A NATIVE PLANT DEMONSTRATION GARDEN GUIDE

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Native plant demonstration gardens provide much-needed pockets of sustenance in our increasingly dense urban and suburban neighborhoods. For insects, birds, and other wildlife they provide essential host plants, nesting materials, and nectar. For humans they provide a connection to the natural world and to community. Native demo gardens also can shift how people plant and maintain their own landscapes by showcasing the beauty of unfamiliar native plants and educating the public about sustainable landscaping practices and the benefits of landscaping with native plants. Native plant demonstration gardens are one powerful tool to effect landscape change.

This guide is intended to empower more people to create more native plant demo garden habitat. It lays out the process and provides an overview of considerations to think through long before putting plants in the ground. These considerations are drawn from lessons learned in the process of creating two Wild Ones Front Range native plant demonstration gardens: one at Depot Park in Englewood and another at Ekar Farm in Denver. Some of this may not be relevant to the project you have in mind but hopefully it inspires you and helps you know what to anticipate so that you have success in creating a native plant demonstration garden in your community.

LAYING THE GROUNDWORK

Building community stakeholders and a mission:

The foundation of a successful native plant demonstration garden is having a core group of people who are invested in the project and committed to doing the ongoing work of maintaining it.

Maybe you already have a partner or a group of people who are passionate about creating a native plant community garden? If not, consider how to engage your community broadly in a vision for the garden so that people are invested in its success. See if there are any local gardening or environmental groups to connect with. Reach out to community leaders in underserved neighborhoods where a habitat demonstration garden would create vibrant green space. Seek community input by inviting your community to brainstorm sessions and asking how people would like to use the garden; how they will actively participate; and what educational goals the garden can serve? Consider who will visit the garden and what impact you want it to have. Are there community members or organizations with expertise to offer in landscaping, construction, community and volunteer engagement, publicity, education or graphics to design signage? Are there community members interested in propagating native plants from seed for the garden? (https://frontrange.wildones.org/propagate-and-or-purchase-native-plants/) Are there organizations in the community- faith-based groups, urban farms, community engagement groups- that may have an interest and common goals? Enlist passionate people and keep plans simple and specific to start. More plans can be added later, maybe, if people have the bandwidth.

Connect with nearby schools or community youth programs for input on how the garden could serve as an outdoor classroom for students to learn about biodiversity and pollinators. Are there teachers who will organize their students to help plant and build the garden? This will engage youth as stakeholders and also involve families who are not familiar with native landscaping and might not visit the garden otherwise. A good place to start is with the teacher at a local school who leads the 5th grade biodiversity unit (which typically doesn't focus on local biodiversity and what students can do to help). There are a ton of online resources for educational garden activities for kids. (Here is one resource)

Bring stakeholders together to define the project goals and create a project mission statement. Having a clearly defined project mission from the start is critical to holding the coalition together as different individual priorities emerge down the road. Also invest time to build a network of support from the start. Seek out the residents who know everyone and will be able to help spread the word to find volunteers. If the site is on city property, seek connections with individual members of your city council. Investing time in building both a core group who will work on the garden and outside supporters is critical to long-term success for public projects where there are often politics to navigate. Explore grants, and reach out to your HOA, local government entities (parks department, water provider, city council, relevant city commissions), community groups, garden groups, and local nurseries for allies — anyone who might provide support for plants and materials, signage, educational programming, or roll up their sleeves to help plant and weed.

PLANNING

Think big, start small.
Chances are that no one who has ever started a sizable Demo Garden had any idea how much work they were getting into. It takes love and determination, but you can increase the project's chances of success by implementing your vision in manageable phases over several growing seasons. Start with a pilot section where you can work out the challenges. You can expand the

landscape as knowledge, community support and your volunteer base grows.

Finding a site

At the most basic level, a little nook of native plants merely needs an interpretive sign in order to serve as a "demo garden." On a more ambitious level, a small park can be transformed into native habitat to serve as a community hub for ecological education and engagement.

Maybe you have a site already? If not, the good news is that here are prime locations for native plant demo gardens all around us — in the hellstrips (aka parking strips), right of ways, lawns of community centers and municipal buildings that no one ever sets foot on, and the endless public garden beds that that get re-planted with "fast food" non-native annuals plant year after year. Consider asking your Parks Department if they have some ugly duckling spot they don't know what to do with. You can offer them a solution that will reduce their water use and eliminate mowing. Community centers, religious institutions and urban gardens/farms may also welcome the installation of native plant habitat to replace turf, and they have the bonus of having a built-in potential volunteer base.

Site analysis process

Make a site visit to create a base map and summary of the site conditions. To do this, first, make a bird's eye view sketch of the space with the property lines and all of the existing features (e.g., shrubs, sidewalks, fences). You can also find the site on Google Maps and bring a printout. Google Maps has a helpful function that lets you measure a site virtually.

Walk the site and note the following on your base map:

1. Measurements: Record measurements of the site perimeter, note each existing permanent feature on your sketch, and distances between them. It helps a lot to have a professional rolling wheel https://www.homedepot.com/s/rolling%2520tape%2520measure%2520tool?NCNI-5.
2. Existing Plants and Trees: Plot the location of existing plant materials and landscape beds. Identify and label the existing plants and note their approximate height and width. If there are deciduous trees, note where their leaves will fall.
3. Water: Note the location of and distance to a water source so you can create an irrigation plan before planting. Even the most drought tolerant plants need regular water for their first two to three years.
    a. Is there existing irrigation? If so, are there different zones? If you have the ability to set different irrigation zones, you can differentiate plant placement by water needs/ zones.
    b. Is there an existing spigot? If there isn't an existing irrigation system, you'll need a spigot to connect a hose and rotors until plants are established.
    c. How will you access winter water when irrigation is shut off? You may need to fill drums with water before the water is turned off.

4. Topography: Note any high or low areas and how rainwater flows. Are there areas where water pools? Is there runoff from nearby downspouts to utilize to passively irrigate plants? Your site's topography should inform your plant selection and placement.
5. Sunlight: Note the cardinal directions -- east, west, north, and south -- on your sketch. Southern and western exposures receive the most sunlight. How many hours of direct sun does the site get in summer? What path will the sun take across the space? Note any shaded areas created by trees or buildings. Note if there are areas that get hotter because of reflected light from a building? If so, at what time and for how long? Visit at different times of day to observe the light. Are there spots to feature grasses that will look glorious backlit by late afternoon sun? Places where only shade tolerant plants will survive? Knowing the sunlight at the site will help you select the right plants.
6. Pedestrian traffic flow: Note if pedestrians cut through on non-designated paths. Accommodate their habitual routes rather than expecting them to stay on your paths – because they won't!
7. Note any utilities and right of ways: Be sure to check with utility companies if there are any underground electricity, sewer, and water lines, or right of ways. And if so, find out if your utility company has potential future work plans (i.e. might they need to rip up your plants in the future?).
8. Site Lines: Are there views you want to draw attention away from or block with plantings? Views you want to feature?
9. Sound: If the site is next to noisy traffic, is there a quieter part of the site for seating or workshops?
10. Soil quality: You may want to do a professional soil test but most likely you can get a sense of the soil quality by digging in different spots and observing the texture of the soil. Is it clay, sand, or loam? Does the soil appear to drain well, or is it hard and compacted? Are there signs of drainage patterns or areas of poor drainage (e.g., standing water)?
11. Wind: Is there a steady wind across the site or is it sheltered? This will affect moisture retention. Wind is also a plant design consideration because it will spread plants that readily reseed.
12. Security: Consider how to protect planted areas from foot traffic and dogs while maintaining open access to make the site inviting. You may want temporary fencing or individual plant cages to protect young plants until they mature. If feasible, avoid night lighting for the sake of the insects.
13. Interpretive signs: consider where to place signs to educate the public about the plants and the ecological functions they serve.
14. Sense what the site calls for: Take time to quietly observe. Visit repeatedly, at different times of the day and year.

Building a welcoming and inclusive space

While you might not be able to serve all needs, consider how to design a space that provides the least restrictive physical access and invites people of all abilities, race, ethnicities, and socioeconomic status.

- Consider what languages are spoken in your community for inclusive interpretive signs and programs.
- Will the space allow for exploration by young children and neurodivergent people? You may want to have tactile/interactive educational signs or a sensory exploration area that invites interaction through the senses of smell and touch.
- Consider physical access in the design. Wide, level, and solid pathways are necessary for wheelchair access. Level paths and handrails, especially where there are steps, support elderly or visually impaired people to move around safely. Exact specifications can be found online.
  - Example: Paths with rope handrails provide a way for blind and visually impaired people to walk safely and independently through sensory gardens.
- Consider how to reflect community culture and needs through plant selections and programming. For low income communities, plants that will provide food or attract pollinators to boost crop yields of vegetable gardens are most relevant.

Interpretive signs to maximize impact

- To many people, a public native landscape will look weedy and unmaintained during its first year or two, or even three while plants are maturing. Consider posting temporary “pollinator-habitat-in-process” signs during the establishment phase to support public understanding and buy-in. The signs can educate the public that native plants put their energy into growing very deep roots during their first 1-3 years, rather than into blooming, and this will pay off in long-term resiliency and carbon sequestration capacity.
- Similarly, to help people understand that a “messy” winter landscape doesn’t mean it is neglected, consider adding signage to explain that “leaving the leaves” until Spring provides winter forage and nesting sites.
- Signs explaining what is planted and why are an important tool for activating the public and expanding the impact beyond the demo garden itself. Interpretive signs can also help generate volunteers. Consider including QR codes on signs linking to more in-depth information and volunteer sign-up.
- A successful demo garden introduces people to unfamiliar native plants- having plant ID tags will help people be able to seek out the plants for their own landscapes.

Budget Estimate

Now that you have the square footage of the area, you can begin calculating cost estimates.

- A ballpark cost for plants, mulch, and minimal irrigation system changes with store bought kits, using volunteer labor is $5-7/sf. The cost will vary widely depending on whether you buy wholesale or retail, the size of plants you order, and the number of shrubs and trees. Smaller plants will cost less, establish faster, be more resilient, and catch up in size to larger plants faster than you may think looking at a little 2” potted

plant. You can also save money by propagating plants from seed (See https://frontrange.wildones.org/propagate-and-or-purchase-native-plants/) and/or planting the site by seed.

- Get quotes for the design and fabrication of interpretive signs and plant identification tags. (Fast Signs fabricated the signs for Depot Park)
- If you plan on providing programming at the site, price out materials and consider presenter fees and rates for registration software. Even if this is a later phase goal or initially programming will be a volunteer effort, give it a budget line to set up expectations.
- If you plan to install hardscape, fencing, or built structures, price out the materials.
- If you plan to contract any of the labor, get quotes — and get quotes early. Your plans may change once you know the numbers! Remember about implementing in phases ☺
- What else is in the project vision and what will it cost to carry it out manageably?
- Be aware that most grants stipulate that funds can only be used for plants and planting materials, and within a year.

Design Plan

For projects where habitat creation is the priority over a designed space, you can figure out plant placement on planting day and so long as you have the right plants for your site and know how they will be irrigated until they are established. However, here is a traditional way to translate your initial sketch from the site visit, your notes, and your project goals into a scaled design – if you want a planned design.

1. **Summarize the site conditions and goals into a one page, bullet-point list.**
2. **Create a scaled base map on graph paper using the measurements from your site visit.** Include property lines, existing structures, any underground utility lines, any vegetation you plan to keep, and a compass rose.
3. **Create plans for the following elements with one layer of tracing paper (on top of the base map) for each of the following:**

   a. Irrigation Plan

   - Note water access and existing or planned irrigation lines and rotors. If there is no irrigation, you'll need to plan for a way to hook up a hose and rotors for the first 2-3 years while plants establish deep roots. After which you can let it go unirrigated and/or hand water. You'll want to keep the soil consistently moist for the first month or so, and then slowly taper off finding a balance between prolonged dryness and a bit of tough love that motivates the roots to grow deep in search of water. This takes some experimentation and observation. "Drought tolerant" means drought won't kill them, but they may go dormant sooner without any supplemental water during prolonged dry periods.
   - Will you incorporate earthworks such as swales, retention basins, or dry stream beds for passive rainwater irrigation? If so, mark them on this plan. For more info on rainwater harvesting https://www.harvestingrainwater.com
   - To maximize water efficiency, create different hydro-zones based on matching

site conditions with mulch (more on this below) and plant selection based on water needs. Typically, the perennials that are happy in wood mulch, prefer or tolerate more water. This includes “moderate water” CO native plants from higher elevation regions that historically have more precipitation. Many native trees and shrubs are in this category too.

b. Hardscape and Permanent Features Plan
- Define walkways and any paved areas — whether existing or planned. You may want main paths to meander so that people take time to notice the landscape. Expect that people will continue to take their habitual off-path shortcuts no matter what you plant and how many signs you post. So, incorporate footpaths to accommodate any existing foot traffic through planted areas. This can be an informal path with stepping-stones or a narrow gravel pathway which will help direct foot traffic. The least expensive path material is breeze and crusher fines.
- Skip permanent fencing, if feasible. It’ll save money and make the garden more accessible and welcoming.
- Delineate any permanent features such as seating for classes or benches for visitors, an entry arch, a birdbath, etc. Consider using salvaged materials to create permanent features.
- Note where signs will be posted.

c. Planting Plan
- Delineate different planted areas based on general plant needs and design goals, eg. Areas primarily for shrubs, or low-water plants, bird habitat, rain gardens, shade plants, etc. Don’t spend time on individual plant placement for now.
- Use topography, natural water flow, sunlight, microclimates, and water from downspouts to your advantage in planning the planting layout of these areas.
- Consider the sun’s movement through the space. Is there an area where you want plants that will look glorious backlit by late afternoon sun?
- Consider how your garden will support your different wildlife. Maybe you want to create zones with different purposes: an area planted with hummingbird favorites, a butterfly area with host plants and shallow water sources, a bird bath and shrubs or trees for bird nesting, or rain gardens to help protect the watershed, an area with deep rooted prairie grasses and perennials to sequester carbon, etc.
- Do you want a youth area for nature play and or a sensory area to interact through the senses of touch and smell?
- Leave some areas with bare soil for ground nesting native bees.

d. Mulch selection:
Mulch selection should be based on plants and their water needs and natural environment. You can create different mulch zones that serve different purposes and plant communities. Mulch zones can be noted on the same sheet as the planting plan. Ultimately the best mulch is plant cover, so design for dense planting.

- Organic wood mulch: Areas with trees and shrubs are suited to organic mulch, as it is similar to their ground cover in nature. To cut down on the carbon footprint and work of hauling away dead leaves, use organic mulch where there are deciduous trees and shrubs and simply leave the leaves to decompose where they fall. Similarly, spring plant cuttings can be chopped up and discarded in the organic mulch or tucked away under shrubs, rather than bagging and hauling it away. These leaves and yard cuttings provide essential nest materials for birds and ground cover for insects, help retain moisture during winter, and improve the soil as they decompose. Wood chip mulch can be obtained inexpensively from tree companies and parks departments. The finer it is chopped, the better since it breaks down slowly in Colorado's dry climate.

- Inorganic rock mulch: In contrast, Colorado's native plants from more arid, rocky regions are happiest in fine gravel mulch that is similar to their natural environment. Light-colored 3/8" chip gravel is ideal for xeric plants and allows them to keep their root crowns hot and dry. *Chip* gravel will lock together, stay in place, and block light better than *rounded* pea gravel. Inorganic mulch also lets more water get to the soil and plant roots rather than being absorbed by the organic mulch material and it keeps soil and plant roots cooler than organic mulch; contrary to what many people think, wood chip mulch can reach higher temperatures than rock chip mulch. Inorganic mulch can also extend the growing season by holding daytime heat and slowly releasing it during colder nights. While rock mulch adds to urban heat island effect when a large area is covered entirely with rock, this is not true when you use gravel mulch in a densely planted landscape. If you rock mulch where leaves fall, you'll have to blow or rake the leaves out every fall to maintain the xeric benefits of inorganic mulch (so build that into your maintenance plan if you use inorganic mulch).

4. **Plant list**

How detailed a plant design you want is a matter of choice. You may want to create a detailed plant layout with specific plant vignettes, or you may simply want to have a plant list for each planting area and decide placement on planting day. Know that all design efforts will end up giving way to the plants' inherent strategies. Seeds will scatter by the wind, some plants will thrive and spread more than others, and volunteers will settle in. Here is how you can create a plant list with general considerations for their placement.

- Consult your summary of site conditions for the space, light, and soil available on the site, and find plants with matching requirements.
- Check availability of these plants at nurseries and have substitute plants in mind because availability may change by the time you are ready to purchase plants.
- Design to have a variety of flowers in bloom at any time of the growing season, for pollinators and as well as for community support. Color is what gets people's attention (in a good way). So, designing for a procession of color is key to getting

people excited about native plants and dispelling the notion that native, low-water landscaping is boring.

- Plan to have more dramatic plants with large, rich-colored blooms in areas that will be seen by passing pedestrians and cars (what will register in 5 seconds of a car passing by?), and keep the plants that are best appreciated close-up, along pathways.
- It is easy to make the mistake of over-planting, especially when starting with 2" or 4" potted plants. Believe the plant labels and plan space plants adequately for them to spread out as they mature. Cut-to-scale cardboard circles of varying mature plant circumferences can help visualize the proper spacing during planting.
- To fill in the initial gaps between young slower-growing perennials and grasses, plant annuals and fast growing, short-lived perennials in between. You can do this economically by seed. It will provide quick color and ground cover during the first years. In time, as the slow to mature, hardier plants grow, they will overtake their annual and short-lived perennial neighbors.
- There are many Colorado native plant garden designs and plant lists available online to adapt for your site. Here are a few:
  - Wild Ones: https://nativegardendesigns.wildones.org/denver-front-range/
  - Habitat Hero: https://rockies.audubon.org/habitat-hero/resources/garden-designs
  - Plant Select: https://plantselect.org/wp-content/uploads/2014/10/Watersmart-Native.pdf
  - Colorado Native Plant Society https://conps.org/home-2/resources/gardening-with-native-plants/

Installation Plan

List all the tasks needed to execute the design plan and map out a work sequence. Determine which method you will use to eliminate weeds and turf in order to prepare the site for planting (see below for turf removal strategies) and how long that will take. Map the timeline keeping in mind that the ideal planting time on the Front Range is typically, if there is "typical" anymore, April through early May or late Sept/early Oct as long as you water periodically through the first winter. Note that Fall is not the ideal planting time for warm season grasses.

For the installation sequence, if irrigation needs to be installed or modified, that can happen before or after site prep but before planting. However, install irrigation after sod removal, if that is your site prep method, but still before planting. Hardscaping should also be done before planting, as should laying down mulch. If the soil is parched and compacted, plan to irrigate the ground before planting to be able to dig planting holes without breaking your back.

Garden Management Plan

Once you have a work plan, determine who will manage each stage from design, plant selection, and procurement, through site prep, planting, and long-term maintenance. Determine what support they will need and who will help them.

- Have a long-term maintenance and management plan before you plant. Plan for regular

weeding and maintenance “workdays.” Weeds will get more manageable once plants fill in, but there will always be some weeds to pull.

- Large demo garden projects inevitably face many challenges. It is a good idea to create a steering committee with leads for different responsibilities such as: garden design, plant purchasing, planting, maintenance, communication, fundraising, volunteer management, educational programming.
- Make an outreach plan to involve your community. Figure out how you will get the word out and whose responsibility it will be. Create a virtual sign-up for volunteers to register for workdays, and mailing lists to keep track of them.
- If you are blessed with a web designer amongst the stakeholders or with funds to hire one, create a website for the garden with event registration and a mailing list sign-up. Importantly, determine who will manage it.
- For planting and maintenance, it is easier to work with small groups of volunteers (5 is ideal). Many volunteers may have some gardening experience but are not familiar with native plants and best practices for planting and maintaining them. Working with a large number of volunteers makes it hard to maintain quality work and oversight. Nevertheless, people get excited to show up for a big planting day and that may be the best way to generate enthusiasm for the project so like so many things with a demo project, be flexible.
- For volunteer retention, make volunteering a fun social gathering at a regular time; tap into individual volunteer’s interests; bring snacks. Maybe “workdays” are followed by potlucks? Think about volunteer incentives like workshops or plants or seeds which volunteers can take home.
- Show appreciation to volunteers. Consider ways to show gratitude such as bringing brownies to “workdays” or hosting an end of season thank-you party.

PLANTING AND MAINTENANCE:

Site prep, site prep, site prep

It is hard to overemphasize how essential it is to take the time to properly prepare your site before planting. For successful plant establishment, you need to remove or kill any existing turf and weeds. Still, no matter how well you prepare the site, ongoing weeding will still be necessary, especially the first few years while the plants mature and fill in.

Turf and Weed eradication methods:

a) **Smothering**: Covering planting area with cardboard covered with 4-8 inches of wood mulch or 3 inches of 3/8” rock chip mulch (mulch choice dependent on the plant zone) for at least two months when the turf is actively growing (i.e. not late Fall- early Spring, when it is dormant). You’ll want to mow grass as short as possible first, and cover with large overlapping pieces of cardboard to be able to block sun and weeds.

   Pros: An effective organic method, if you have the lead time and cardboard. The cardboard shades the soil and can measurably improve soil tilth with even one

season. You can plant directly through the cardboard.

Cons: Slow— ideally smother for at least a whole growing season before planting. Obtaining large amounts of large pieces of cardboard and removing tape and staples can be challenging and much of the cardboard used for boxes has a chemical coating that seems to repel water; bike shops and appliance stores may be good sources for large cardboard.

b) **Solarizing:** This works best June through August when done for a minimum of 8 weeks in a full sun area. The process involves deeply watering the planting area and digging a trench around it, then covering the area with 2-6 mil CLEAR plastic and burying the edges of the plastic in the trench under soil to seal and trap heat. And yes, clear plastic, not black; clear will allow more heat to pass through to the soil – think tinted windows and car heat. Solarizing can be more effective with repeated cycles of removing the plastic to pull or hoe (don't rototill) the newly emerged weeds after 4 weeks, repeating the process several times through the growing season as another batch of weeds in the seed bank germinate. After solarizing, plant directly into the dead sod in the Fall without tilling.

Pros: An effective organic method for removing turf and many weeds if done in repeated cycles for a whole growing season on a hot, sunny site.

Cons: Uses a lot of non-recyclable plastic that will need to be landfilled; unsightly; takes a lot of time and effort; won't kill bindweed, thistle,and other deep rooted weeds.. The high temps will sterilize the top 4-6 inches of soil, temporarily reducing beneficial soil microbial activity.

c) **Sod Removal method 1:** Water turf area, then remove top 8" of turf by hand or with a sod cutter. You can plant directly after or water, wait for new growth, and manually weed or spray, once or twice before planting - more times when seeding. Mesotione is a "natural" herbicide option synthesized from the bottlebrush plant.

Pros: A quick organic method.

Cons: Not advised under trees canopy as it will harm tree roots**;** in removing the sod, you also remove the rich topsoil and its beneficial soil biota which adversely affects the soil structure. Removing the turf also exposes the dormant weed seed bank, so prompt mulching is essential. It's labor-intensive, and creates a need to compost or dispose of removed turf. It is difficult to remove all the rhizomatous roots of turf grass, so you may have to play some Kentucky Bluegrass whack-a-mole for the first one to two growing seasons until plants mature.

d) **Sod Removal method 2:** Remove top 8" of turf, flip it and return flipped sod to cover the site, cover flipped sod with mulch, and plant.

Pros: Organic method with no sod hauling or composting, and dead sod will enrich soil as it decomposes.

Cons: Colorado native plants prefer less rich soil. Plus the same cons as above other than need to haul away the removed sod.

e) **Herbicide application**: See discussion below
Pros: Minimal soil disturbance, dead turf provides mulch, time efficient.
Cons: Not an organic method; has health risks and impacts to ecology

Herbicide Use to Control Weeds and Prepare Site

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 micobiomes. (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.

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https://library.wur.nl/WebQuery/wurpubs/589618

For additional information on organic methods for site preparation, see Xerces Society, *Organic Site Preparation for Wildflower Establishment*: http://xerces.org/publications/guidelines/organic-site-preparation-for-wildflower- establishment

Planting and maintenance tips

- Disturb the soil as little as possible during site prep and planting. You want to keep the soil biome and soil structure intact and the weed bank dormant by not stirring it up. e.i., DO NOT ROTOTILL! Really, truly, you will bring lots of weed seeds to the surface, multiply the bindweed, and destroy pore space in the soil. Some people

advise tilling expanded shale or pea gravel into clay soil. We don't recommend this except in the most compacted soil, and even then, do not rototill it in.

- Apply adequate mulch as soon as you eradicate turf and weeds, and before planting. Exposed soil is a party invitation to weeds. (See above for mulch selection).
- Bare root planting, rather than planting in an amended planting hole, minimizes soil disturbance and encourages plants to establish quickly in the native soil where you want them to grow deep roots and spread out.
- Until plants mature and cover the bare ground densely, plan for regular weekly weeding. Spring through early Aug, after which bi-monthly through Fall. With climate change, plants are going into dormancy later which means weeds can still be growing through November, or later!
- Leave leaves, plants, grasses and shrubs as they are in the Fall and wait until Spring to prune and do any clean up. This creates winter interest and provides winter forage and nesting sites.

CONCLUSION

Just as each pocket of native plants can provide one steppingstone in a habitat corridor that supports pollinators, native plant demonstration gardens are also steppingstones to build interconnected communities of people who are committed to healing our ecosystems. Demo gardens are invaluable tools to communicate the ecological value and beauty of native landscapes and inspire others to transform their own or public landscapes. The heavy lifting it takes to create and maintain a demo garden should not be underestimated, yet neither should the deep gratification of seeing a bevy of pollinators feasting on the vibrant plants you planted, hearing people who live in the neighborhood say how much they love this new habitat, and knowing that you are helping sustainable land stewardship get a stronger foothold where you live.