



REPLACING TURF— GOALS AND APPROACHES

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One of the first goals for many gardeners new to landscaping with native plants is to rid their landscape - in part or entirely - of non-native turf. Doing so is a no-brainer! Non-native turf grasses have very limited ecological value, they require large amounts of water, and often prompt gardeners to use fertilizer and herbicides to ensure turf is lush and weed-free. Non-native turf also provides an excellent overwintering environment for Japanese beetle grubs, which will then emerge to eat foliage and flowers of other plants in the summer. Around half of the water used in Denver during irrigation season goes to outdoor use- much of it to watering Kentucky bluegrass or KBG (which incidentally is from Eurasia and not from Kentucky— not native to North America). If there weren't already enough reasons to ditch your KBG, many cities along the Front Range are offering rebates for turf removal (see more details in Richard Phillips' article on this topic). And Colorado's recently passed Turf Replacement Bill (House Bill 22-1151) provides additional support and funding for turf replacement. So, there's never been a better time to roll up your gardening sleeves and convert your non-native turf to native alternatives.

SETTING A TURF REPLACEMENT GOAL

Whether you have a few hundred square feet or acres of turf, set a realistic goal for turf replacement before you embark on your project. For large areas, it may make sense to approach it incrementally over time- start small and expand your effort over time, learning what works best for you as you go. It is also important to consider what you'd like to replace the turf with. Are you looking for native turf alternatives? Colorado has wonderful native grasses to choose from. Do you want to be able to walk and run on the replacement plants? Do you want to mow the replacement plants or simply let them grow? Or is your preference to replace turf with flowering plants to provide more diverse pollinator habitat? Check out the design section of the WOFR toolkit as you think through your turf removal goals and your strategy for replacement. But have a clear goal for removing turf and a conceptual plan for what comes next before you begin.

APPROACHES TO REMOVING NON-NATIVE TURF

1) Smothering

Cover the turf to be removed with a continuous layer of clean cardboard (i.e. no plastic or non-biodegradable tape or staples). Appliance stores and bike shops may be good sources for large pieces of cardboard that they need to recycle or dispose of. Water the cardboard thoroughly to ensure that it will begin to break down. Cover the cardboard with 3-4 inches of wood chip or crushed leaf mulch for at least two months during the active growing season and preferably a full season. The cardboard and mulch kill the turf by smothering it and depriving it of light. You can also use gravel mulch over the cardboard if your ultimate plan is to plant flowering plants rather than other grass alternatives. Many Colorado native plants prefer a non-organic lean mulch that does not add nutrients and that keeps the soil and plant roots cool. Apply 2-4 inches of 3/8" rock chips, pea gravel or 'squeegee.' (note that if using gravel much, dig down around the edges before putting down the gravel, so that the gravel mulch doesn't spill over into walkways or areas not covered with gravel.) The cardboard method has several benefits. The cardboard degrades over time and can be planted directly through. It also can improve soil structure, a benefit in our often dense compacted Front Range soils. In just one year at WOFR's Ekar Farm demonstration garden, the cardboard and other mulch noticeably improved the tilth of the highly compacted soil.



Smothering weeds with cardboard prior to installation of Wild Ones Ekar Farm demonstration garden. Some of the cardboard was mulched with gravel and some with crushed leaf mulch so we are watching the relative benefits of these different mulches in suppressing weeds and retaining moisture.

2) Solarizing

- Start at the beginning of the growing season and continue the process for two months minimum or ideally through the season.
- Irrigate the site before applying plastic to ensure the grass is actively growing.
- Dig a trench around the turf removal target area. Cover the area with clear 2-6 mil clear plastic (not black) and bury the edges of the plastic in the trench so that a seal is formed to trap heat under the plastic. In lieu of a trench, you can also lay boards or rocks along the edges of the plastic to seal the area and trap the heat.

The heat generated by the plastic's 'greenhouse effect' will kill the turf but some particularly hardy perennial weeds like bindweed and Canada thistle can still survive. Although this method is effective, it does generate plastic waste that is not accepted by most municipal recycling programs and may have to be disposed of. This method works best on sites with full sun.

3) Mechanical Sod Removal

Remove the top several inches of turf by hand or with a sod cutter. The target area should be lightly watered a few days prior to make it easier to cut through. Sod cutters can be rented or often found in tool libraries. Water the remaining soil and wait for new growth and remove by weeding or spraying (see discussion below). Although this method is quicker than solarizing or smothering, it is difficult to remove all the turf rhizomes. The removed

turf and topsoil will need to be disposed of. It is preferable if the removed turf/soil can be managed onsite; composting it may be an option. Some gardeners have tried 'flipping' the removed sod and leaving it in place. However, the grass may reestablish. This method also exposes dormant weed seeds in the subsoil, creating continued weed management issues.

HERBICIDE USE TO CONTROL WEEDS AND PREPARE SITES FOR NATIVE PLANTS

(This section was prepared with advice from John Murgel, CSU Extension)

Regardless of which method is used to remove non-native turf, there will still be weeds and/or weed seeds and likely some remnant turf remaining in the soil. Gardeners have two choices to create a 'clean slate' for planting the replacement native plants. This can be accomplished through ongoing weeding, which may be a large and time-consuming task, or through limited application of herbicide. This is a topic that engenders strong opinions; our purpose here is to simply lay out the pros and cons of each approach and every gardener will make their own choice. Just know that your goal is to give your new native plants the best chance of establishing by minimizing competition from remnant turf or weeds during their establishment.

For those wanting to use an herbicide to control existing weeds prior to planting native plants or seeds, products containing glyphosate (the active ingredient in Round-up and other products) are often the go-to for weed control. Use of glyphosate, or any herbicide, is a controversial topic among gardeners dedicated to enhancing ecological integrity in their landscapes. Because of their controversial nature, Wild Ones Front Range is providing this more complete discussion on the issues and concerns associated with herbicide use. All herbicides, whether organic or conventional, are designed to kill living things and can have adverse effects on the environment and/or the applicator. At a minimum, strictly following the label instructions is critical to avoid environmental harm and risk to yourself and others by accidental exposure. General information about pesticides, pesticide safety, and the environment can be found at the National Pesticide Information Center website: <http://npic.orst.edu/>

Glyphosate is among the most controversial herbicides. Though glyphosate can be an effective and efficient means of reducing or eliminating nuisance weeds, it, like other herbicides, does have human health and environmental impacts that are not fully understood. Careful consideration of the goals and potential impacts before using glyphosate or any herbicide is an absolute "must". This is particularly true given recent steep increases in glyphosate use in the US and the resulting evidence of human and environmental exposure (see citations below). Glyphosate use increased tenfold from 1990 to 2014 (Van Bruggen et al). While glyphosate is used widely in agriculture, water testing results from the state of Colorado suggest that detections of glyphosate and many other chemicals found in streams and rivers (Colorado Department of Public Health and Environment Pesticide Data Summary <https://oitco.hylandcloud.com/pop/docpop/pdfpop.aspx>) are due to improper homeowner or property management use in developed areas rather than industrial-scale applications on farm fields, highlighting the need for home gardeners to follow all label instructions. In addition to being widely detected in water (including precipitation), glyphosate was detected by the Centers for Disease Control in 87% of urine samples from children and 80% of urine samples from adults (Environmental Working Group). The World Health Organization's International Agency for Research on Cancer (IARC) has designated glyphosate as a

probable human carcinogen. However the U.S. EPA in September 2022 upheld its prior finding that glyphosate is not likely to be carcinogenic to humans.

Some ecological effects are considered in EPA's registration process for pesticides, but many ecological effects are not assessed or considered, and are sometimes only uncovered after years of use and study. Furthermore, the primary breakdown products of pesticides can be problematic themselves and can behave differently than the active ingredient. Case in point, although dissolved glyphosate degrades fairly quickly in soils, glyphosate and its main breakdown product can strongly adhere to clay and organic particles in soil, with 90% degradation estimated to take more than 1,000 days (Van Bruggen et al).

Examples of cascading ecological effects include the following. Some recent studies have looked at ecological impacts of glyphosate on soil biota and pollinators. More recent and detailed studies showed reductions in specific genera or species of soil biota as well as biological processes. For example, plant growth-promoting rhizobacteria often are negatively affected by glyphosate, while pathogenic bacteria and fungi are enhanced (Van Bruggen et al). In one study, honeybees were exposed to glyphosate and then intentionally inoculated with a bacterial pathogen. The exposed bees had 100% mortality, while control bees not exposed had only 50% mortality. This was attributed to glyphosate-induced changes in the bee microbiomes. (Van Bruggen et al.) And all of this is for just one of the potential array of chemicals that could be procured and applied with neither training nor license!

All herbicides, even (and sometimes especially) home-made or organic products, have collateral effects on the environment. (see Xerces society- https://xerces.org/sites/default/files/publications/13-053_web-screen.pdf). Carefully reading and strictly following the label instructions are essential to protect the environment from unintended consequences of pesticides. Applying chemicals in a manner inconsistent with its labeling is irresponsible, dangerous, and a violation of federal law. Any chemical applications should be made to avoid blooming plants and minimize insect exposure, and applications should never be made when it is windy to prevent drift.

Wild Ones Front Range acknowledges the challenge of minimizing or eliminating weeds, particularly in large areas undergoing landscape conversion, to enable native plants to survive and thrive. Each gardener should inform themselves about the human health and ecological risks, as best we understand them, of herbicide use and make a decision with the planet and our fellow inhabitants in mind. Whenever pesticides are used, gardeners should protect themselves and the environment by *at a minimum* wearing the personal protective equipment stipulated on the label and by strictly following label instructions for application. Remember that you can always take a precautionary approach by protecting yourself beyond the label requirements with extra skin, eye, and respiratory protection. It may be prudent to do so given differing agency conclusions about health effects.

REFERENCES

International Agency for Research on Cancer Monograph on Glyphosate, July 2018
<https://www.iarc.who.int/featured-news/media-centre-iarc-news-glyphosate/>

“CDC finds toxic weedkiller in 87 percent of children tested”, Environmental Working Group, July 2022
<https://www.ewg.org/news-insights/news-release/2022/07/cdc-finds-toxic-weedkiller-87-percent-children-tested#:~:text=WASHINGTON%20-%20About%2087%20percent%20of,for%20Disease%20Control%20and%20Prevention%20.>

Van Bruggen et al, ‘Indirect Effects of the Herbicide Glyphosate on Plant, Animal and Human Health Through its Effects on Microbial Communities’, *Frontiers in Env. Science* 9, 2021
<https://library.wur.nl/WebQuery/wurpubs/589618>

WHAT COMES NEXT? OPTIONS FOR NATIVE ALTERNATIVES

As mentioned above, once you have removed that pesky turf, you have many options for all or part of your target area. You can convert to some ‘lawn-like’ native turf alternatives, discussed below, which allow for some foot traffic although not as much as KBG and can be mowed or left to grow. You can convert to a prairie landscape encompassing native grasses and flowering plants. Or you can focus on flowering annuals and perennials that provide pollinator food and habitat. And of course, you can combine these alternatives in whatever way works to make your landscape meet your needs as well as those of our ecological co-habitants. And don’t forget the option to include high-value native shrubs or even trees in your former lawn areas. The WOFR toolkit has a section on landscape design as well as some landscape templates for Colorado that can help you think through these choices. And the design section includes resources on selecting plants as well. Be sure to check out Wild Ones member Jan Midgley’s excellent discussion of and spreadsheet on Colorado native warm and cool season grasses in that section. Our native grasses are beautiful and their deep root systems are soil-enhancing carbon sequestering powerhouses!

Native Lawn Alternatives

There are, unfortunately, no perfect native turf alternatives that perform quite like the ubiquitous Kentucky bluegrass in terms of foot traffic tolerance. This may not matter if your converted turf area does not receive heavy traffic. But there are alternatives that will tolerate more limited foot traffic, and that can be mowed or left to grow to their natural height depending on preference.

One commonly used native alternative is buffalo grass (*Buchloe dactyloides*). This is a native drought resistant sod-forming grass that spreads by stolons (aboveground stems). It can tolerate light-moderate foot traffic so is a very viable alternative for children and pets to walk and play on (so long as it’s not a daily game of tackle football). As a warm season grass, it grows most actively from May-September and will green up later in the spring compared with KBG. Once established, buffalograss can survive without irrigation, though it does better with infrequent deep irrigation (or rain)- 1-2 inches every 2-4 weeks. It grows 5-8” tall. Occasional mowing will encourage it to spread and fill in open areas. However, it will take considerably more water during establishment. See the [CSU Fact Sheet](#) on buffalograss lawns for more information. Buffalograss establishes and does best if grown from plugs or sod rather than seed, so this can be expensive for large expanses. Plugs are usually female plants, which fill in more densely, can be darker in color, and have less visible flowers.

Colorado's state grass is blue grama (*Bouteloua gracilis*), another good lawn alternative which can be interplanted with buffalograss. It grows 8-12" and has attractive flowering stalks that look like eyelashes. It is less tolerant of foot traffic, so is not a good choice for kid and pet play. It is beautiful mowed or left in its natural state to feature the flowers. The Ladybird Johnson Wildflower Center recommends a combination of blue grama, buffalograss and James' galleta (*Hilaria jamesii*) as seed mix for Colorado shortgrass prairie for those wishing to try their hand at growing from seed.

All these replacement options offer great benefits in food and habitat for native species, deep and robust root systems that keep lots of carbon in the soil to increase climate resilience, and minimal water demand. One other note about replacement alternatives - for high intensity traffic areas one alternative that has been successful for some is the Plant Select 'Dog Tuff' sod introduced by Kelly Grummons. It is not native to North America, so many of the benefits we've talked about with native grasses do not apply. However, it requires considerably less water, and does tolerate the high intensity traffic for those locations where this is essential. And finally, no artificial turf as a replacement! See Deborah Lebow Aal's article on all the reasons not to consider artificial turf.

ADDITIONAL RESOURCES

Xerces Society, *Organic Site Preparation for Wildflower Establishment*:

<http://xerces.org/publications/guidelines/organic-site-preparation-for-wildflower-establishment>

CSU Fact Sheet 7.224 Buffalograss Lawns:

<https://extension.colostate.edu/docs/pubs/garden/07224.pdf>

Tony Koski, CSU Extension, *Native Lawn Establishment in Colorado*:

<https://www.fcgov.com/natureinthecity/files/native-lawn-fact-sheet-2020.pdf>

Jan Midgley, [*Grasses Are the Foundation*](#); [*Spreadsheet of Colorado Native Grasses*](#)

Deborah Lebow-Aal, [*Glorious Grasses Native to Colorado's Front Range*](#); [*That Non-Native Turf Grass Has Got to Go!*](#); [*So Many Better Alternatives to Non-Native Turf*](#); [*Artificial Turf- Why It's Not An Alternative*](#)

Danna Liebert and Richard Phillips, [*Metropolitan Turf Replacement Rebate Programs Along the Front Range*](#):