, affecting local waterways and biodiversity. To combat this, it's crucial to implement effective erosion control measures.

- **Minimize Land Disturbance:** Limit soil exposure by preserving existing vegetation. Plan construction and landscaping activities to minimize land disturbance and protect soil.





- **Install Sediment Barriers:** Before beginning any land-disturbing activities, install sediment barriers such as silt fences or straw wattles around the project perimeter to prevent sediment runoff. Refer to [this guide](#) for proper BMP installation.
- **Immediate Soil Stabilization:** Quickly stabilize exposed soils, especially on vulnerable slopes, using techniques like hydroseeding, mulching, or applying erosion control blankets.
- **Adopt Vegetative Solutions:** Promptly revegetate disturbed areas with native plant species to stabilize the soil and promote natural rainwater infiltration.
- **Implement Structural Measures:** Where necessary, employ structural solutions like terracing, retaining walls, or check dams to effectively manage erosion on steep gradients.
- **Design Efficient Drainage Systems:** Create well-planned drainage solutions to manage surface water runoff, utilizing swales, ditches, and retention basins to direct water flow safely.

Regular Maintenance and Inspections: Conduct routine checks of erosion control measures, particularly after weather events, to ensure they remain functional and effective.

Compliance and Community Engagement: Adhere to local regulations regarding erosion control. For support and guidance, engage with local initiatives and resources such as the Gallatin River Task Force.

Topsoil

Keep Your Topsoil and Use it Later: Topsoil is fundamental to the health and productivity of our landscapes. For optimal growth and ecological balance, it's essential to use natural surface soil to support your plants. So, be sure to start by stockpiling any topsoil you disturb and use it later.

Approved Sources: If possible, use local topsoil to ensure compatibility with the local ecological conditions. If you do bring soil into your landscape, be aware that this can be challenging as the soil will contain both nuisance and noxious weed seeds. If you have questions regarding transplanting local soil, seek advice from a local expert. Be prepared to manage whatever unexpected ends up growing out of the topsoil.

Composition and Handling





- **Neutral pH:** Imported topsoil should maintain a neutral pH level to support a wide range of plant life.
- **Woody Debris Content:** The soil should contain approximately 10% woody debris. Woody debris is defined as coarse organic material that meets the following criteria:
 - Less than 90% is smaller than 30 cm in length.
 - Less than 50% is smaller than 15 cm in length.
 - Less than 10% is smaller than 5 cm in length.

Storage and Protection

- **Stockpile Management:** Topsoil stockpiled for more than 14 days must be covered or seeded to prevent the invasion of noxious weeds and to maintain soil quality.
- **Erosion and Sediment Controls:** Install sediment controls around topsoil storage to prevent sediment transport and protect water resources. These measures are vital for maintaining soil integrity and preventing contamination of nearby ecosystems.

Fertilizer

Locally adapted species and new seedlings do not need fertilizer. Fertilizers will encourage weed infestations.

If needed, low analysis NPK fertilizer could be applied to the bottom of the transplant holes for trees, shrubs, and grasses as a starter fertilizer. If placed there, there is little chance of encouraging weeds.

It's always best to implement native, low-maintenance landscapes that can survive on mulches and slow down evapotranspiration.

Seeding

Preparation: Properly prepare the soil before seeding by removing wood, debris, and rocks. Loosen the compacted soil to improve aeration and water penetration, creating an ideal seedbed for germination.

Selecting the Right Seeds: Choose high-quality, certified weed-free seed mixes that are native to the Big Sky region. Select species suited to the local climate, soil conditions, and intended use of the area, prioritizing drought tolerance and resistance to local pests and diseases.





Timing: The best time for seeding is during seasons with favorable weather conditions—typically spring or late summer to early fall in Big Sky. The timing takes advantage of natural soil moisture and temperature conditions conducive to seed germination and establishment.

Application: Evenly broadcast seeds over the prepared area, ensuring good soil-to-seed contact. For larger areas or slopes, consider using hydro mulching techniques for uniform coverage and to prevent erosion. Lightly rake, then roll or lightly compact the area to get good seed-to-soil contact. Covering with a thin layer of soil will help to retain moisture and protect seeds from birds.

Irrigation: After seeding, provide gentle, consistent irrigation to keep the soil moist but not waterlogged. This is crucial for germination and early seedling development. Adjust watering practices based on rainfall, temperature, and soil moisture levels to avoid overwatering or drying out.

Maintenance: Monitor the seeded area for signs of germination, growth, and any emerging weed competition. Conduct light, selective weeding as needed to reduce competition for resources. Mowing or weed wacking at 4' encourages grass growth while addressing nuisance and noxious weeds. Reseed bare or thin spots to ensure dense, uniform coverage and reduce erosion risk.

Post-Germination Care: Once seedlings have established, gradually reduce watering frequency to encourage deep root growth and enhance drought resistance. Continue monitoring for weed growth and managing as needed to maintain the health and diversity of new vegetation.

Maintain Spaces Between Plants

Proper plant spacing is imperative to designing a landscape that is fire-resistant and efficient with water. Consider the following for spacing within your landscape:

Tree Spacing: Leave 10-15 feet between tree crowns with increased spacing on slopes or areas with high winds to reduce the chance of fire jumping from one tree to another.

Shrub Spacing: Keep a minimum of 5 feet between shrub clusters. Adjust distance based on height and growth habits of shrubs.



Vertical Spacing: Prune tree branches to create a clearance of 6 to 8 feet from the ground to prevent ground fires from climbing into tree canopies.

Group for Water Efficiency: Group plants with similar water needs to create hydrozones for watering that meets the specific needs of each plant group.

Irrigation

System Selection and Design

- **System Types:** For landscaping areas, including trees, shrubs, sod, and flower beds, the use of automatic, timed, underground, or drip irrigation systems is recommended. These systems should be appropriately sized to ensure the successful establishment of vegetation.
- **Plant Selection:** Choose plantings that minimize the need for ongoing irrigation, selecting species according to their water needs to facilitate efficient water use. If planted at the proper time, early spring or late fall-early winter, native seedlings do not require irrigation for establishment. Adapted native plants establish with normal annual rainfall, just like they do in nature.
- **Water Conservation:** Employ water conservation devices and techniques in all irrigation designs. Conventional spray irrigation should be limited to defined lawn areas, and use properly programmed Smart Controllers for ease and efficiency.
- **Revegetation Areas:** Automatic irrigation is advised for all revegetation efforts, with the understanding that systems can be phased out once plantings have been established after three growing seasons. To ensure successful establishment, begin revegetation with grass, followed by the introduction of wildflowers.

Watering Needs and Scheduling

- Group plants by their water needs into hydrozones for efficient irrigation.
- Consider using the [WaterSense](#) irrigation controller to manage your watering schedule. This device will test your soil's moisture and adjust your irrigation schedule based on the plant's needs to maximize water efficiency and plant health. Refer to their website for more irrigation tips and WaterSense products to increase your lawn and home water efficiency.
- The Gallatin River Task Force offers rebates for installing water-saving products [indoors](#) and [outdoors](#). Visit their website for details.



Installation and Verification

- **Pre-Installation Checks:** Before installation, ensure there are no conflicts between the irrigation components and existing hardscape, infrastructure, or architectural elements. All planning should respect the location of trees, walls, and other site features to prevent damage or interference.
- **System Testing:** After installation, the irrigation system must undergo a successful pressure test to ensure functionality and no leakage. This step is crucial before the landscape architect's final sign-off.
- **Regular Maintenance:** Irrigation systems should be properly winterized and checked every year for leaks and other inefficiencies.

Maintenance and Operation

- **Water Proximity:** Avoid irrigation within two feet of roadways to prevent water waste and potential damage to paved surface.
- **Screening:** Irrigation equipment should be discreetly placed to minimize visual impact and shielded from off-site views as much as practicable.
- **Moisture Management:** Incorporate moisture sensors and apply soil amendments within the root zone and at least two inches of mulch to optimize water usage and promote soil health.

Verification Post-Installation

- **Component Location:** Confirm the placement of all irrigation components and sleeves, ensuring they are installed as per the landscape design.
- **Conflict Resolution:** Address any potential conflicts with site infrastructure or landscape features before beginning irrigation work to avoid future complications.



Landscape Maintenance

Landscaping Best Practices

Overview:

- **Support Big Sky's Ecosystem:** Design landscapes that minimize disturbance, support pollinators, and consider wildlife.
- **Preserve Native Vegetation:** Select native plants and adapted species and take measures to protect and revegetate disturbed soil.
- **Use Effective Water Management Practices:** Create hydrozones and conserve water.
- **Actively Manage Weeds:** Nature is dynamic, therefore land stewardship must also be active and ongoing. Weeds (both noxious and nuisance) will find an opportunity if there is one, thus weed management is an annual effort.
- **Ongoing Maintenance and Care:** Regularly assess your landscape for the safety of your home and the health of your plants.

Embrace the Local Ecosystem

- Prioritize the preservation and enhancement of Big Sky's native plant communities.
- Inventory soils and pre-construction indigenous vegetation before excavation to provide insight into post-construction landscape plant composition and accelerate the re-establishment of the post-construction backfilled.
- Design landscapes that minimize disturbance to the natural environment.
- Provide essential defensible space against wildfires.

Stockpile the Topsoil and Preserve Native Vegetation

- Avoid removing any native vegetation.
- Stockpile any topsoil that is moved for later use as an endemic plant growth media and plant species seed bank that will accelerate the re-establishment of the post-construction landscape.
- When disturbing a site, use a barrier fence to protect the native vegetation.
- Quickly revegetate and restore the site's original character with native or adapted species plants.
- Use native seeding and appropriate vegetation as soon as possible. This may include a mix of grasses, wildflowers, trees, and shrubs to ensure rapid stabilization and prevent the spread of noxious weeds.

Select Native or Adapted Species Plants

- Select native or adapted species plants; these plants are easier to maintain and help





control stormwater runoff.

- Choose plants that are well-suited for Big Sky's climate and soil types.
- Consider drought-tolerant plants that require minimal irrigation.
- Incorporate fire-resistant plants and landscaping techniques to create defensible space around your property, minimizing wildfire risk.
- Be vigilant in selecting plants; avoid species known to be invasive to Montana to protect the local biodiversity.

Support the Ecosystem

- Encourage pollinators: include a variety of flowering plants to attract and support pollinators such as bees, butterflies, and birds, all vital for a healthy ecosystem.
- Consider wildlife: choose plants that provide habitat and food for local wildlife, but also take measures to protect young or preferred plants from browsing by deer, elk, and moose.

Use Effective Water Management

- Implement water-wise landscaping practices to conserve water.
- Opt for drip irrigation systems, which directly water the root zone of plants and reduce evaporation and runoff.
- Group plants with similar water needs together.
- Install smart irrigation controllers that adjust watering based on weather conditions.

Employ Erosion and Sediment Control Tactics

- Protect steep slopes and areas prone to erosion by planting native vegetation that stabilizes the soil.
- Utilize erosion control mats and blankets in critical areas until plants are established.
- Ensure that all landscaping practices prevent sediment runoff and protect water quality.

Actively Manage Weeds

- When seeding disturbed landscapes, start with grass since it simplifies weed management. After grasses have established and weeds are under control, introduce wildflowers. It can be challenging to manage weeds among wildflowers because weeds tend to outcompete other plants and quickly dominate the site.
- Stay vigilant about weed control to prevent the spread of invasive species.
- Use cultural methods (mulch, proper pruning, and proper irrigation) to encourage plant health and growth and discourage weeds.
- Keep planter beds and tree wells free of weeds and debris by hand pulling or other mechanical means.

Ongoing Maintenance and Care

- Regularly assess the health and growth of plants.
- Verify that the plants are free from disease, pests, or stress.



-
- Do not use fertilizer on native plants. Fertilizing native plants is counterproductive to their long-term health and growth and promotes weed infestations.
 - If needed, use a small amount of organic, slow-release fertilizers to provide non-native plants with nutrients.
 - Do not over-fertilize non-native plants; over-fertilization can lead to excessive growth, water demand, and runoff that can harm local waterways.

Firewise Maintenance

Fire-resistant plants can lose these traits over time. To retain these properties, the plants on your landscape must be maintained.

Vegetation Management:

- Periodically assess the health and growth of vegetation in the Home Ignition Zone (HIZ).
- Remove dead or diseased branches from trees and shrubs to reduce potential wildfire fuel.
- Mow or trim grass to a low height within your defensible space, especially as it dries or cures.
- Avoid mowing ecologically sensitive areas around streams.

Debris and Growth Control:

- Remove accumulated dry or decaying materials such as fallen leaves and pine needles from yards, gutters, roofs, and decks.
- Remove or manage new vegetation growth, such as seedlings and tree regrowth, by cutting and pruning. An exception to this approach would be caring for Aspen trees. If possible, it's best to promote and take care of Aspen suckers, as they often help out their parent trees with resources.

Be Firewise with Mulch:

- Replace mulch with firewise materials to maintain a protective layer around plants.
- If organic mulch is utilized, it must be at least five (5) feet from the structure.
- Adjust landscaping practices based on plant health and evolving conditions to maintain a sustainable and firewise landscape.

Firewood Storage:

- Store firewood at least 30 feet away from flammable structures. Do not use decks, balconies, or locations adjacent to the home as storage areas or places to stack firewood.

General Upkeep:

- Adhere to local regulations concerning vegetative clearance and debris disposal to maintain compliance and reduce fire risk.
- Rake leaf litter and other natural debris that builds up throughout the season.



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- Timely pruning is critical to lowering fuel loads and encouraging the growth of healthier, more fire-resistant plants.
 - Frequently clean roofs, decks, and gutters to keep them free of pine needles, dead leaves, and other flammable materials.



Glossary

Defensible Space: The buffer space around a structure that has been landscaped and designed to reduce wildfire threats between your property and the surrounding wild area. It acts as a barrier to oncoming fire. It is typically separated into three home ignition zones where the vegetation and flammable materials should decrease as they get closer to structures.

Nutrient Pollution: The process where excess chemicals and nutrients such as nitrogen and phosphorus contaminate water sources. Nutrient pollution has devastating effects on aquatic life, local ecosystems, and even our health.

Noxious Weeds: Plants designated by a governing authority as harmful to public health, wildlife, and vegetation.

Erosion (Soil): A process where soils, rock, and nutrients are displaced by wind, rain, and flowing water. Human activities such as farming, land clearing, and construction have left soil more susceptible to erosion and have detrimental effects on soil health.

Flora: Plants in a specific region, habitat, or geological area.

Fauna: Animals in a specific region, habitat, or geological area.

Biodiversity: The variety of living species within a particular habitat or the Earth. Biodiversity is essential and indicative of a healthy environment.

Radiant Heat: Heat transfer from an object with a higher surface temperature to an object with a lower surface temperature by electromagnetic radiation. In regards to wildfires, radiant heat can pre-heat and ignite materials at a distance before the fire makes direct contact.

Organic Mulch: Mulch made from living materials such as bark, leaves, wood chips, or compost that can enrich and keep moisture within the soil.

Inorganic Mulch: Mulch made from non-living materials such as rubber, stones, and volcanic rock that provide a longer-lasting solution to weed suppression.

Dead Fuels: Organic materials that have fallen on the forest or landscape and become flammable.



Herbicides: Chemicals toxic to specific types of plants and used to destroy unwanted vegetation, particularly weeds.



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