

FOREST STEWARD FIELD GUIDE

**GREEN CITY
PARTNERSHIPS**





FORTERRA



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DEAR FOREST STEWARD

Welcome to the Green City Partnerships!

The Green Cities Forest Steward Program provides you the opportunity to be part of one of the largest, community-based urban forest restoration efforts in the country. We have an ambitious goal to restore thousands of acres of forested parklands and natural areas throughout the region — and with your volunteer efforts, we can achieve it.

This endeavor benefits both the environment and local communities. To date, the work of many dedicated Forest Steward volunteers has been substantial. Green City staff stand by to assist in making your experience personally satisfying — and your efforts highly successful.

While the thought of tackling invasive plants in your neighborhood park may seem daunting, remember that you have the unyielding and full support of the Green City Partnerships. As Forest Stewards, you will stand shoulder to shoulder with Green City staff, professional crews, other volunteers and partner organizations to get the work done. You also play the vital role of engaging your community — inviting new people into the urban forest and providing them opportunities to volunteer in their neighborhood park or natural area.

This Forest Steward Field Guide contains basic, yet essential information you will need to start and implement site restoration plans, and track your progress. As a Forest Steward, you will have opportunities to expand your forest restoration knowledge and skills by attending specialized training sessions. In addition, Forest Stewards may be eligible to receive tools, materials, plants and crew assistance for your restoration projects.

Thank you for taking the lead to restore, maintain, and steward our urban forests and natural areas. Your commitment makes the Puget Sound region an even better place to live. We look forward to many great years of cooperation and success!

Sincerely,

The Green City Partnerships

Field Guide

Purpose

This Field Guide is a quick reference for Forest Steward volunteers on how to get started and proceed with community-based forest restoration at their neighborhood parks and natural areas.

It does not have all of the answers to invasive plant management, community engagement, or species selection.

The best available science drives work by the Green City Partnerships and is reflected within our current program policies. As urban forest restoration is a relatively young practice, agency staff, volunteers and non-profits involved in Green City Partnerships have worked together to develop and test Best Management practices (BMPs) to effectively complete field work and maintain a consistent quality of work across all Green City sites.

On a broad scale, learning and innovation occurs at restoration sites every day, the results of which are captured in formal documents like this Forest Steward Field Guide. BMPs are updated as new methods are tested and deemed successful. Remember: Your feedback is essential to our continuous learning process.

Regulations

Many of the habitats where we work, including wetlands, are ecologically important and sensitive. As such, the Green City Partnerships have a responsibility to comply with a variety of state and local regulations. These regulations are used as the basis to assess potential environmental impacts of our restoration program and to issue project requirements that are embedded in the BMPs.

Working closely with your designated city/county staff and following established BMPs for volunteer activities is important to ensuring that restoration work complies with local, state and federal regulations.



Why Green City Partnerships?

Our vision: Improve quality of life, connections to nature, and enhance forest benefits in cities by restoring 13,000 acres (as of 2020) of forested parks and natural areas.

The Green City Partnerships was established to harness the power of our communities and create a culture of volunteerism and stewardship to protect local forested parks, and maintain a healthy tree canopy. Using best practices developed over the past 15 years, Green Cities Partnerships work with municipalities and counties to develop achievable goals, longterm land management plans and community-based stewardship programs. Through Green City Partnerships, local nonprofits, community groups, businesses, government agencies and neighborhood volunteers all work together to care for their local forest. We also collaborate with restoration practitioners studying the latest trends throughout the Pacific Northwest so that Green Cities remain at the forefront of knowledge, tools and techniques.

Washington's landscapes have a history of logging and urbanization that has left our natural areas in less than ideal conditions. Many of these areas have a canopy of short-lived deciduous trees, like red alder and bigleaf maple, and an understory that often is battling aggressive invasive plants. These conditions do not support the regeneration of a diverse native forest. Without intervention, we are at risk of losing the quality forests our cities need.

These forests provide a host of benefits to our region: cleaner air, cleaner water, reduced stormwater impacts, reduced erosion, improved

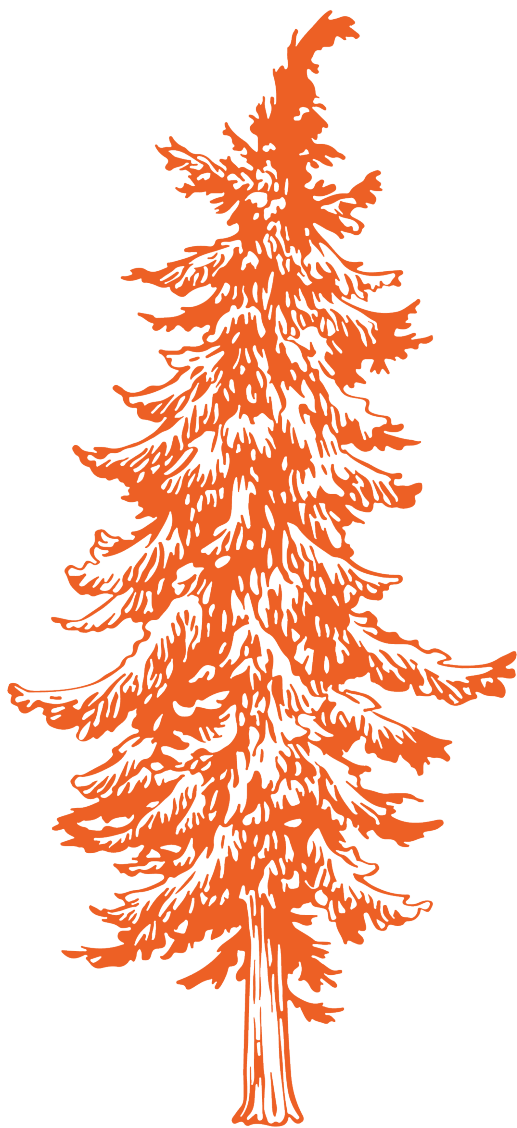
wildlife habitat and mitigated climate change impacts. Additionally, healthy forests are attractive assets in city neighborhoods and provide access to nature all across the city. The Green City Partnerships strive to provide education and engagement opportunities for all residents, empowers residents to make a positive change in their community, and encourages the next generation of Forest Stewards.

The Green City Partnerships are committed to creating healthy forested parklands, supported by long-term community stewardship and the establishment of resources within each city.

Our Goals

- 1** Restore and maintain the forested parklands and designated natural areas within our Green City Partnerships.
- 2** Expand and galvanize an informed, involved, and active community around forest restoration and stewardship.
- 3** Ensure long-term sustainable funding and community support.

In order for the Green City Partnerships to achieve these goals, we utilize volunteers, professional crews, community partners, and staff to advance our progress in restoring forested parklands and natural areas.



Being a Forest Steward

Forest Stewards are dedicated and trained volunteers who serve as the backbone of the Green City Partnerships. They build a community of stewardship around public forested parks and natural areas to safeguard their future.

Forest Stewards commit to stewarding a specific Park or natural area in collaboration with Green City staff and their community.

FOREST STEWARD RESPONSIBILITIES AND DUTIES

- Attend a Green Cities Forest Steward orientation.
- Serve as key contact for stewardship activities at a park or natural area.
- Coordinate volunteer forest restoration events and activities in your park; aim for four volunteer events per year (of any size), where appropriate.
- Manage event postings, material requests, sign-in sheets and work logs.
- Participate in an annual site-planning visit with Green City staff to agree on an identified plan for volunteer work.
- Attend Green Cities training events for ongoing personal development.
- Follow Best Management Practices for volunteers working at your site.
- Maintain a positive working relationship with staff, volunteers, donors and community members.
- Stay in compliance your Green City background check requirement (if applicable).
- Follow your Green City's Volunteer Code of Conduct.
- Perform work in accordance to City guidance.

Green City Partnerships Volunteer Code of Conduct

1. As a volunteer, you represent your Green City Partnership. You must treat the public, park users, other volunteers, and Green City staff with respect.
2. Threatening or harassing behavior will result in removal from the volunteer event and could result in expulsion from the park.
3. Individuals must not be under the influence of alcohol or controlled substances while participating in volunteer activities.
4. Safety is of utmost importance at all times. Take safety seriously and consider the use of safe work practices for yourself and others as a personal responsibility.
5. Recognize parks as public places. All users have rights to the parks. Volunteer events are open to the public unless City/County staff have approved a closure or exclusive event.
6. Adhere to any specific regulations set forth by your particular City (also reference Appendix A for further Green Cities ground rules).

The Role of a Forest Steward

This section is intended to clarify the role of a Forest Steward. It will help you get your feet firmly planted before you start digging in.

STEPS TO FOLLOW

1. Orient yourself

Attend a Green City Forest Steward orientation.

2. Pick a site

To be set up for success, your restoration site should be:

- Accessible (to volunteers and for materials/support)
- Appropriate (for restoration activities performed by volunteers)
- Safe (not too steep or located along busy streets)
- Sturdy (sometimes wetlands or other sensitive areas are not the best choice for volunteers)

3. Schedule a site visit

Green City staff will help Forest Stewards establish a site plan that identifies specific goals for ecological restoration. Some parks may already have a

Stewardship Plan established, in which case staff will help you interpret that plan. Staff will clarify what work volunteers can perform and identify areas that must be left for professional crews, such as slopes and areas in need of herbicides. Site visits will cover the following:

- The history of any prior forest restoration work at your site.
- How to set a timeline for volunteer events.
- The best area to focus volunteer work in your first year.
- What Best Management Practices (BMPs) to use to work efficiently and effectively.
- Which plant species exist at your site.
- A draft list of tools needed for your work.

4. Get familiar with your site

Explore your site to understand its

ecological conditions, including sun exposure, water features, wet conditions and signs of wildlife. Familiarize yourself with the site's plant species and soil type (Appendix A).

5. Recruit volunteers and prepare for your event

Conduct outreach for your event using Green Cities printed materials, social media, networking sites, neighborhood blogs and word of mouth. Print volunteer sign-in sheets and make sure you have the tools, materials, and snacks you need to run a successful event.

6. Host events

Pick up any coffee or snacks before your event, and plan to arrive early to set up. Make sure your volunteers all sign in and have work gloves. Use the Event Welcome and Safety Talk speaking points on pages 19–21. Thank all volunteers and celebrate the work accomplished. Clean and put away tools, and have volunteers brush their boots and shoes.

7. Follow up

For each event you host, be sure to submit a work log and volunteer sign-in sheet as soon as possible. If you are working independently, please record and submit hours regularly. Timely submission of work logs and volunteer sign-in sheets is important for tracking and reporting monthly progress, and demonstrating this progress is key to attracting the financial, political and volunteer support necessary to sustain the program into the future. You can also send personalized emails to volunteers to thank them and invite them to your next event.

8. Repeat

Continue with volunteer events, reporting, and individual work. The work will change throughout the seasons and over time as your site progresses through the phases of restoration. You will gain experience, expertise and confidence with each volunteer event. Attend Green City workshops and training opportunities. Read up on the latest BMPs, and utilize Green City staff to help you grow in your Forest Steward role. Stay connected to the Green City Partnerships and Forest Steward community through social media, email and Green City e-newsletters.

COMMUNITY ENGAGEMENT

Forest Stewards often are the face of Green City restoration efforts. You will interact with volunteers, Green City staff, park users and the broader community. Some of the types of community engagement tools that may be available to you as a Forest Steward include:

EVENT CALENDARS Green City staff have the ability to post events to a variety of event calendars, including Forterra's event calendar, Green City specific calendars and other local calendars. Be sure to connect with your Green City staff for additional help publicizing your events.

PARK H-STAKE SIGNS These temporary corrugated plastic signs let park users know a little bit about what is going on at your park or natural area, and invite readers to participate in a

volunteer event or contact you about your restoration project.

KIOSK SIGNS Some parks have kiosks that are available to you to publicize information about your restoration project or invite community members to an event.

GREEN CITIES SOCIAL MEDIA If you have a special event or an event you want to highlight on Green City social media streams, be sure to contact your Green City staff to help publicize your event.

YOUTH AND STUDENT ENGAGEMENT

The Green City Partnerships have a specific goal to engage youth in forest restoration efforts and train the next generation of Forest Stewards. You can help us reach that goal in a number of ways:

- Make your events family- and kid-friendly.
- Connect with teachers and administrators at schools nearby your park.
- Advertise your events as a way for middle and high school students to earn community service hours that many schools require.
- Connect youth working at your site with Green City youth leadership opportunities

Planning Youth Events

- A supervisor-to-youth ratio of 1:5 to 1:7 is recommended. Supervisors can be other Forest Stewards, teachers or parent chaperones.
- Prepare age-appropriate tasks for youth volunteers. Plan multiple tasks for a volunteer event so that you can be flexible if something isn't working out well.
- Provide appropriate-sized tools and equipment for youth volunteers.
- Be prepared to provide snacks, or arrange in advance for volunteers to bring their own snacks.
- Youth aged 14 to under 18 must either: be accompanied by a responsible adult, or submit a youth waiver, or have a parent/guardian sign them in at the start of the event.
- Youth under aged 14 must be accompanied by a responsible adult who sign-in, remain on-site, and supervise the minor for the duration of the event.

- For groups with youth participants (scouts, clubs, schools, etc.) all the above requirements apply. Make sure all teachers, leaders and chaperones also sign in.

Event Logistics

- Give older kids a chance to help lead younger kids.
- Be mindful of event length. One-hour volunteer events are typical for elementary school students.

- Celebrate work accomplished and lessons learned. Ask youth volunteers to identify one thing that they accomplished or learned during their work time.

Fun and Games

PAIRS PLANTING Have students work in teams of two for planting. Have them identify their plant species with ID cards (if available) and make a mulch donut.

FRIENDLY COMPETITION Have students compete to remove the largest blackberry root ball, create the largest compost pile, or pull the longest strand of ivy.

SCAVENGER HUNT Select three to five leaves, berries, bugs or other items from your park and encourage the youth to find them throughout the event.

BIRD OR NATURE WALK Take a break from the work and walk through the park with the youth, pointing out interesting features like nurse logs, snags, bird nests, animals, special plants and human impacts.

MATH SKILLS Engage youth in reporting by having them measure newly mulched areas, tally up plantings and ivy rings, or estimate the size of weeded areas.

volunteer at your Green City work site.

Today, you are joining the Green _____ Partnership to work at _____ Park.

Who here has a favorite park?

(Expect answers related to soccer fields, spray parks, playgrounds, etc.) This park is a little bit different. Instead of soccer fields and jungle gyms, this park is meant to be a forest.

Who knows why healthy forests are important for a city?

Answers: They absorb and filter rain water in a totally natural way. — They absorb pollution in the air and provide fresh clean oxygen. — “Take a deep breath in! Thank you, trees!” — They provide a living space for wildlife, like birds, and a place for people to connect with nature and the outdoors.

To improve the health of all of that forested land, we need the help of everyone in the city, “including young people just like you!”

Green City Partnerships bring together people like you and me to extend the life of our forests so that you can enjoy them for many years to come, maybe with your own children and grandchildren.

GREEN CITIES INTRODUCTION FOR YOUTH AND STUDENTS

Here is an example of a script that can help you engage and inspire the youth and students who have arrived to

BUSINESS ENGAGEMENT

Local businesses can help build your volunteer base, promote a healthier and cleaner forest, coordinate group



For additional activities and educational lessons for youth, visit the Washington Native Plant Society resource page at WNPS.ORG/EDUCATION/RESOURCES/INDEX.HTML

volunteer efforts and provide donations for your restoration events:

- Invite local businesses or business associations to volunteer at your restoration site.
- Ask local businesses if you can advertise your neighborhood event at their location.
- Partner with local businesses to provide in-kind donations for your volunteer events, such as coffee, donuts or healthy snacks.
- Review a guide for engaging your local business community and utilize your Green City's outreach materials

RACE AND SOCIAL JUSTICE INITIATIVES

The Green City Partnerships have set goals for volunteer participation that represents each City's race/ethnicity demographic as a whole. To measure our progress toward this goal, Green Cities may ask for voluntary anonymous demographic information of volunteers when they register online or attend an event, which includes race/ethnicity. Forest Stewards may get questions about these demographic surveys. View them as your opportunity to explain the racial equity goal for the program.

In addition to collecting demographic data at Green City volunteer events, the Green City Partnerships are working on other ways to meet the goals of larger Race and Social Justice Initiatives, including but not limited to:

- Building individual and programmatic knowledge of institutional racism by hosting at least one annual Forest

Steward training that focuses on the topic.

- Reducing barriers to participation in Green Cities programming for under-represented groups. Examples of this may include providing food when possible, diversifying when events are held, adding a stipend for participation when possible, etc.

VOLUNTEER EVENTS

As a Forest Steward, you should commit to holding at least four events per year, if appropriate. Volunteers can help with all four phases of restoration — from the initial removal of invasive plants to watering and maintaining plants.

Volunteer events vary in size, from a small group of neighbors to a larger corporate outing. Forest Stewards should submit an event request at least three weeks in advance. This is to ensure that there are no conflicting events in the park, and to allow Green City staff to better direct interested volunteers to your event and provide enough time to coordinate the necessary resources.

Forest Stewards are also encouraged to do additional outreach to recruit enough volunteers for a successful event. Each Green City has created outreach materials that are available to Forest Stewards, and can be requested by reaching out to Green City staff.

Volunteer events are a great way to get work done in the forest, but they also serve as important opportunities to get people outside and connected to their local parks and natural areas. Forest Stewards can provide a fun and rewarding experience for residents by being organized, friendly, prepared, and appreciative. To set up a successful volunteer event, prepare to have enough work and enough event leads for volunteers to get the instruction they need to do

THE 10 ESSENTIALS OF A VOLUNTEER EVENT

- 1 Volunteers!
- 2 Restoration materials: plants, mulch, etc.
- 3 Tools and work gloves
- 4 Garbage bags for trash and, if needed, as makeshift rain ponchos
- 5 Signs for posting at park entrance and sign-in table
- 6 Sign-in materials: volunteer sign-in sheet, extra youth waiver forms, clipboards, pens, etc.
- 7 Program and site information: your site plan, Green City brochures, dates for subsequent events, etc.
- 8 Work plan: clear goal of restoration work for the day
- 9 Safety resources: first-aid kit, cell phone, nearby hospital or clinic information
- 10 Water, coffee and snacks

meaningful work. Suggested work group sizes are 10 to 15 for adults and five to seven for youth and student groups. Each group should have a knowledgeable leader, who can be another Forest Steward or an experienced volunteer.

Green City staff and professional crews are available to help lead larger events, as long as enough advance notice is provided. Please contact your Green City staff to request volunteer-event support. If you cannot accommodate an interested volunteer group, please ask Green City staff for assistance or direct the requester to another scheduled Green City event.

BE PREPARED

1 At least three weeks in advance of your volunteer event, identify what work volunteers will be doing — and where. Considerations include:

ACCESS TO AMENITIES Is the work site close to parking and restrooms? Will the restrooms be open for your event?

SAFETY Is the site too steep for volunteers? Are there other site hazards that could impact negatively the volunteer experience, such as overhead dead trees, active bees nests, high traffic areas (bikes/runners)?

SKILL/EXPERIENCE LEVEL Is this work appropriate for the skill level that volunteers will have?

SUCCESS Is the work plan something that could be accomplished in a single event and provide a feeling of success?

SEASONALLY APPROPRIATE WORK Is the work appropriate for the season? For example, is it the most opportune

time to work in wet areas, install new native plants, work in brushy areas where birds nest? Consult the Green Cities Seasonal calendar on pages 28–29 to get an idea of what activities are appropriate for the time of year.

EVENT LEADERS Are there enough knowledgeable leaders to support a larger volunteer event?

2 Create a list of tools and materials for your event to ensure that you have the right resources to accommodate your volunteers and get the work done. Request any materials, sani-cans, or extra tools at least three weeks in advance. If plants are needed for your event, additional lead time may be required for procurement. Learn more about creating a tool list in Appendix D.

3 Conduct outreach to recruit volunteers and encourage online registration for the event.

HOSTING YOUR EVENT

As a volunteer event leader, the Forest Steward's main jobs during the volunteer event are to explain to the volunteers how the work impacts the forest, teach volunteers how to do the work, monitor work quality, and ensure that volunteers are working safely and enjoying their time. It will be tempting to dig in and do the work yourself, but a better investment of your time is to make sure all volunteers are doing quality work. Follow these steps to ensure you cover all important points.

1. Prepare for volunteers

- Be onsite and ready 15 to 30 minutes before volunteers are scheduled to arrive.

- Make sure adequate signage is posted at the park entrance so volunteers can locate your site easily.
- Set out and count tools.
- Set out the sign-in sheet.
- Make sure any co-Stewards or lead volunteers know the agenda and work plan for the day.

2. Event welcome

Feel free to customize or adapt these talking points as you get more comfortable leading volunteer events.

Introduce yourself and other Forest Stewards and/or Green City staff present.

Thank everyone for donating their time.

Explain why it is so important that people are participating

- Healthy forests provide many benefits including improved water and air quality, reduction in stormwater runoff, habitat and improved public health.
- Forest restoration work parties help bring together communities, promote healthy living and make the park look better.
- Reference the number of acres of forested parkland and natural areas included in your Green City Partnership.
- “These forests need our help!” Many are dominated by relatively short-lived trees, such as red alder and bigleaf maple. The forest floor is being taken over by weeds like English ivy and

Himalayan blackberry. These conditions are preventing the native forest from regenerating and creating a forest that is sustainable and long-lived.

Explain the Green City Partnerships

"The Green City Partnerships are a region-wide effort that includes City staff, Forest Stewards like myself, many nonprofit partners, and residents like you working together to restore forested parklands and natural areas." (Consider providing a longer explanation regarding your specific Green City Partnership).

Acknowledge tribal history

Please use your City's adopted land acknowledgment, or utilize the land acknowledgment below if your City does not use one.

"We gather and live on the plains, plateaus, mountains, and coastal lands that have been home to indigenous peoples since time immemorial. We respect their indigenous and tribal treaty rights, and honor their culture today."

Introduce your project

- Give an introduction to your specific park.
- Touch on the history of the restoration and your long-term work plan.
- If your group is appropriately sized, have volunteers introduce themselves.

Explain today's activities

- Today we are going to be:
- Our schedule is going to be:
- Bathrooms are located:
- Water and snacks are located:

3. Safety talk

Set the tone for safety

- "While we are working today, our main goals are to be safe, have fun and get some good work done — in that order."

General safety reminders

- "If you haven't already signed in, please do so now." (Pass around a clipboard, if needed.)
- Let volunteers know that you have a first-aid kit and tell them where it can be found.
- Tell volunteers that they can always call 911 for emergencies. If other issues arise, ask them to find you. Also share that you have copies of incident and accident forms with you on site and share where they can be found.

Tool safety

- Introduce what tools you are using, addressing all aspects of CUSS (Carry, Use, Safety, Storage) for each tool.
- Remind volunteers to keep track of tools and to return them to an identified area before switching to a new tool.
- Remind everyone that they should always be wearing work gloves, which you are providing, while handling tools.

Activity and environmental concerns

- Warn against heavy lifting.
- Explain that no work is to be conducted on steep slopes, or even moderate slopes.

- If your event is close to a road, inform volunteers that they must be wearing safety vests and no one should be working in the road.
- Welcome water breaks and rest in the shade.
- Be aware of ground nesting bees, and recommend that if volunteers get stung, they should run far and fast to escape other stinging bees. Ask volunteers to identify (to the group or event lead) if they have a bee sting allergy.
- Remind volunteers to not pick up items from the work site that could be personal belongings (tents, clothes, etc.). Remind volunteers to never pick up needles or syringes; notify the event lead so that the area can be flagged off and reported to Green City staff.
- Identify known areas of noxious weed infestations that should be avoided, or if you are working in those areas, explain the need to clean boots, clothes, and tools before leaving the area. Show the location of boot brushes and explain how and why to use them.

4. Demonstrate Best Management Practices

Demonstrate how you want volunteers to perform restoration work, including:

- Identification of invasive plants
- Proper invasive plant removal techniques
- Compost pile building
- Proper planting techniques

After you demonstrate, ask if anyone has questions.

5. Final pre-work reminders

- Identify event leads one more time.
- “If you have any questions while we are working today, please feel free to ask us. We will be walking around to be available to help you.”
- “If you have any general forest- or park-related questions, let us know and we will do our best to answer them.”
- Break up into work groups (as the last step or before the safety talk, depending on your group size).

6. Other considerations during the event

- Check in with volunteers to make sure they feel comfortable with the tools and the day's tasks.
- Redirect volunteers to a different task if they request a change or you observe that one may be necessary.
- Remember that you are there to facilitate the event, not do all the work yourself.
- Keep your volunteers busy and make them feel useful.
- Thank everyone sincerely and often.

7. Event Wrap-up

- Wrap up your event a few minutes early so that you can have volunteers help with clean up, gather them together, and formally conclude by the posted time.

- Have volunteers return tools for counting and cleaning.
- Have volunteers brush tools and their personal footwear. (See sidebar on page 23.)
- Thank volunteers for their time and efforts.
- Ask volunteers for something they learned or enjoyed at the event.
- Tell volunteers what their accomplished impacts were today (example: 200 square feet of ivy removed, 5 yards of mulch spread).
- Share other opportunities for volunteers to stay involved (provide the date and time of the next event or reference your Green City Partnership website to help out at other parks).
- Take a group photo that you can send out with the follow-up “thank you” email.
- Tell the group how they can stay involved with your project and other Green City events.

REPORTING

Reporting citywide forest restoration progress is absolutely essential for gaining political will and financial support, and for adapting practices to ensure an ongoing successful program.

Event Hours and Work Logs

After each event, it is important to finalize the following event data via work logs and entering information in to your Green City’s data portal if applicable.

1. Finalize event sign-in sheet

Confirm volunteer attendance and hours on your event sign-in sheet. Submit sign-in sheets to Green City staff or enter them in to your Green City’s data portal if applicable.

2. Fill out event work log

Calculate quantifiable work from the event and submit to your Green City staff or in your program’s data portal if applicable. Be equipped to take notes during the event. The key metrics to be recorded are:

- Number of volunteers
- Number of volunteer hours
- Invasive species removed (check list)
- Number of ivy survival rings
- Area (in square feet) of first-time invasive plant removal
- Area (in square feet) of weeding
- Plants installed (by category and stock type, not species)
- Area (in square feet) of mulch spread
- Plants watered

Individual Volunteer Time and Work

Your work and time contributed to park restoration outside of volunteer events can be captured in an individual work log. Please record your hours that contribute indirectly to the work on the ground such as: attending site visits, conducting outreach, or whatever you do to keep things running smooth at the park. The individual work log can only be used for reporting work for yourself, not for your volunteers’ work or time. You can submit an individual work log after every trip to the park, or lump work and hours together at an interval that works best for you, such as weekly, monthly, or even annually.

Accidents

If you or any volunteers sustain an injury while working in the park, complete an accident report form and ensure that the injured volunteer is signed in on the sign-in sheet. If your Green City does not have a formal accident report form, or if you do not have a copy of an accident report form with you in the park, take down the contact information of the injured volunteer and procure details after the event. Please contact your Green City staff for the appropriate accident reporting forms and protocols.

Incidents

If you encounter an item, person, or situation in the park that you think should be reported — for example, an altercation with a park user, the discovery of something suspicious or dangerous or vandalism — fill out an incident report form. This is not in lieu of a police report, but it does document the occurrence for Green City staff and can be used to analyze patterns or trends. Please contact your Green City staff for the appropriate incident reporting forms and protocols.



Tool and Boot Brushing

The seeds of troublesome weeds are traveling to different restoration sites on tools, boots and clothing. To avoid making infestations worse or spreading them to new parks, please have your volunteers use the boot and tool brushes provided by your Green City. To reduce the potential for moving weeds, soil and seeds on boots or clothing:

- Clean soil from tools while still on site using a stiff brush or gloves in a designated decontamination area. Plan time into your event schedule to accomplish this with volunteers.
- Remove plants and mud from boots before entering the site, using a stiff brush.
- Before leaving site, remove plants and mud from boots with a stiff brush, and consider spraying down with water if available.
- Limit access to designated noxious weed areas during volunteer events.



Ecological Restoration

Ecological restoration is the practice of renewing and restoring degraded, damaged, or destroyed ecosystems and habitats in the environment through human intervention and action. The goal behind restoration is to improve the health, productivity, and species diversity of an ecosystem, through such acts as planting native species, removing invasive species, and bringing back natural processes to a damaged, degraded, or destroyed ecosystem.

It is important to remember that all lands were stewarded long before us by Indigenous Peoples since time immemorial. It wasn't until colonization and industrialization that our natural world began to face unique challenges not encountered before.

The history of logging, the presence of invasive plants and urban pressures have guided the Green City Partnerships in the development of a four-phase approach to ecological restoration. This approach captures the key actions for restoring urban natural areas in the Puget Sound area. Additionally, this breakdown of phases aids our ability to monitor progress and develop site-specific management strategies.

PHASE 1 Focuses on removing invasive plants for the first time.

PHASE 2 Focuses on the planting of native trees, shrubs and groundcovers.

PHASE 3 Focuses on native plant establishment. Sites are weeded, mulched, and watered as needed. Some sites may stay in Phase 3 for several years to manage invasive plant regrowth and wait for new plantings to grow.

PHASE 4 Focuses on long-term stewardship and maintenance, which includes monitoring for new populations of invasive plants, social use impacts and other ecosystem health indicators.

While most forest areas will need all four phases of restoration, some with low levels of invasive plants may only need a quick Phase 1 sweep to prepare the site for Phase 2. If a healthy native plant community already exists, the site may graduate quickly to Phase 3 or Phase 4.

Considering Climate Change

Green Cities is well-positioned to help move forward a variety of climate change resistance and resilience actions. Green City restoration efforts are essential to preserve forest and natural-area health, and ensure the critical ecosystem functions these resources provide, such as reducing urban-heat-island effects, sequestering carbon, and mitigating stormwater impacts from increased precipitation. To improve the ability of forests and natural areas to mitigate as well as adapt to climate-change stressors, Green City staff will need to integrate adaptation and resilience strategies into general management practices and

park-specific stewardship plans. It is a priority of the Green City Partnerships to use the best available science to inform site planting lists and restoration activities so that our restoration sites are best adapted to the impending impacts of climate change.

GREEN CITIES MAPPING

Each park or natural area that the Green City Partnerships identify for ecological restoration are broken down into management units, also referred to as zones. These units are various sizes but generally share site characteristics, and are helpful for tracking your restoration progress. Contact your Green City staff to access up-to-date maps for your park or natural area.

GETTING TO PHASE 4

Once work on the ground begins, Green Cities records what restoration work has occurred and calculates progress. Progress happens as zones move through the four phases of restoration and as zones transform into the identified Target Ecosystem. Zones are moved into Phase 4 after Green City staff perform a verification process that ensures the full zone is on a trajectory toward Target Ecosystem goals.

Tracking Progress

Work Logs: What restoration work is happening on the ground?

Your restoration project story is told through the logging of information on what work has been done in the park — and where. A work log quantifies how much volunteer and/or crew time has been contributed in a given area, and the work completed. Work logs are submitted directly to Green City staff or through your Green City's data portal if applicable.

The data can be used to analyze and evaluate volunteer attendance, retention, and basic demographic information to measure program effectiveness and reach. Field-based metrics, recorded by park location and zone, will also be collected, such as the area and types of invasive plants removed, acres enrolled in restoration, the number of plants installed and watered, and the area mulched and maintained. The Partnership will share successes and lessons learned, celebrate progress, and evaluate effectiveness.

Forest Monitoring: How is this natural area progressing over time?

As the field program proceeds, the Partnership will continue to conduct routine monitoring of planting and restoration sites to track their condition and health, and gauge progress. On forested land, success will rely on developing and

refining effective strategies to remove and control invasive plants and keep newly planted natives healthy. Planting refinement may need to occur if areas change due to climate, development, or other conditions.

To monitor fieldwork, new acres will be tracked as they are brought into active restoration and mapped in GIS. Volunteer and skilled field crew time will be devoted to revisiting sites that have been previously worked on and assessing their ongoing needs as they move through the four phases of restoration. One component of monitoring is to track plant survival rates, as forests and natural areas will always be subject to pressure from their surroundings. Although the work needed decreases dramatically each year that an area goes through the program, Phase 4 of restoration continues indefinitely.

The Long View: How should I plan annually?

Forest restoration is so much more than just a large-scale weeding effort. Forest Stewards take time to plan out the entire restoration cycle, identifying and accounting for any site-specific considerations before work on the ground begins. We even have an annual planning booklet written specifically for Forest Stewards, which can be found at [FOR-TERRA.ORG/WP-CONTENT/UPLOADS/2015/05/STEWARDS-ANNUAL-PAN-WORKBOOK.PDF](https://FOR-TERRA.ORG/WP-CONTENT/UPLOADS/2015/05/STEWARDS-ANNUAL-PAN-Workbook.PDF).

Seasonal Considerations

Although enjoying a generally mild climate year-round, the Puget Sound's four distinct seasons dictate appropriate and efficient timing for urban forest restoration activities. This guide outlines basic forest restoration considerations and recommendations for each of the four seasons.



WINTER

Invasive plant removal is easiest in damp soils.

If invasive plant removal results in large amount of bare soils, cover with mulch or organic debris.

Native plant installation should be wrapped up by March.

Live stake plant propagation and installation.

Watch for early bird nesting and avoid working in areas of high avian nesting activity.

SPRING

Invasive plant removal is easiest in damp soils.

Maintenance weeding in planted areas.

Avoid removing brushy invasive plants from April to July to respect nesting birds.

Wetland species can be planted in wet areas after flooding has receded (April to June).

Plan for fall planting by identifying planting location and organizing a species list.

Submit herbicide requests for applicable invasive species for summer treatment.

SUMMER

Remove invasive plants.

Break down dried-up compost piles.

Water plants if available and/or appropriate (May to September).

Professional crews conduct herbicide treatment.

Restoration pruning occurs (mid-July to September).

FALL

Remove invasive plants.

If invasive plant removal results in large amount of bare soils, cover with mulch or organic debris.

Plants that will be installed in saturated or seasonally wet sites should be planted in September to October or March to April, outside of the wet season as much as possible.

Install native plants once rain is regularly falling (October to March).

Site-Specific Considerations

In addition to seasonal climate, there are additional site-specific considerations to factor into restoration planning in order to accommodate wildlife, people/volunteers, safety and wetlands.

WILDLIFE HABITAT

Once the forests are restored, they will provide superior habitat to invaded ecosystems. While sites are in the process of restoration, it is important to plan activities with the needs of wildlife in mind, including birds, insects, mammals, salmon and more. Below are some suggestions for keeping particular wildlife in mind while you restore your site, noting that your sites will contribute to habitat for all wildlife, and considerations are not limited to the ones mentioned below.

BIRD HABITAT

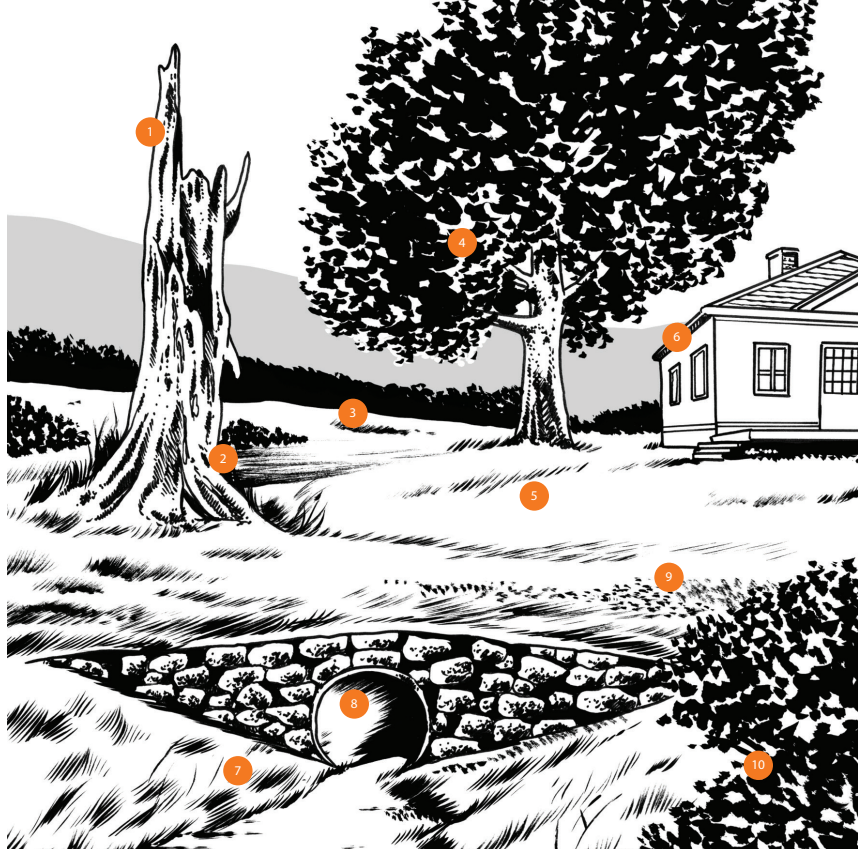
Here are some suggestions for improving bird habitat while also being respectful of the current habitat:

- Avoid clearing work or large events in high value nesting areas from April 15 to July 31.
- Avoid leaving sites barren for extended periods. Limit clearing work to areas where you can ensure replanting and establishment.
- Minimize long periods of disruption to riparian areas and wetlands and their buffers as much as possible, as these areas are widely used by wildlife.
- Leave snags and other habitat structures on site. Do not cut down invasive trees.
- Consider continuity between restoration sites to allow for safe travel between populations.
- Spend time with a bird expert to get familiar with local species. Local Audubon Society chapters are a great place to access experts to contact.
- Select plant species for your site that optimize both habitat and food sources for birds.
- Spend time getting to know your site during nesting season. Come before a volunteer event to look and listen for bird nesting activities. Become familiar with the birds that are nesting in your

restoration areas. Use the nesting diagram for ideas of where to look for nesting activity at your park.



For more information on bird habitat considerations, look for resources from your local Audubon chapter.



BIRD NESTS

Look for ... 1. Woodpecker nests in snags. 2. Pacific wren nests in log and stump crevices. 3. Spotted towhee nests on open ground under shrubs. 4. Songbird nests in healthy tree branches; chickadee and brown creeper nests in the crevices of trees. 5. Spotted towhees and Pacific wren nests in compost piles. 6. Robin, house finch and barn swallow nests under eaves. 7. Kingfisher nests in streambanks. 8. Barn swallow nests in culverts. 9. Killdeer nests in open gravel. 10. Hummingbird and warbler nests in shrub branches.

POLLINATOR HABITAT

Pollinators need safe places for nesting, laying eggs, and overwintering, ideally located within 300 feet of a food source. Green City forest restoration efforts can provide quality habitat for native pollinators with careful consideration:

- Leave it messy! Dead wood, leaf debris, rocks, and compost piles are all structural and nutrient resources for a rich and diverse insect paradise. Dead wood includes standing dead trees, downed logs, stumps, root wads, log rounds, untreated lumber, and chunks of bark. Place large wood



For more information on pollinator habitat, visit EarthCorps' Native Pollinator Habitat Restoration Guide at [EARTHCORPS.ORG/WP-CONTENT/UPLOADS/ THE-NATIVE-POLLINATOR-HABITAT-RESTORATION-GUIDE-EARTHCORPS.PDF](https://earthcorps.org/wp-content/uploads/the-native-pollinator-habitat-restoration-guide-earthcorps.pdf)

in the shade and let fungus go to work on it. Holes, peeling bark, or bits of wood may be utilized as lodging or housing materials by butterflies, beetles and bees.

- Compost or brush piles are great nest sites for bumble bees. If you need to flip a compost pile to pull out invasive weeds underneath it, first examine it for signs of active bee nesting and try not to disturb if bee activity is observed.
- Rocks provide safe and dark spaces for all kinds of invertebrates. Piles of rocks can provide overwinter refuge and cover for butterflies and bumble bees.
- Spots of bare, undisturbed ground allow ground-nesting bees to make a home. They need a few spots that are not vegetated and not mulched, even better if they are sunny and gently sloped. Well-draining soils that are sandy or loamy are preferred.
- Take care with soils. Excessive social trails, tillage, compaction and digging can disrupt pollinator nest sites.

restoration planning and implementation appropriately:

- If there is a year-round wet area in the restoration site, limit volunteer involvement to small events of 10 or fewer people. If the wet area is seasonal, regular to large events are permitted when the site is dry.
- If possible, try to work at the driest time of year.
- If a Stewardship trail skirts or passes through a wet area, planks or duck boards should be used to minimize impacts to the soils.
- Adjust planting timing to install native plants in the shoulder season (often early fall or late spring) when soils are damp or wet, but not saturated or with standing water. Native plants installed in standing water could float out of their planting hole.
- Do not place compost piles in areas that become wet or saturated or within the flood zone.

WETLANDS, WET AREAS, AND RIPARIAN HABITAT

Work with Green City staff for resources on identifying any designated wetlands, wet areas, or riparian habitat at your site. You also can use the wet area decision tree in Appendix F to see if site conditions are consistent with a wetland or wet area. If a site has wetland conditions, or if any rivers or streams run through your site, please adjust

STEEP SLOPES

For safety reasons, volunteers can work only on relatively flat terrain, with even professional crews needing special equipment for very steep work. As a general rule, work on slopes steeper than a 40% grade requires additional professional resources. Consult with Green City staff to identify any areas within your site that are too steep for volunteers, and to create a work plan for how restoration of these areas will be addressed with professional crew support.

Access and Safety Considerations

ACCESS PATHS

Stewardship access paths create access to restoration sites. Not all Green City restoration sites have official trails to move volunteers and materials to and through sites. In those cases, access paths need to be carefully planned and laid out, taking into account disturbances that foot traffic will have on your restoration site.

- Access paths should travel through the center of restoration areas, not adjacent to them.
- These paths often are inviting for other parks users. In fact, many people consider them a permanent park feature. To discourage use, keep paths discrete and close access points by pulling brush across entrances when not in use.
- Stewardship access paths are for temporary access only. Once a site is in maintenance, trails should be replanted and naturalized.

CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED)

CPTED is an approach to deter crime that was developed for the urban built environment. Based on the principle of designing spaces that reduce the opportunity and desirability for criminal acts, effectively applied CPTED principles can also make spaces feel more comfortable and safe to park users. With thoughtful planting, intentional pruning, and careful weed removal, these principles also can be applied to managed natural areas. See page 54 and 56 for CPTED considerations related to plant selection and placement, and pages 65–66 for CPTED considerations for restoration pruning in the plant establishment section.

Your restoration goal is to preserve the naturalistic character of the urban forest while also providing personal safety for all park users. CPTED guidelines are as follows:

TREES WITH HIGH CANOPY

High branching structure allows for clear sight lines, which are associated with a greater sense of safety and allow for visibility in and out of the park and to and from trails.

VIEW CORRIDORS Open sight lines provide the ability to see and be seen at many entry points and along trails.

VEGETATION WITH TRANSPARENCY

Plantings that are open and composed of plants with varied heights will allow for visibility through the vegetation and reduce opportunities for concealment.

WELL-MAINTAINED SETTINGS

A more intentional level of care for trails, entrances, and critical locations not only helps manage vegetation, but also presents a sense of continuous community attention and oversight that can deter crime.

COMMUNITY STEWARDSHIP Involving and engaging the community in forest stewardship provides increased opportunities for surveillance and provides a more maintained setting.



For more information on the CPTED, visit FORTERRA.ORG/WP-CONTENT/UPLOADS/2020/12/CPTED-IN-NATURAL-AREAS-FEB-2018_WEB.PDF

Phase 1

Invasive Plant Management

Phase 1 focuses on removing invasive plants for the first time.

Invasive plants require thoughtful management strategies. Integrated Pest Management (IPM) should be used to help decide and develop your approach for reducing invasive plants at your site. IPM options consider weed biology, site conditions, and anticipated labor capacity.

In some cases, using volunteers to remove invasive plants will work great. Some plant species and populations, however, may require herbicide treatment that requires a professional crew to perform. Over several years, multiple methods of invasive plant removal often will be used. The Green City Partnerships are committed to using non-herbicide strategies whenever possible and strictly follow best management strategies.

MANUAL REMOVAL

Manual removal techniques can be very effective and may be applied to invasive shrubs, vines, and herbs. Here are some considerations for manual removal:

- Take into account habitat considerations when planning the size of clearing goals. In some cases, leave a portion of the invasive plants in place until the new native plants are established.
- Removal often causes soil disturbance. Make plans for covering bare soils before starting.
- Place flagging around the perimeter of the work area to identify where volunteers should work (called "clearing limits") to avoid impacting sensitive

areas, especially during larger volunteer events.

- Hand pulling is most appropriate for small herbaceous plants and some vines, while hand tools can help with shrub and vine removal.
- Use tools of an appropriate size for the job to avoid stress on your hands and the tools. Stem-cutting tools include hand-pruners for stems of less than 1 inch in diameter, loppers for stems of 1 to 2 inches in diameter, and handsaws for stems of more than 2 inches in diameter. Root-removal tools include hand tillers for herbaceous plants, and large picks, shovels, and Pullerbear™ (formerly called Weed Wrenches) for shrub roots, tree roots, and rhizomes (creeping rootstalks).
- Be sure to maintain a safe distance of at least 10 feet between volunteers when they are using tools.
- Demonstrate to volunteers the proper ergonomic use of tools.
- Avoid pulling non-target plants. Spend time helping volunteers with plant identification during your work event.
- Consider assigning one species for removal so that volunteers who are not as familiar with plant identification can become experts in identifying and controlling a specific plant species.

When deciding if an invasive plant infestation can reasonably be removed manually, weigh the full impacts of manual removal against other methods. These impacts include:

- Soil disturbance.
- The potential for scattered plant fragments to re-sprout.
- The risk for composted materials to re-sprout in new locations.
- Impacts from dragging and hauling vegetative material across a site.
- The potential for increasing sediments in nearby water.
- Impacts to wildlife.

CHEMICAL CONTROL

In some instances, herbicide use is our best tool to control a given plant species or population. Forest Stewards and volunteers never are allowed to do any herbicide application. Instead, Forest Stewards can request professional crew support from their Green City staff, who will review requests and coordinate any work that may come from it.

EROSION CONTROL

For the health of the larger watershed and to prevent erosion, keep soils in their natural areas. The following should be considered before moving forward with invasive plant removal:

- Volunteers are restricted from working on steep slopes. Green City staff coordinates all slope work and only professional crews perform it.
- If you are unsure if a slope is too steep, reach out to your Green City staff.
- Wet slopes with seeps or perched wetlands present specific challenges, including an increased likelihood of soil erosion and the possibility of more deep-seated slope stability problems. Green City staff will help determine if wet slopes in areas that are not steep are appropriate for Forest Stewards or need professional crew attention.
- Bare soils are more susceptible to erosion. Sections of bare soils and minimal canopy cover must be covered within five days. Leaves, downed wood or twigs, blackberry canes (cut to 2 feet in length), forest duff, burlap and wood chip mulch all can be used to cover soils.

- If sites are close to a lake, stream, or wetland (or even a drain structure), erosion barriers may be needed during invasive plant removal efforts. Green City staff can provide recommendations, materials, and crew support if needed.
- On-site wood debris can be used. Lay or stake it perpendicular to the slope to provide some additional stability.

COMPOSTING AND WEED DISPOSAL

Have a plan for the disposal of weed waste before any plants or plant materials are removed. In some situations, we prefer that you bag and dispose of invasive weeds. You can coordinate the pickup of bagged weeds with Green City staff in the following situations:

- If the plants are capable of re-sprouting from plant fragments (ex. hedge bindweed).
- If the plant contains seed parts that spread easily (ex. Stinky Bob).
- If the plant is toxic to people or pets (ex. poison hemlock).
- If the plant is on the Class A noxious weed list (ex. garlic mustard).
- In some cases, removing only the reproductive parts of the plant is necessary (ex. arum fruits and seeds).



For more information on invasive plant identification and removal and disposal methods, visit the King County Noxious Weeds website: KINGCOUNTY.GOV/SERVICES/ENVIRONMENT/ANIMALS-AND-PLANTS/NOXIOUS-WEEDS.ASPX, or go to KINGCOUNTY.GOV and search: NOXIOUS WEEDS

BUILDING AN ONSITE COMPOST PILE

Onsite composting is cost effective, helps to leave organic material and nutrients where they belong, and provides excellent habitat for wildlife. There are two basic forms of compost piles:

SQUARE Should not exceed 4 feet by 4 feet in area on the ground.

WINDROW Should not exceed 3 feet wide, but can be as long as necessary. Windrows can be strategically placed along informal boundaries or run parallel to gradual slope contours to provide simple erosion control. Work with Green City staff on site location to ensure proper site drainage.

Steps for building onsite compost piles are as follows:

Step 1

Find or create an area free of native plants and remove all invasive plants and roots. Clear the area thoroughly before you build your compost piles. Place compost piles out of sight from walking trails and roads as much as possible. Never build a compost pile against the trunk of a living tree.

Step 2

Collect and lay out a frame of downed sticks and branches from your park that will define the edges of your compost pile. If you are using burlap, lay the burlap down first, then put the frame of branches on top of the burlap edges.

Step 3

Fill in the frame with dead branches and sticks found on site. Place them in both directions to form a grid. This helps prevent the composting weeds from having direct contact with the soil and allows for air to circulate under the pile.

Step 4

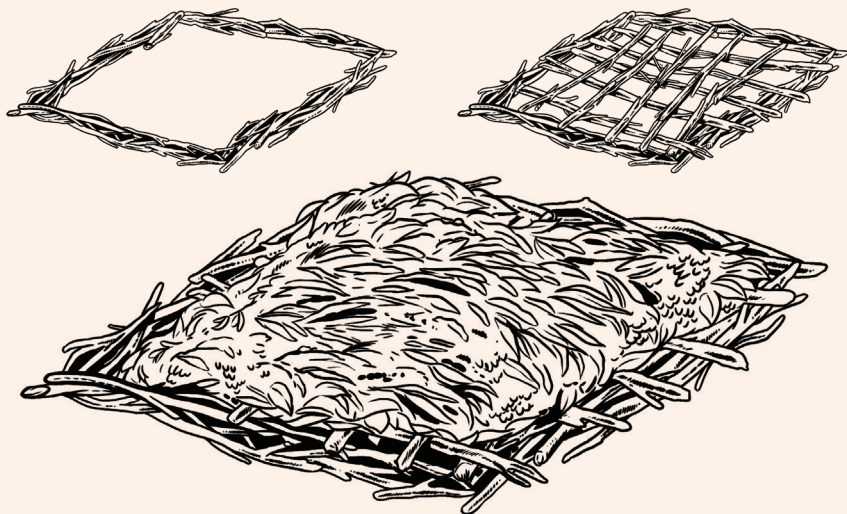
Put pulled weeds on top of the compost rack. For square compost piles, do not stack weed debris taller than 4 feet. For windrow compost piles, do not stack weed debris taller than 2 feet. Do not let weed debris spill over beyond the frame. Separate invasive woody material, such as laurel or holly branches, into a different pile from herbaceous weeds when creating piles. The herbaceous material breaks down faster and can be redistributed sooner. Only weed debris should go in compost piles. Resist the urge to clean up the forest floor of all sticks and leaves. Not only does this create more compost piles than necessary, but decaying logs and sticks are an important component of healthy forest ecosystems.

Step 5

Check piles throughout the year. Turn or maintain them as needed to ensure that weeds do not re-sprout.

Step 6

Pull compost piles apart when all the material has dried out. This can take as little as three months to more than a year depending on temperature, moisture,

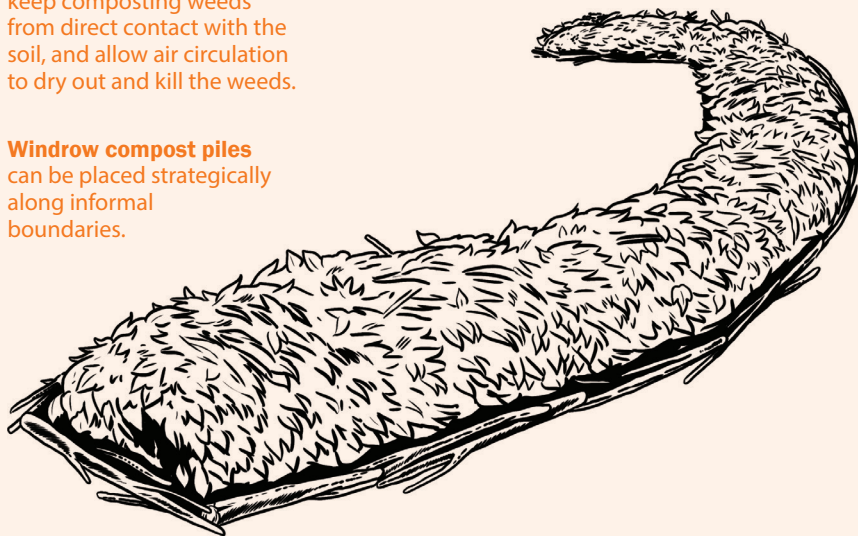


Square compost piles

keep composting weeds from direct contact with the soil, and allow air circulation to dry out and kill the weeds.

Windrow compost piles

can be placed strategically along informal boundaries.



and weed species. Dried-out weed debris can be used like mulch across your site, spread across the ground or concentrated around new plants. Redistribute sticks and logs throughout the site. Do not deconstruct piles during bird nesting season if you observe bird activity as some ground-nesting species

use compost piles for nesting, foraging and refuge. Feel free to leave some compost piles so wildlife can continue to use them.

Methods for Removing Invasives

The species described on the following pages are some of the most common invasive plants a Forest Steward will encounter at their sites. For the methods of removal described, “small infestation” refers to an area from which you can effectively and reasonably remove all necessary plant material (usually all above and below ground plant parts) given your available time, ability and resources.

INVASIVE TREES AND SHRUBS

Do not cut down or pull out an invasive tree unless you also remove all of its roots. If roots are left behind, they will send up suckers that will grow into many more trees, greatly multiplying the problem. Small, young plants may be hand pulled. Plants that are less than 1 inch in diameter may be taken out successfully with a Pullerbear™.

For any tree more than 1 inch in diameter, remove the lower branches to provide access to the ground around the tree. Then, connect with your Green City staff to request herbicide treatment.

Do not leave freshly cut or pulled holly stems or branches in direct contact with the soil, as the cuttings can easily re-root. Make sure they are left to dry out on top of an onsite compost pile. Place invasive tree branches and stems on their own compost piles, separate from cut and pulled blackberry and ivy, as they decompose at different rates.

Woody Invasive Plants

Here is the complete list of target woody invasive trees and shrubs.

Botanical Name
Common Name

Acer platanoides
Norway Maple

Acer psuedoplatanus
Sycamore Maple

Aesculus hippocastanum
Horse Chestnut

Buddleia davidii
Butterfly bush

Clematis vitalba
Traveler's Joy

Cotoneaster spp.
Cotoneaster

Crataegus monogyna
English Hawthorne

Ilex aquifolium
English Holly

Populus alba
Silver Poplar

Populus nigra
Black Polar (Lombardy)

Prunus domestica
domestic cherry

Prunus spinosa
Sloe

Prunus avium
Wild Cherry

Prunus cerasifera
Thundercloud plum

Prunus laurocerasus
Cherry Laurel, English Laurel

Prunus lusitanica
Portuguese Laurel

Pyracantha spp.
Firethorn

Robinia pseudoacacia
Black Locust

Sorbus acuparia
Mountain Ash

Tamarix ramosissima
Saltcedar

Ulex europaeus
Gorse

Ulmus parvifolia
Chinese Elm

Ulmus procera
English Elm

Ulmus pumila
Siberian Elm

BITTERSWEET NIGHTSHADE (*Solanum dulcamara*)

Hand-pull the stem close to the ground and pull or dig up the roots, taking care not to break the slender roots. This method is most effective with young plants and small infestations. Manual control works best after rain or in loose soils. Recommended tools include shovels, spades and hand tillers to loosen soil. When substantial manual removal is used in wet areas, take care to prevent soil erosion. Wear gloves when handling Bittersweet nightshade, as it can be toxic to people, pets and livestock.

Fruiting plants and root balls should be collected and disposed of in the garbage. Composting root balls is not recommended. Stems can be left on site to dry out and decompose if they are in a dry area where they will not move into waterways or onto moist soil.



Bittersweet Nightshade



English Ivy

ENGLISH IVY (*Hedera helix*) **CLEMATIS** (*Clematis vitalba*)

Create “lifesavers” or “survival rings” to preserve existing trees and reduce the seed source. Start by cutting vines at shoulder height, then again at the base of the tree. Then, remove all ivy or clematis from the tree, from shoulder to base. Grub out the roots in a radius at least 5 feet away from the tree. Do not attempt to pull vines above shoulder height out of the tree. They will die and decompose on their own, and pulling them down from high branches can possibly damage the tree.

Remove dense ground patches of ivy and clematis by clipping edges of the swaths, then continue clipping, digging and rolling the tangled mat up into an ivy/clematis log. The rolling method

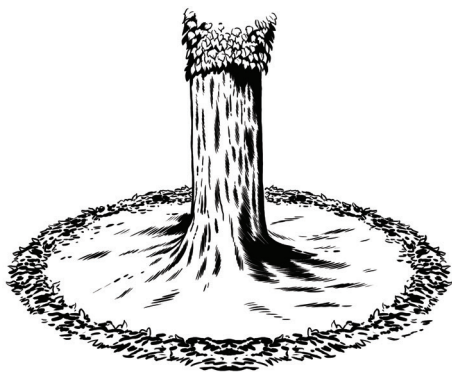


Clematis



Garlic Mustard

IVY REMOVAL & DISPOSAL



“Lifesaver” Tree Ring



Ivy Log



Ivy Bundle

works better for ivy because it grows along the ground and the vines and roots are more flexible. Clematis can grow up trees, down trees, and back up trees again, which requires following all vines to make sure the plant isn't making contact with the ground. Take care to cut around or gently lift ivy/clematis mats over existing native plants. If the ivy or clematis vines grow into thick woody stems that are too large to dig out, Forest Stewards can request herbicide treatment by connecting with their Green City staff. Ivy and clematis can be composted on site.

Quick Tips for Removing Ivy/Clematis

“LIFESAVER” TREE RING Cut ivy at shoulder height and again at base of tree. Do not attempt to pull vines out of tree. Roll ivy back away from tree in logs. Clear at least 5 feet back from each tree trunk.

IVY BUNDLE For small clumps of ivy, pull all vines out, wrap into a tight bundle, and dispose on compost pile or hang on a branch where it will not come into contact with the ground.

IVY LOG For large contiguous swaths of ivy, clip edges of 5- to 10-foot-wide sections, roll into a log, clip root connections at the end of the roll, and roll on top of the compost pile to decompose. Ivy logs fit nicely on windrow compost piles.

GARLIC MUSTARD (*Alliaria petiolate*)

IMPORTANT: Garlic mustard is designated as a regulated noxious weed in counties throughout the Puget Sound. Please report to Green City staff all locations of garlic mustard that you identify — even if you remove the weed.

Hand-pulling individual garlic mustard plants is effective if the entire root is removed. Flowering or seeding plants must be put in a bag and discarded in the garbage. Carefully and thoroughly clean off boots, clothes, and tools before leaving the area to avoid carrying the tiny seeds to new sites. Larger populations of garlic mustard will have to be managed by professional crews, so please notify Green City staff to coordinate the removal.

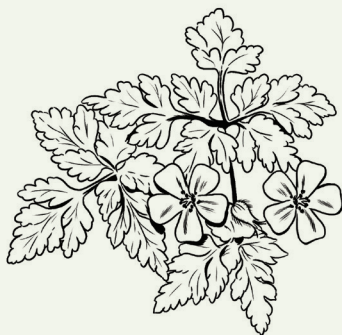
HEDGE BINDWEED/ MORNING GLORY (*Calystegia sepium*)

Hand pull at least three times per year (early growing season, mid-summer, and late summer) for at least three growing season cycles. If keeping up with all the bindweed takes more time than you have available, you may need to prioritize clearing all the bindweed from the native plants first, or at minimum, clipping all the bindweed away at their base as they are trying to establish. Covering bindweed with sheet mulch can help weaken the bindweed, slow regrowth, and make pulling more effective. Bindweed can be composted on site unless it is blooming. Shade is the best way to control bindweed. Plant conifers and other native plants for long-term bindweed suppression success.

For larger or more established infestations where manual removal is impractical, consult with Green City staff for options.

HERB ROBERT A.K.A. STINKY BOB (*Geranium robertianum*)

Hand-pulling individual plants is effective if the entire root is removed. Try to remove plants before the seeds form to avoid further distribution of seeds. Flowering or seeding plants must be put in a bag and discarded in the garbage. If Stinky Bob is growing in a monoculture, then sheet mulching can be an effective way to smother seeds and root fragments that are left behind. Carefully and thoroughly clean off boots, clothes, and tools before leaving the area to avoid carrying the tiny seeds to new sites.



Herb Robert



Hedge Bindweed



Himalayan Blackberry



Knotweed

HIMALAYAN BLACKBERRY

(*Rubus armeniacus* syn.
Rubus discolor)

Blackberries have a large root mass in the first 6 to 18 inches of soil, and often have smaller roots that spread from the main root mass. All roots should be dug up as completely as possible. Blackberry canes and roots can be composted on site.

To keep compost piles tidy and volunteers safe from stickers, cut live canes into manageable pieces to stack on the compost piles before digging in to get the roots. With large volunteer groups, you can assign cane cutters and root diggers separately.

Before initiating blackberry removal during early and primary nesting season (February to the end of July), visit your site and watch for nesting activities. Phase removal over time, if possible, to minimize eliminating all habitat.

KNOTWEED

(*Polygonum cuspidatum*
and other species)

Foliar herbicide application is the most effective way to eradicate knotweed. It must be performed by Green City staff or professional crews during dry periods from July to September. If knotweed is present, Forest Stewards can request herbicide treatment by speaking with Green City staff.

Volunteers are highly discouraged from removing knotweed patches as disturbance promotes growth and dispersal. Hand removal of knotweed is impractical and could actually exacerbate the problem.

Any fragments of the plant should be disposed of in the garbage. Do not compost this plant on site.

POISON HEMLOCK

(*Conium maculatum*)

IMPORTANT: Poison hemlock is designated as a regulated noxious weed in counties throughout the Puget Sound. Please report to Green Cities staff all locations of poison hemlock that you identify.

Removal of this plant is not appropriate for a volunteer event. Forest Stewards may request professional crew support to remove poison hemlock through the online form. If attempting to manually control poison hemlock, please note that all parts of this plant are toxic. You must wear gloves and long sleeves, and wash hands thoroughly after handling plants. Pull or dig up the entire plant, including the root. All parts of the plant should be disposed of in the garbage. Adding a layer of mulch to the area after it has been cleared will reduce germination of seeds still present in the soil.

POLICEMAN'S HELMET

(*Impatiens grandulifera*)

SPOTTED JEWELWEED

(*Impatiens capensis*)

IMPORTANT: Policeman's helmet is designated as a regulated noxious weed in

counties throughout the Puget Sound. Please report to Green City staff all locations of policeman's helmet that you identify — even if you remove the weed.

Manual removal is effective for small infestations. Pull or dig up plants in the spring or early summer when the soil is still moist and before the plant develops seed capsules. Make sure to remove entire root as the plants have a tendency to snap off near the ground and will re-grow if the root is not removed entirely.

Cut and bag all flower and seed heads, using sturdy plastic bags. Dispose

as garbage, not in yard waste or compost bins. Stems can be left on site to be composted but only if they are first crushed and dried out thoroughly. Do not let plant fragments get into waterways. This plant is notorious for continuing to grow after it has been pulled. It is very important to crush the stems and leave them somewhere dry, or leave on a tarp to prevent them from forming new roots and producing new flowers.

PURPLE LOOSESTRIFE

(*Lythrum salicaria*)

GARDEN LOOSESTRIFE

(*Lysimachia vulgaris*)

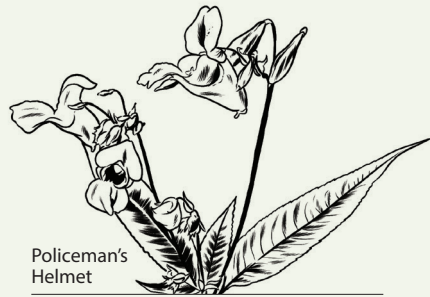
IMPORTANT: Purple and garden loosestrife is designated as a regulated noxious weed in counties throughout the Puget Sound. Please report to Green City staff all locations of purple and garden loosestrife that you identify — even if you remove the weed.

Hand-pulling of purple and garden loosestrife is only recommended for plants in sandy, mucky, moist, or loose soil. Removing hard, woody roots in compacted soils is impractical. If the plants are in flower or in seed, cut off and securely bag all flower heads. Pulling plants while they are in seed will disperse the small, lightweight seeds, which you want to avoid. Cut plants may continue to produce flowers later in the season. Regularly monitor them until frost, and cut and remove any subsequent flowers. Cutting will not control purple loosestrife, but is an adequate interim measure until more effective control methods can be implemented.

Care should be taken to minimize erosion when digging in saturated soils on shorelines. Brush off boots, clothing, and tools prior to leaving the infested area. All parts of the purple loosestrife plant, including



Poison Hemlock



Policeman's
Helmet



Purple Loosestrife
and Garden
Loosestrife



Reed Canarygrass

flowers, seed heads, stems, leaves, and roots must be securely bagged and discarded in the garbage or taken to a transfer station. Do not compost or place in yard waste.

For larger or more established infestations where manual removal is impractical, consult with Green City staff for options. In most cases, controlling this species will require multiple methods over several years, potentially including herbicide treatment by professional crews.

REED CANARYGRASS

(*Phalaris arundinacea*)

Manual removal of reed canarygrass is impractical except for the smallest of patches (1 to 4 square feet). Hand dig when the ground is soft. Be sure to remove all roots and rhizomes because any left in the soil will re-sprout. Roots and rhizomes can be composted on site away from wet areas so long as they are not in contact with the soil. Monitor the site for regrowth.

For areas where reed canarygrass is dominant, one long-term control strategy is to shade it out. Shade won't eradicate the species, but it will control it and allow for a more structurally and genetically diverse site. Install sheet mulch with several layers of cardboard or burlap and 6 inches of wood chip mulch. Do not install sheet mulch in areas where standing water is 6 inches or more in depth at any point in the year. Leave sheet mulch in place for at least

one growing season. Monitor the edges of the mulch site for shoots coming up from lateral growth of rhizomes. Efficacy can be increased by removing above-ground plant material at — or just after — flowering. Conduct this removal with hand-tools, and time it prior to laying down the sheet mulch. Any removed above-ground plant material that hasn't gone to seed can be left on site.

After at least one growing season, the area should be planted with native species. Plant layout should be dense over the entire site, or in a clump-gap or row pattern. Fast-growing species adapted to wet areas — such as black cottonwood, red alder, and several types of willow — should be installed initially. Once they become established, a second planting of shade tolerant species — such as Western red cedar; thicket-forming species like red-osier dogwood, snowberry, and Nootka rose; and fast-growing conifers like Douglas and grand fir (placed along southerly and westerly edges) — should be planted.

SCOTCH BROOM

(*Cytisus scoparius*)

Hand-pull small plants and use Pullerbear™ to extract smaller plants when the soil is moist in spring. Note that disturbing the soil may cause germination of seeds in the soil. The area should be monitored to control any new seedlings.

Cutting can be effective on older Scotch broom plants that have a stem diameter of 2 inches or more. Cut plants in late summer to early fall as close to the ground as possible and monitor for new growth. Scotch broom can be composted on site.

SHINY GERANIUM

(*Geranium lucidum*)

IMPORTANT: Shiny geranium is designated as a regulated noxious weed in counties throughout the Puget Sound. Please report to Green City staff all locations of shiny geranium that you identify — even if you remove the weed.

Shiny geranium is difficult to distinguish from other geranium species. It is distinguished by shiny, kidney-shaped leaves that have individual hairs and pink, five-petal flowers. Plants can be carefully hand-pulled or dug out before they go to seed, but take care to remove as much root and stem as possible to prevent plants from re-sprouting. Put all plant material in garbage bags to prevent spreading. Never compost shiny geranium plants. Deep mulch should be applied to the site to limit seed germination and regrowth. Work with Green City staff to determine if fencing off the site from foot and paw traffic is appropriate. Monitor the site closely.



Scotch Broom



Shiny Geranium

TANSY RAGWORT

(*Jacobaea vulgaris*)

IMPORTANT: Tansy ragwort is designated as a regulated noxious weed in counties around the Puget Sound. Please report all locations of tansy ragwort that you identify to Green City staff, even if you have already removed it. Note that tansy ragwort is often confused with an even more widespread nonregulated weed called common tansy (*Tanacetum vulgare*). Tansy ragwort flowers have outer petals while common tansy just has button-like flowers with no outer petals.

For small infestations, manual removal will be effective. Pull the plants after they



Yellow Archangel



Yellow Flag Iris

bolt, but before they flower (typically in May through June) to prevent seed spreading and when the soil is wet, such as after a rain, to ensure that all roots are fully removed. Tansy ragwort is toxic to humans and animals, so gloves and protective gear should be worn. Mowing is not effective on its own and should only be done to cut down tansy before it flowers for a second time in a season after being treated through some other method.

For larger infestations, selective herbicides (applied by professional crews) may be used following federal and state laws. Biological control may be used in larger infestations as well, in conjunction with another nonchemical method. While effective at controlling tansy populations in the long run, biological controls may take up to six years to establish and show a significant impact.

YELLOW ARCHANGEL (*Lamium galeobdolon*)

Manual removal is generally not effective. Plants grow densely, sprout from root or stem fragments, grow easily among desirable vegetation, and are labor-intensive to hand-pull. For very small populations (less than 10 square feet), try continuous hand-pulling and revisit the site monthly. Sift through the soil to ensure removal of all root and stem fragments. This removal is easiest in fall through early spring. All plant debris should be disposed in the garbage.

Dense infestations may be controlled by sheet mulching. It is crucial to control any escaping plants, so regularly check for holes in the covering material. Stem fragments and roots can re-sprout if left in contact with wet ground. Forest Stewards can request herbicide treatment for yellow archangel by consulting with their Green City staff.

YELLOW FLAG IRIS (*Iris pseudacorus*)

Manual removal can be effective for small infestations, especially for very young plants not yet established. Manual removal of larger plants is difficult and may require sturdier tools or saws to remove the entire rhizome. Monitor the location after you have removed the plants — new leaves will show you where you missed any sections of rhizome. Precautions should be taken to protect your skin, as resins in the leaves and rhizomes can cause irritation. Dispose of all plant parts in the garbage.

For larger or more established infestations where manual removal is impractical, consult with Green City staff for options. In most cases, controlling this species will require multiple methods over several years, potentially including cutting and herbicide treatment by professional crews.

Improving Soil

In parks, we commonly use wood chip mulch (also called coarse arborist wood chips) to improve soil health at restoration sites. Wood chips help retain soil moisture, build soil nutrients and structure, block growth of weeds around desirable plants, prevent soil erosion, and moderate soil temperatures. Decaying wood chips mimic the decomposition that commonly happens in Pacific Northwest forests, improving soil bioactivity and plant growth. Mulching is particularly important for plantings that will not receive supplemental water.

DIFFERENT WAYS TO ADD WOOD CHIPS AT YOUR RESTORATION SITE

MULCH RING Apply wood chip mulch in the shape of a donut around new or existing plantings at a depth of 4 inches, about 12 inches wide, and with a 3-inch buffer of bare soil around the stem of the plant. Two 5-gallon buckets per plant is usually the right amount of mulch for newly installed plants. Do not create “mulch volcanoes.” Mulch piled up around the stem of your plant, will trap moisture around the root collar, inviting decay and disease.

SHEET MULCH For areas that had been dominated by invasive plants, especially blackberry, sheet mulching can help suppress weed growth and prep soils for future planting. You may choose to place

one or two layers of cardboard or burlap on the ground, working around any desirable native plants at the site. Make sure the two layers overlap so no openings exist for weeds to grow through. Follow up by applying 6 to 8 inches of wood chip mulch across the site. If you do not have access to cardboard or burlap, simply place a thick, 6–8 inch layer of mulch on top of the ground. This method helps suppress weed regrowth, but follow-up weed maintenance will be required. Sheet mulching should not be used in areas with a strong native seed bank since it will discourage regeneration of desired species.

Other considerations

- Do not use bark mulch, as this material contains a higher wax content than wood chip mulch and can reduce soil moisture.
- To minimize the spread of weeds or possible contamination by chemicals, acquire wood chips only from Green City approved sources.
- Forest Stewards are encouraged to reach out to local businesses to procure burlap and cardboard needed for sheet mulching. Please ensure these materials are not made of plastic, and that they do not have any plastic attached.

- For restoration sites with wet areas, wood chip mulch should be used only in wetlands that dry out during the summer and early fall months, or where invasive regrowth pressure is high.
- When applying mulch near a stream bank, do not apply below the ordinary high water mark (OHWM). This is the elevation to which stream flows regularly rise. It can be estimated by locating exposed woody roots along the stream bank where soils have been scoured away or by identifying where herbaceous plants do not grow. Mulch placed below the OHWM has a high chance of washing away during rains.

A NOTE ON COMPOST

Compost generally is not used on Green City restoration sites due to cost but can be considered for sites that are extremely compacted and nutrient poor. Talk to a Green Cities plant ecologist for more information. Compost should be used only as a top dressing (1 to 2 inches on the soil surface with follow-up mulch to suppress weeds). It never should be used to prep planting holes.

HUGELKULTUR

Hugelkultur is a horticultural technique for building mounds, layered with logs, dead plant material, soil, compost, and wood chips. The mounds retain moisture, provide long- and short-term carbon and nutrients for plants, and can help diversify the topography of a site. Plants then can be installed on the top and sides of the mounds.



For more information on Hugelkultur, visit the King Conservation District's webpage at KCDCOMMUNITYAG.ORG/HUGELKULTUR

Phase 2

Planting

Phase 2 focuses on the planting of native trees, shrubs and groundcovers.

TIMING: WHEN TO PLANT?

In the Puget Sound region, native plants installed in the fall have the highest survival rate in forest restoration projects. The cool, cloudy days and frequent precipitation provide ideal planting and transplanting conditions. Forest restoration projects often are not in close proximity to water for irrigation, and the number of plants often makes watering impractical. The earlier plants go into the ground in the fall, the more time they have to recover from transplant shock, adapt to the site, and expand their root systems before the growing season.

EXCEPTIONS TO THE RULE

BAREROOT STOCK is an affordable option for plant material that often is not available until late winter, so fall planting is not an option. Plant bareroots as soon as possible, or pot plants to install the following fall.

LIVE STAKES (cuttings that can grow into new plants) are harvested when the plant is dormant but before bud break, so installation time can span between late fall and early spring depending on the species. For more information on planting live stakes, see page 63–64.

If your wet areas dry out during parts of the year, you will want to plant on either side of the wet season to avoid soil impacts (early fall/winter and late spring). Avoid planting when wet areas are inundated with water.

- If soil is saturated all year, prime planting time usually is between late spring and early fall. To ensure plant establishment, do not plant within the two months prior to site flooding as plants can float out of their holes. Avoid planting at a site if it is under water.
- If your site has standing open water at a depth of at least 10 centimeters at any time during December through May, avoid work during this

period as it may impact breeding and developing amphibian species.

SELECTION: WHAT TO PLANT?

Choosing the appropriate plant species is among the most critical responsibilities of Forest Stewards. Especially in the urban setting, Forest Stewards need to account for many considerations as they build a planting list. These considerations include: physical site characteristics, forest maturity, reference ecosystems, pollinator habitat, bird habitat, trail corridors, utility corridors and crime prevention.

Changing climate conditions should be top of mind when selecting long-lived plant species.

PHYSICAL SITE CHARACTERISTICS

SUNLIGHT Consider light conditions as they change dramatically through the year.

SOIL QUALITY Reference Appendix B to understand the type of soil present at your site.

ASPECT (DIRECTION THE SLOPE FACES)

Certain species can handle more intense sun exposure, common to south and southeast facing slopes.

MOISTURE Get familiar with the moisture levels and wet areas across your site. Observe the site throughout all seasons

to get a complete picture of where wet areas exist. Note the toe of slopes or other areas where soil moisture may be higher.

EXISTING VEGETATION AND

SURVIVABILITY Identify native plants already thriving at your site. If creating a supplemental planting list, look at how previous plantings survived and select those that did well.

FOREST MATURITY

Some forest restoration projects are further along than others. For very young forests, you may need to consider succession planting to establish shade or enhance soil quality before “climax species” (late successional plantings) are installed.

REFERENCE ECOSYSTEMS

Discovering a reference ecosystem for your site can be a great way to identify plant lists that can guide your planting plans. Of course, getting out to natural areas around the Puget Sound area to look at what plants grow together — and under what conditions — will help you build a better understanding of how to build a future forest at your site. Appendix G Native Plant List provides growing conditions for common native plants.



For additional resources, visit the Washington Native Plant Society Plant Directory at WNPS.ORG/NATIVE-PLANT-DIRECTORY

POLLINATOR HABITAT

Pollinators are drawn to the flower of a plant based on smell, color, size, shape and the timing of blooms. Use the following guidelines when selecting plants to support pollinators:

SPECIES RICHNESS Plant at least 10 species of flowering plants that fit your moisture, light and soil conditions. Groundcovers, shrubs and trees all flower. Flowers don't have to be showy to support native pollinators.

BLOOM TIMES Consider when the species you select will be blooming. When bloom times overlap, from February to October, the availability of nectar and pollen is continuous. Aim for at least three species that bloom in early-bloom season, three species in mid-bloom season and three species in late-bloom season.

STRUCTURAL DIVERSITY A variety of plant forms (branching trees, thick-et-forming shrubs, creeping groundcovers, etc.) will support a variety of insect and animal species. Strive to establish multiple vertical layers of plant heights. Where appropriate, include both annual and perennial species, as well as both woody and herbaceous plants. Even non-flowering plants, like sword fern, are helpful to pollinators because as hardy evergreens, they create structure. Flowers with a variety of different shapes (flat radials, cups, rounded domes, tubular trumpets, etc.) will appeal to different species of pollinators.

CLUMPING Plant species in clumps, preferably in a rounded shape. Pollinators are more inclined to locate a clump of flowers, rather than individual flowers that are separated.

STEM TYPES Plants with pithy or hollow stems (elderberry, for example) are helpful to cavity nesters, which burrow into the stems.

LARVAE Larval host plants are critical for moths and butterflies. They generally lay their eggs on or near specific plants that hatched larvae need for food. Grass species can act as larval host plants for some butterflies and provide overwintering or nest sites for bumble bees and other beneficial insects. If appropriate, include at least one native bunchgrass in your plant palette.

BIRD HABITAT

A variety of plant forms, from tall trees and brushy shrubs to groundcover, provide nesting habitat for a greater variety of bird species. Even if you don't see birds nesting at your site, they likely are using it for shelter or foraging. Increased plant diversity also provides birds with food sources — directly through plants that produce nectar or berries, and indirectly through plants that attract different insects for birds to eat.



For more information on pollinator habitat, visit EarthCorps' Native Pollinator Habitat Restoration Guide at [EARTHCORPS.ORG/WP-CONTENT/UPLOADS/ THE-NATIVE-POLLINATOR-HABITAT-RESTORATION-GUIDE-EARTHCORPS.PDF](https://earthcorps.org/wp-content/uploads/the-native-pollinator-habitat-restoration-guide-earthcorps.pdf)

TRAIL CORRIDORS

For an official trail, the corridor includes the tread and the areas to the sides and above the tread. Consideration of the trail corridor in your planting plan will improve long-term success of your restoration site while also recognizing trail maintenance, which is coordinated through Green City staff.

Within 2 feet of a trail corridor, don't plant material that will grow significantly higher than 18 inches. Plant trees at least 10 feet away from the trail. Take time to explain these considerations to volunteers and walk the trails after volunteer events to check for plants that are too close. It is easier on the plants to relocate them before they get established. Trail corridor standards do not apply to social trails or stewardship trails.

UTILITY CORRIDORS

Aboveground and belowground utilities must be considered when placing plants, especially trees. Trees are discouraged under or near transmission lines and towers. Do not plant trees within 30 feet of any power line.

Belowground utilities and drainage lines may need to be accessed for maintenance or upgrades. Consult with Green City staff to identify any potential belowground utilities at your site. Choose plants that can tolerate disturbance or harsh pruning along these areas. Do not plant trees or larger shrubs on or adjacent to these areas. Please note that some utility corridors are privately owned and maintained. Please check with Green City staff before starting activities to ensure the utility corridor is a viable restoration site.

CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED)

Selection of the right plants is imperative to make your site safe and comfortable for park users. Choose species with natural adaptations and growth habits, while also considering how users interact with the space. CPTED considerations include:

- Place low-growing species near trail edges, such as fringe cup, sword ferns and low Oregon grape.
- Place larger shrubs and trees with an ample setback from trails and from each other (at least 5 feet).
- Keep densely growing and spreading plants away from trail and forest edges, specifically salmonberry, thimbleberry, native roses, snowberry and red twig dogwood.
- Adjust the placement of evergreen trees and shrubs to accommodate different visibility needs within the site. Corners and entries need a broader view corridor. Trails are safer when they have a sense of open space and good views of what lies ahead.

SPACING: WHERE TO PLANT?

Just like with selecting what to plant, figuring out where to plant is a critical responsibility of Forest Stewards. Spacing refers to the amount of distance between installed plants, and it ultimately will determine how many plants you need to order. Spacing can be a difficult concept to grasp. Here are some concepts to consider:



TRAIL CORRIDOR

This trail corridor example highlights a 4-foot-wide trail tread (D) with a corridor that is 8 feet high and 10 feet wide (C). This influences not only plant selection but trail maintenance over time. Groundcovers can be planted near trail edges (E), while shrubs should be planted at least 5 feet from the trail (B) and trees should be planted at least 10 feet from the trail (A).

DENSITY IS INSURANCE FOR POOR

PLANT SURVIVAL It is extremely unlikely that you will have 100% plant survival, so overplanting is better than under planting. Increasing planting density can help in avoiding planting at the same site year after year.

SITE CONDITIONS DICTATE SPACING

Areas with sandy soils or without water access should be planted at higher density, given the expected higher plant mortality rate. If your restoration site already has a healthy amount of mature and young conifer trees, you may consider selecting only a few for additional succession planning. If your restoration site already has a healthy and diverse shrub layer, you may not need to plant more and instead can focus on trees and groundcovers.

KNOW MATURE SIZE Some plants can be deceiving when they all start in the same 1-gallon pot. Plants vary greatly in size once they have matured. Familiarize yourself and your volunteers with plant species and think about how big they will grow together in five or 10 years. Although we talk about average spacing (as in the table on page 57), you should expect to plant more densely in big open gaps (with ample sunlight) and less densely around existing plants. Spacing will never be even across the entire site.

The spacing table on page 57 is organized into plant type and desired plant density, indicating the square footage that each plant will occupy based on that spacing.

INSPECTING

Successful plantings start with good plant material. As soon as plants are delivered, you should inspect each one. Pull some plants from containers to examine the root ball for girdling or pot-bound roots. Use a clean, sharp pruner or hori-hori to sever girdling or overly matted roots. You also should watch for germinating weeds and signs of other pests or pathogens (spots on leaves, insect damage, etc.). If you observe unhealthy plants, please make a note of the species and communicate your findings to Green City staff.

STAGING

Staging is the distribution of plants across a site in preparation for planting. Since first-time volunteers and new crew members may not be familiar with each plant species, we recommend that you place plants exactly where they will be planted prior to your planting event. It will take one person about one hour to stage 50 to 100 plants.

For smaller volunteer events, or events with more experienced volunteers, you can consider having the volunteers stage the plants. Consider focusing on a handful of species at a time. Provide a few basic rules to follow, such as no planting trees within 10 feet of a trail or other tree. You also should provide, information about the preferred site conditions for the species — for example, a Douglas fir does best in a sunny spot. If volunteers are staging plants, you should be prepared to answer their questions and monitor plant placement closely.

SPACING

PLANT DENSITY ESTIMATES

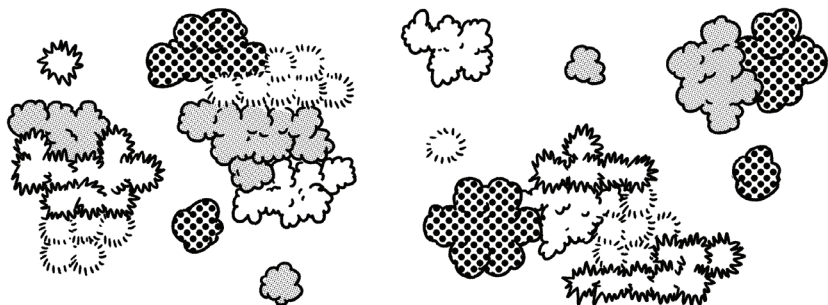
If you estimate the size of your restoration area, you can divide that size by the square footage to estimate the number of plants you would want in that area. After making these calculations, you need to factor in existing vegetation.

For example, if your site is 10,000 square feet and you are shooting for medium density:

Trees: $10,000 \text{ sq. ft.} \div 100 \text{ sq. ft.} = 100 \text{ trees}$
Shrubs: $10,000 \text{ sq. ft.} \div 16 \text{ sq. ft.} = 625 \text{ shrubs}$
Groundcovers: $10,000 \text{ sq. ft.} \div 4 \text{ sq. ft.} = 2,500 \text{ groundcovers}$

Plant and Stock Type	Desired Plant Density	Spacing Average (on center)	Divide Square Footage by
Trees	Dense	6 ft.	36 sq. ft.
	Medium	8, 9, or 10 ft.	64, 81 or 100 sq. ft.
	Sparse	15 ft.	225 sq. ft.
Shrubs	Dense	3 ft.	9 sq. ft.
	Medium	4 ft.	16 sq. ft.
	Sparse	5 ft.	25 sq. ft.
Live Stakes	Dense	1 ft.	2 sq. ft.
	Medium	2 ft.	4 sq. ft.
	Sparse	3 ft.	9 sq. ft.
Emergent Plugs	Dense	6 in.	.25 sq. ft.
	Medium	12 in.	1 sq. ft.
	Sparse	18 in.	2.25 sq. ft.
Herbaceous/ Ground Cover (4" pots in groups of 3)	Dense	2 ft.	4 sq. ft.
	Medium	3 ft.	9 sq. ft.
Herbaceous/ Ground Cover (1 gallon pot)	Dense	2 ft.	4 sq. ft.
	Medium	3 ft.	9 sq. ft.

PLANT STAGING



Clump-Gap Mosaic

Plants of each species are “clumped” and individuals of the different species are randomly placed in the gaps.

The following plant staging patterns are frequently used: clump-gap mosaic, forest thicket, and row planting. There also are special staging considerations for shade-tolerant conifers.

CLUMP-GAP MOSAIC

In this pattern, 5–10 plants of each species are “clumped,” sometimes with several groups of 5–10 plants of other species. Between these clumps are gaps where individuals of the different species are randomly placed with wider spacing. The gaps lend a naturalistic aesthetic to the planting and supports pollinator habitat. This formation can improve plant establishment and makes maintenance easier.

FOREST THICKET

This planting pattern is high density, with no large gaps. As this pattern grows,

it quickly will shade out bare ground and fill in completely. This style of planting is useful to address areas that were previously heavily infested by invasive weeds, as it maximizes site occupancy by native plants. If weeds are not well controlled at the time of planting, this type of density may make maintenance more challenging.

ROW PLANTING

In this pattern, plants are placed in irregular intervals along rows to support mowing, or irrigation lines and hoses. When possible, orient rows along contours of the slope to avoid unnatural looking lines. Plants are in clumps of five to 10, by species. The initial aesthetic of these plantings may appear formal, but with careful staging, the plants will grow into a more natural aesthetic. This method works well for sites dominated by reed canarygrass.

Shade-Tolerant Conifers

Plant shade-tolerant conifers in an appropriate microsite, within 2 feet adjacent to tree stumps, logs, or compost piles. These conifers are important priority plantings for forest restoration and, as such, are not subject to the usual spacing considerations. They can be planted within 4 feet of another shade-tolerant conifer and within 6 feet of any other plant species.

INSTALLATION

Proper installation is one of the most important things you can do to influence plant survival. When working with volunteers, take time to properly teach planting techniques, and spend time with them to ensure quality installation. It can be helpful to have volunteers work in pairs, to build in some redundancy and quality control.

Preparing the Hole

Planting too deep can cause the stem to rot and kill the plant, and planting too shallow can dry out the roots.

- Clear away all loose materials, such as leaves, mulch, rocks and branches from the planting area. It is important to install the plant into mineral soil, not only layers of mulch or debris.
- Dig the hole wide enough to completely spread out the plant roots, without crowding or bending them. If you are planting a container plant, dig a hole that is cylindrical and twice the width of the container.
- Pile soil in a cleared area next to the hole. Remove plant roots and grass clumps from the soil that you will be using to backfill the hole.

- Dig deep enough so the plant, when set in the hole, will have the top of the root crown flush with the soil surface. Use a shovel as a level. Use the level of soil around the base of a container plant as a guide for how to plant in the ground. To avoid soil settling, avoid digging deeper than necessary.
- Roughen the sides of the hole if they appear slick or claylike, as it will help the new roots to penetrate the surrounding ground.
- It is suggested to incorporate as much as one gallon of wood chips or mulch with the local soil when planting conifer trees or other woody species (but not madrone). This will help improve soil, sparking microbial activity. Talk to a Green Cities staff member for more information about using this technique.

Preparing the Plant

There are slightly different preparation methods depending on whether the plant is in a container or bareroot. Flip to the next page for details on how to best install potted and bareroot plants.

INSTALLING PLANTS



Potted Plant

Loosen roots outward and place the root collar level with the ground.



Bareroot Plant

Atop a cone of soil, arrange the roots pointing outward from the plant.

For Potted Plants

- Tip the pot on its side and gently press on the pot to loosen the plant.
- Loosen up the roots with your hands or a tool such as a hand tiller. It is OK to allow the potting soil to fall away to expose the roots.
- Pull loose roots outward.
- Cut or straighten any roots encircling the root ball or growing upward. These roots may affect the health of the plant.
- Place the plant so that the root collar is at the same level as it was in the pot ensuring the root collar is uncovered. When you fill the hole in later, the soil should be at the same level as it was in the pot.
- Place the plant in the hole and arrange the roots so they point outward.

For Bareroot Plants and Plugs

- Keep roots moist until planting by storing them in moist sawdust or soil. In addition, you may soak them for one to two hours (but never longer than six hours) before planting.
- Prune badly bruised, broken, kinked, or jagged roots.
- Make a small cone of soil in the bottom of the hole.
- Arrange the roots around the cone so they all point outward from the plant.
- Make sure the hole is deep enough for roots to extend downward without curving back up.

Planting on Slopes

Dig your plant hole deep enough so that the root collar will be level with the lower edge of the slope. Place the plant so it grows straight up, not perpendicular to the slope.

On a Slope

Place the root collar level with the lower edge of the slope.

**Burlap**

Remove all burlap before backfilling hole with soil.

**Backfilling the Hole**

To backfill, use the native soil that was dug out of the hole, or from a nearby hole if more soil is needed.

- Ensure that only soil goes back into the hole. Limit large rocks, sticks, grass clumps, leaves, or mulch.
- Push soil around the roots, minimizing disturbance to the root arrangement.
- Push soil down firmly to remove any air pockets. Gently pull the plant by holding the base of its stem to make sure it is firmly planted.
- Form the surface soil into a small basin around the periphery of the planting hole to hold water, and adjust the soil so that water drains away from the immediate trunk area.

Mulching

Apply wood-chip mulch to the top of the soil in a circle at least as 12 inches wide and 3 inches deep, but not touching the

stem. This mulch ring will help retain soil moisture, suppress weeds, and provide nutrients as the mulch breaks down. Two 5-gallon buckets of mulch in a 4-inch-deep donut around each container plant is optimal.

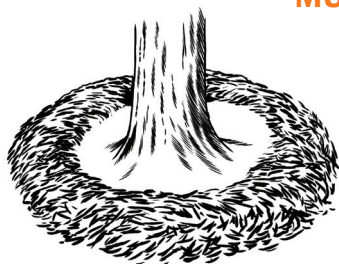
Watering

If possible, water the plant immediately to settle the soil and eliminate air pockets. Add more soil if needed.

Adding Flagging

All installed plants should be flagged with flagging tape to make it easier to find for weeding, watering and monitoring. For plants with year-round stems or branches, loosely tie a small section of flagging to a side branch. Do not tie flagging around the trunk or main stem. For plants without branches or above-ground vegetation at planting, tie flagging to a stick and place it in the ground near the plant.

MULCH RING



Do leave space.



Do not pile mulch onto the trunk.

PLANTING LIVE STAKES (CUTTINGS)

Live stakes are sections of branches taken from certain plant species that, when installed correctly, can grow in to a new plant. Live stakes frequently are used in wetland and riparian restoration projects, but they can be successful in upland forests, too. Live stakes should be collected and installed when plants are dormant but before bud break, which could be from late fall to early spring depending on species.

How to collect live stakes

- Use a clean pruner or loppers to cut upright branches of the parent plant. The optimal size of the stake has a diameter of $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches, and a length of $1\frac{1}{2}$ feet to 3 feet. Lengths and diameters may vary depending on species.
- To prevent the stakes from respiring and drying out, remove any leaves and small branches after cutting.
- When collecting stakes, cut back to the next largest branch or to the ground to leave the parent plant looking neat and healthy.
- Make a flat cut on the top of the branch above a leaf node, with the leaf nodes or buds pointing up toward the flat top. A straight cut will expose less surface area of the stake to potential disease and insect infestation.
- Make a diagonal cut on the bottom. A diagonal cut makes it easier to drive the live stake into the ground. It also aids in telling which end is up.
- If live stakes cannot be installed immediately, store them in a bucket of water or wrap them in wet burlap to keep them from drying out.



You can view the Green Cities Plant Propagation Field Guide at FORTERRA.ORG/WP-CONTENT/UPLOADS/2015/05/GREEN-CITIES-NATIVE-PLANT-PROPAGATION-FIELD-GUIDE.PDF

How to install live stakes

- A planting bar tool is often used to create a pilot hole for the live stake. In soft soil, the cuttings can sometimes be directly pushed in.
- Place the cutting in the hole right-side-up, with the flat end sticking up and the diagonal cut driving down into the ground. Make sure that the buds point upward.
- A general rule is to plant live-stake cuttings 18 inches deep, or for short cutting, at least half their length. Deeper is fine, as long as a few buds are exposed at the top.
- Spacing of live stakes depends on the mature size of the plant and site conditions that could impact survival, such as moisture levels.

Installing Wetland Plants

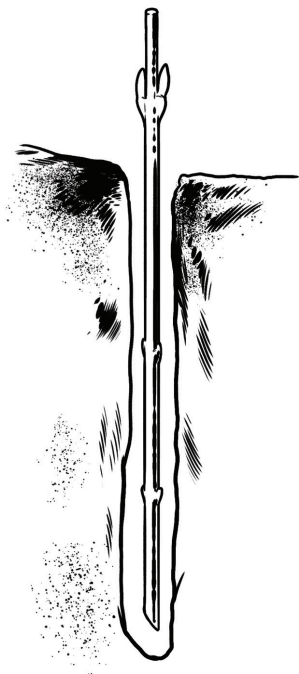
Special considerations are made for the installation of plants destined for wetlands.

- Keep the plugs in their packaging until just before planting.
- When installing emergent bareroot plugs, the most common method for planting is to use a dibble tool to open up a planting hole in soft, saturated soil. If you don't have a dibble, use a narrow-bladed shovel or trowel. Make a slit in the soil, levering back and forth so that the plug will fit into the slit.
- Carefully install the plug, and then press the surrounding soil to remove large air pockets. Do not over-compact the soil.

INSTALLING LIVE STAKES

Some species that can be propagated by live staking include:

Cornus sericea Red-osisier dogwood
Lonicera involucrata Twinberry
Physocarpus capitatus Pacific ninebark
Populus trichocarpa Black cottonwood
Rosa nutkana Nootka rose
Rubus spectabilis Salmonberry
Salix spp. Willows
Sambucus spp. Elderberries
Spirea douglasii Spirea



Cuttings

Live-stake cuttings should be pushed into the soil to at least half their length.

- Match the soil surface of the plug to the surrounding soil surface.
- Plugs can “float” out of their hole if water levels rise before the roots have anchored into the soil. Therefore, plant at least two months before the date you anticipate the site will become submerged.
- Mulch is rarely used when planting emergent plugs because the soils are typically moist enough year-round to support these species.
- Flag installed plugs by tying flagging to a stick, and then place the stick into the ground near the installed plant.



For more information on planting live stakes, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/TRAINING-VIDEOS/ and watch the live staking 101 video

Phase 3

Plant Establishment

Phase 3 focuses on native plant establishment. Sites are weeded, mulched, and watered as needed. Some sites may stay in Phase 3 for several years to manage invasive plant regrowth and wait for new plantings to grow.

Most plants require at least three years of establishment care to ensure plant survival. Volunteers can do a lot to ensure plantings survive and thrive in their first years, including: replenishing mulch rings, watering, removing invasive plants, and supplemental planting or plant replacement (if needed). Remember that not all plants are expected to survive, which is accounted for in your planting plan density. Establishment is going well if you have at least 80% survival.

Watering

We tend to not water our restoration sites due to access or practicality. Connecting to an existing irrigation system or installing a temporary gravity-fed cistern may be a possibility, however, depending on your site location and conditions. Volunteers also may transport water from the nearest source with buckets or watering cans. Coordinate with your Green City staff before planting to discuss irrigation options.

Ideally, you want to saturate each plant with two gallons of water every few weeks, from June through September, for the first two years after planting.

Pruning

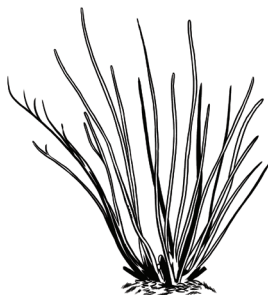
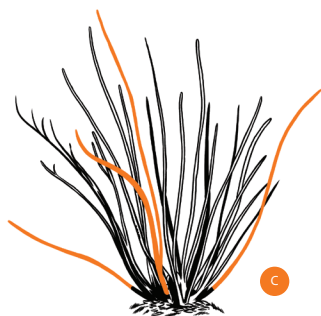
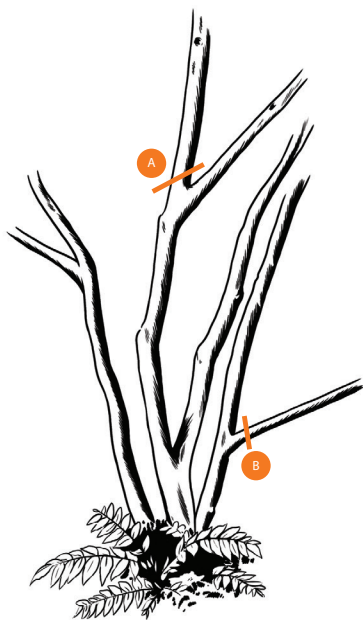
Restoration sites may need some tweaking as time progresses. Pruning can help tame plants installed in a less-than-ideal site, and can help make room for slower-growing conifers. Avoid shearing and heading cuts along trail sides, as they promote dense hedges that are incompatible with CPTED principles. For more information on CPTED principles, turn to page 32–34.

Managing Impacts from Animals

Animals may browse, rub or otherwise damage new plantings installed in their habitat. Deer, rabbits, beaver, mountain beaver, elk, voles and humans can cause enough damage to impact the establishment of your new plantings.

Potential signs of animal related damage include sharp angled cuts on stems, ripped/torn branches and leaves, stripped bark, and/or teeth marks on stems/roots. Fencing, tubes or other deterrents may be needed to protect the plantings and to help establishment.

Contact your Green Cities staff if you see signs of animal damage to explore potential options.



REDUCTION & REMOVAL CUTS

Removal and/or Relocation

Remove plants that are too large, cannot be fixed by pruning, or have growth habits that are incompatible with the trailside. Native plants, including seedlings of large plants that crop up, can be transplanted to a better location during the dormant (winter) season.

A light, late summer pruning (mid-July to September) results in a more desirable, subdued growth response. Be sure to not prune more than one-quarter of living plant. Two types of pruning cuts are “reduction” and “removal”:

- Reduction cuts shorten the length of a stem by cutting to a lateral branch large enough to serve as the new, shorter leader. Choose a lateral branch that is at least one-third the diameter of the main stem (See above, A).

- Removal cuts remove an entire branch at its point of attachment. These cuts are made at the branch collar on trees and larger shrubs (B), and down to the root crown for multi-stem shrubs and cane plants (C).

Releasing Conifers

Utilizing reduction or removal cuts, prune back native plants 5 feet from around smaller conifer trees to allow for greater light and airflow.

Tree Pruning

If medium to larger trees already are growing into the trail, or will soon, prune lower branches to create overhead clearance. This is best done when branches are less than 2 inches in diameter. Place cuts at the branch collar and don't leave stubs. Cut branches all the way around the trunk — prune even those sides not growing into the trail. The remaining branch area after pruning should cover at least two-thirds of the total height of the tree.

Phase 4

Long-term Stewardship and Maintenance

Phase 4 focuses on long-term stewardship and maintenance, which includes monitoring for new populations of invasive plants, social use impacts and other ecosystem health indicators.

After a restoration site has gone through invasive removal and planting, and the trees, shrubs, and groundcover are established, the zone may be a candidate for moving into the fourth and final phase of restoration: Long-term Stewardship and Maintenance. The decision to move a zone into Phase 4 is important because it helps the program shift attention and resources to the next restoration sites.

Green City staff use forest assessment data to evaluate a site's ecological health, along with a field visit to verify on-the-ground conditions. Using values specific to the identified Target Ecosystem, staff can measure how a Green City zone is progressing on seven criteria:

1. Native tree regeneration
2. Regenerating native tree diversity
3. Canopy cover
4. Shrub and groundcover density
5. Shrub and groundcover diversity
6. Invasive cover
7. Woody invasive regeneration

Be in touch with Green City staff if you'd like to nominate your park for Phase 4 verification. Remember, the entire zone must be ready to move into Phase 4 (not just your site), and there must not be any presence of Class A Noxious Weeds (weeds required for control annually, such as garlic mustard). Once your site is in Phase 4, your volunteer tasks and approach to hosting volunteer events may shift. In fact, Phase 4 stewardship and maintenance may occur just once a year and as little as once every five years, depending on your site conditions. We expect Forest Stewards of Phase 4 zones to:

- Sweep through sites looking for new or returning invasive plants. This can be accomplished by coordinating a small or medium volunteer event to search for specific plants that are a problem at the site. Alternatively, you can have volunteers spread out and walk through a site, looking for any and all invasive species. We often see ivy and holly/laurel in the interior of a zone that is seeding

in. Where parks property meets adjacent properties, be on the watch for garden-variety invasives finding their way into the park. This work requires a keen eye for identifying species. Be prepared to share photos or identification cards with volunteers, or plan the event for a small group of experienced volunteers.

- Bring flagging to mark problem areas or to mark specific invasive plants for future treatment. Consider capturing the GPS coordinates (using a map app on a smart phone) and taking photos for easier follow-up and communication with Green City staff.
- Monitor the zone for social-use impacts that need to be addressed through restoration (for example, off-trail hiking).
- Monitor forest health issues, such as pockets of root rot or storm damage.
- Develop planting projects to address these impacts.

OTHER PARK ACTIVITIES

Forest Stewards often are the eyes and ears on the park and notice issues and opportunities that fall outside the purview of Green City forest restoration.

Litter Removal

If restoration work uncovers litter or other garbage, volunteers may collect it. If the garbage isn't a great volume, volunteers are encouraged to dispose of it in trashcans if they are on site. If there are no cans or the collected garbage is of considerable volume, then the garbage should be bagged up. Notify a Green City staff person to arrange for pickup. Place collected bags in a location where staff

can collect it easily, out of sight as much as possible so as to not encourage more dumping.

Trails

Forest Stewards and volunteers are welcome to keep trails free of debris and vegetation. If you or your volunteers are interested in work to install or improve official park trails, contact your Green City staff.

Dealing with Dogs Off-Leash

While it is not your duty as a Forest Steward to regulate off-leash dog use in parks, you may want to consult with your Green City staff if you suspect damage to your restoration site has been caused by off-leash dog use. The following are some techniques to protect the restoration area and should only be implemented in coordination and with approval from your Green City staff:

- Use city approved signs or fencing, when appropriate, to educate and designate areas where dogs are not allowed. Forterra can provide example signs used in other Green Cities by request.



- Lay branches or rocks to designate protected areas and deter access from people and animals. Do so in a way that mimics downed wood and branches. Avoid lining the trail with material that may keep water on the trail tread.
- Consider leaving a temporary buffer of weeds (for example, 3 feet of blackberry) in front of your restoration site to keep dogs out while new plantings are getting established.
- If the problem persists, you can contact your local Animal Control.

Unauthorized Camping in Parks

Leave camps and personal items in place. It is disrespectful and unlawful to remove personal belongings from a park. Do not approach camps, and be mindful of your own personal safety and that of your volunteers.

Please contact your Green City staff to report unauthorized camping in a park. Please include a simple map and photo, and list any potential hazards or other relevant information. Your Green City staff may ask you to submit a formal report through appropriate city or county reporting tools.

Needles and Syringes

Before starting your volunteer event, sweep your work site for needles, syringes, and other discarded sharp-pointed devices. If you find any, limit access to the area by flagging off the site. Place a pot over the needle or syringe, if possible. Forest stewards and volunteers are discouraged from removing any discarded needles and syringes that you find. Instead, report your findings to the appropriate Green City staff. Staff will arrive to clean up the site as soon as possible.

If you or a volunteer is pricked by a needle during an event, transport yourself or your volunteer to the nearest hospital, and bring the needle. File an accident report as soon as possible with Green City staff.

Inadvertent Discoveries

Be aware that when engaged in any activity that disturbs the soil (planting, grubbing, etc.) you may encounter historic and archaeological artifacts. In order to protect the region's cultural and historical heritage, it's important to consider and be aware of potential cultural resources you may uncover.

Recognizing Cultural Resources

A cultural resource discovery could be prehistoric or historic. Examples include, but are not limited to:

- An accumulation of shells, burned rocks or other food related materials
- Bones or small pieces of bone
- An area of charcoal or very dark stained soil with artifacts
- Stone tools or waste flakes (an arrow-head or stone chips)
- Clusters of tin cans or bottles, logging or agricultural equipment that appears to be older than 50 years
- Buried railroad tracks, decking or other industrial materials

When in doubt, assume material is a cultural resource. If you believe you have made an inadvertent discovery, on-site responsibilities include:

1. Stop work. If you believe you or another volunteer have uncovered a cultural resource, stop all work immediately, leave any objects exactly where you found them, and avoid and prevent any further disturbance at the discovery location.
2. If human remains are encountered, treat them with dignity and respect at all times. Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection in place and to shield them from being photographed. Call 911 or the coroner's office.
3. Notify a City official immediately. If you reach a voicemail, leave your name, a contact number, and describe what you found and where you found it. Be as specific as possible to the location. Leave any objects exactly where you found them and remember where they are in case you need to lead a city official to its location.
4. Once the City is notified, further provisions kick into place at the city and state level. Try to find another location to continue the restoration event that is not at or adjacent to the discovery site.

Appendix A

GREEN CITIES GROUND RULES: A QUICK REFERENCE

- Green City staff must be notified before you begin forest restoration work in any city park.
- Volunteers are restricted from using power tools at restoration sites.
- Volunteers are restricted from working on steep slopes. Green City staff will coordinate all slope work, using professional crews.
- Wet slopes with seeps or perched wetlands present specific challenges, including an increased likelihood of soil erosion and the possibility of more deep-seated stability problems. Green City staff will help determine if wet slopes in areas that are not steep are appropriate for volunteers or if they will need professional crew attention.
- Bare soils susceptible to erosion should be covered within five days.
- Volunteers should never clean-up unauthorized camps that they encounter within a park. They also should never move personal belongings from a campsite, or pick up discarded needles, syringes, or other sharp-pointed devices from a work site.

Appendix B

UNDERSTANDING SOIL

Soil quality is an important consideration in restoration plantings, especially in urban habitats where there can be significant disturbance. Before finalizing your planting plan, dig in and get familiar with the beneath-ground soils at your site.

Analyzing soil texture — the distribution of different sized particles — is key to understanding the capacity of a soil to hold and supply water and nutrients to a plant.

SANDS are the largest particles and make for well-aerated and well-drained soil that consequently has poor water- and nutrient-holding capacities.

CLAYS are the smallest particles and have slow drainage and poor aeration, but high water- and nutrient-holding capacities.

SILT PARTICLES fall between sands and clays in size, and also in their capacity to hold nutrients and moisture.

LOAM refers to a soil that has half as much clay as sand or silt, making for a well-structured soil with ideal pore space and surface area to hold water and nutrients.

Soil Texture Field Analysis

Select a soil sample from the rooting zone (between 4 and 8 inches deep). Place the soil in the palm of your hand, add water, and knead until the soil is like moist putty. When you squeeze it, see if the soil remains in a ball. If not, add more water or soil to get the correct consistency. If your soil still will not remain in a ball, it is sand.

If your soil is not sand, place your soil ball between your thumb and forefinger. Push the soil upward into a ribbon shape with uniform depth of about $\frac{1}{8}$ of an inch. Let it break under its own weight. Does the soil form a ribbon? If yes, use the chart on page 73 to identify your soil. If your soil did not form a ribbon, it is loamy sand.

The results of your soil texture field analysis will help determine your best options for plant installation and management practices. Consider the following:

- Knowing your soil texture will change your approach to moisture management during dry summer months. Sandy soils drain quickly, so supplemental irrigation should be applied more frequently at decreased amounts. Irrigation may be unnecessary for clay or clay loam soils.
- Organic amendments such as mulch rings can improve the water-holding capacity of sandy soils by decreasing evaporation

Field Analysis	Forms a weak ribbon of less than 1 inch	Forms a ribbon 1–2 inches before breaking	Forms a ribbon 2 inches or longer before breaking
Feels gritty?	<ul style="list-style-type: none"> • Sandy • Loam 	<ul style="list-style-type: none"> • Sandy • Clay • Loam 	<ul style="list-style-type: none"> • Sandy • Clay
Feels equally gritty and smooth?	<ul style="list-style-type: none"> • Loam 	<ul style="list-style-type: none"> • Clay • Loam 	<ul style="list-style-type: none"> • Clay
Feels very smooth?	<ul style="list-style-type: none"> • Silt • Loam 	<ul style="list-style-type: none"> • Silky • Clay • Loam 	<ul style="list-style-type: none"> • Silky • Clay

and improving soil structure as the mulch decomposes.

- Soil amendments, however, can be expensive and logistically impossible to apply at many sites. Often, your best option is to select the right plant species for the existing soil conditions. For sandy soils with no natural seeps, select plants that establish roots quickly and can tolerate drought. Slow-draining soils heavy in clay are prime for plant species that can tolerate anaerobic conditions common in saturated soils.
- Clay soils can have adequate organic content, providing for a combination of good moisture-holding capacity and a structure that allows for drainage and aeration.
- At sites where plant establishment has proven to be difficult, you may consider sending a soil sample to a testing lab such as the Washington State University Extension or King Conservation District.

Appendix C

CALCULATING MULCH NEEDS

CALCULATING CUBIC YARDS

1 cubic yard = 27 cubic feet.

To convert cubic feet to cubic yards:

$$\begin{aligned} & \text{number of cubic feet} \\ & \div 27 \text{ cubic feet} \\ & = \text{number of cubic yards} \end{aligned}$$

Example

You have an area of 1,000 square feet and you want to cover it with four inches (0.33 feet) of mulch. $1,000 \text{ square feet} \times 0.33 \text{ feet (depth of the mulch)} = 330 \text{ cubic feet}$.

$$\begin{aligned} & 330 \text{ cubic feet} \\ & \div 27 \text{ cubic feet} \\ & = 12.2 \text{ cubic yards} \end{aligned}$$

Each plant should receive two 5-gallon buckets of mulch to create the mulch ring after a plant is newly installed, which is about 1.25 cubic feet of mulch per plant. For 1 yard of mulch, you should be able to mulch 20 to 25 plants.

For reporting mulch rings on a work log, estimate 4 square feet per mulch ring. Example: 10 plants would be 40 square feet, or 50 plants would be 200 square feet.

MULCH DEPTH

Use this table to determine the total number of yards that you need, based on your area's square footage and desired depth.

Square Feet	Depth 3 in.	Depth 4 in.	Depth 5 in.	Depth 6 in.	Depth 7 in.	Depth 8 in.
100	1	1 1/4	1 1/2	2	2 1/4	2 1/2
150	1 1/2	2	2 1/2	2 3/4	3 1/4	3 3/4
200	2	2 1/2	3	3 3/4	4 1/2	5
250	2 1/2	3	4	4 3/4	5 1/2	6 1/4
300	2 3/4	3 3/4	4 3/4	5 1/2	6 1/2	7 1/2
350	3 1/4	4 1/2	5 1/2	6 1/2	7 3/4	8 3/4
400	3 3/4	5	6 1/4	7 1/2	8 3/4	10
450	4 1/4	5 3/4	7	8 1/2	9 3/4	11 1/4
500	4 3/4	6 1/4	7 3/4	9 1/4	10 3/4	12 1/2
600	5 3/4	7 1/2	9 1/4	11 3/4	13	15
700	6 1/2	8 3/4	11	13	15 1/4	17 1/4
800	7 1/2	10	12 1/2	15	17 1/2	20
900	8 1/2	11 1/4	14	16 3/4	19 1/2	22 1/4
1,000	9 1/2	12 1/2	15 1/2	18 1/2	21 3/4	24 3/4
2,000	18 1/2	24 3/4	31	37	43 1/4	49 1/2

Converting Square Feet into Acres

1 acre = 43,560 square feet (1 acre measures 208.71 feet × 208.71 feet)

Example: You have a restoration area that is 7,850 square feet.

$$\begin{aligned}
 &7,850 \text{ square feet} \\
 &\div 43,560 \text{ square feet} \\
 &= 0.18 \text{ acres}
 \end{aligned}$$

Appendix D

TIPS FOR CREATING TOOL LISTS

When planning for your event, estimate about one or one-and-a-half hand tools per expected volunteer (not including buckets, wheelbarrows, tarps, etc.).

Volunteers can share or trade tools as needed, so you do not need all of the different tools for each volunteer.

Please note that the preferred tool for a job varies among volunteers. The following suggestions are based on what tools are most readily available.

All Restoration Activities

- Gloves (make sure you have enough for each volunteer)
- Garbage bags

Invasive Plant Removal

- Hand tillers and/or mini-mattocks (for digging out small roots)
- Loppers (for all-purpose cutting)
- Hand pruners (for cutting smaller invasive plants)
- Folding hand saw (for cutting ivy vines from trees)
- Digging shovels (for digging out blackberry roots)
- Tarps (for carrying piles of invasive plants)
- Hard rake (for moving piles of invasive plants)
- Pullerbear™ (for removing Scotch Broom and small invasive trees)

Mulching

- Buckets (for moving mulch or gravel)
- Pitchfork
- Wheelbarrow
- Hard rake (for spreading mulch)

Planting

- Digging shovels
- Hand trowels (for smaller four-inch plants)
- Utility knife/industrial scissors (for cutting through burlap)

Other Available Tools and Materials

- Push broom (for sweeping paved surfaces)
- Leaf rake (for keeping trails free of debris)
- Litter picker-uppers
- Sani-cans (for larger events)
- Mulch
- Buckets for carrying tools

Example

For a 20-volunteer event involving the removal of English ivy and some blackberries, you would need the following tools:

- 8 loppers
- 8 hand tillers
- 5 hand pruners
- 2 folding hand saws
- 3 shovels
- 2 tarps
- 25 sets of gloves
- 3 buckets (for carrying tools)
- 2 tarps

Tips for keeping track of your tools

- Count your tools before you start working.
- Keep tools in a central location at the work site when they are not in use.
- Collect and count tools when breaking for snacks or lunch.
- Assign one of your volunteers to sort and count tools at the end of the day before volunteers leave. If there are tools missing, have everyone go back and look together.
- Tie brightly colored flagging tape to small tools such as hand pruners and folding saws.
- Sweep through the site as people are working to look for abandoned tools.
- Make sure people don't forget to return their gloves neatly rolled together.

Caring for tools and onsite storage

- Have volunteers clean off their own tools to make it easier for event leaders.
- Use tool brushes, grass, and/or puddles to clean tools.
- If tools dull or break, notify Green City staff to get a sharpener or replacement tool.
- Don't over stuff your tool storage. If needed, notify Green City staff to have tools removed.
- Don't store treats or snacks in jobboxes, as they invite mice.

Appendix E

ESTIMATING SQUARE FOOTAGE

Use your average stride as a measuring tool for estimating distance.

You can determine your average stride by counting how many strides it takes you to travel 100 feet. One stride is the equivalent of two steps, with each foot forward counting as one step. Take an average of two stride counts at 100 feet to determine your average.

Example

Ann counts her strides for 100 feet two times. The first time, she counts 20.5 strides. The second time, she counts 19.5. Therefore, Ann's average number of strides for traveling 100 feet is 20, or 5 feet per stride.

$$\begin{aligned} & 100 \text{ feet} \\ & \div 20 \text{ strides} \\ & = 5 \text{ feet per stride} \end{aligned}$$

So for every stride Ann takes, she can measure 5 feet.

Use your personal average stride calculation to measure the square-foot dimensions of your restoration area, which you will need to estimate for work log reporting.

Square footage area is calculated by multiplying length by width (Length \times Width = Area).



For more information on estimating square footage, visit GREENSEATTLE.ORG/INFORMATION-FOR/FOREST-STEWARD-RESOURCES/TRAINING-VIDEOS/ and watch the measuring restoration areas video

Appendix F

WET AREA DECISION TREE

It's important to be able to answer the question: Does my site have a wetland or wet area?

Answer the questions below, starting with question 1. If you get to a green box, move to the next question. If you land on an orange box, you have a wetland. A black box indicates that you have upland site. Throughout the Field Guide, there are special considerations and schedules specific to working in wet areas.

1 What season is it?

Dry
mid-June to
mid-November

Wet
mid-November
to mid-June

2 Is the soil surface glistening or is there standing water?

Yes

Wetland

No

3 What plants are present at your site?

Group 1

- skunk cabbage
- sedge species
- yellow flag iris
- watercress
- water parsely
- purple loosestrife

Wetland

Group 2

- black cottonwood
- red alder
- western red cedar
- salmonberry
- Oregon ash
- lady fern
- willow species
- red twig dogwood
- black twinberry
- hardhack
- reed
- canarygrass
- creeping buttercup
- large-leaved avens

Neither

Upland

4 Dig down 12 inches. Is the soil glistening or is there water?

Yes

Wetland

No

Upland

Appendix G

NATIVE PLANT LIST

Species Code	Botanic Name	Common Name	Growth Form	Life History	Flowering Period	Average Soil Moisture Regime	Shade Tolerance
ABGR	<i>Abies grandis</i>	grand fir	tree	perennial	May–Jun	dry–moist	sun–shade
ACCI	<i>Acer circinatum</i>	vine maple	shrub	perennial	Mar–Jun	dry–moist	part shade–shade
ACMA	<i>Acer macrophyllum</i>	bigleaf maple	tree	perennial	Mar–Jun	dry–moist	dry–moist
ACMI	<i>Achillea millefolium</i> var. <i>occidentalis</i>	yarrow	forb	perennial	July–Sep	dry–moist	sun–part shade
ACTI	<i>Achlys triphylla</i>	vanilla leaf	forb	perennial	Apr–July	dry–moist	part shade–shade
ADBI	<i>Adenocaulon bicolor</i>	pathfinder	forb	perennial	Jun–Oct	moist	moist shaded
ADAL	<i>Adiantum aleuticum</i>	Western maidenhair fern	fern	perennial		moist–wet	part shade–shade
ALCE	<i>Allium cernuum</i> var. <i>obtusum</i>	nodding onion	forb	perennial	July–Aug	dry–moist	sun
ALRU	<i>Alnus rubra</i>	red alder	tree	perennial	Mar–Apr	dry–wet	sun–part shade
AMAL	<i>Amelanchier alnifolia</i>	serviceberry, saskatoon	shrub	perennial	Apr–Jun	dry–moist	shade-tolerant/intolerant
ARME	<i>Arbutus menziesii</i>	arbutus, madrone, madrona	tree	perennial	Apr–May	dry	shade-tolerant/intolerant
ARDI	<i>Aruncus dioicus</i> var. <i>acuminatus</i>	goatsbeard	forb	perennial	May–July	moist	sun–part shade
ASCA	<i>Asarum caudatum</i>	wild ginger	forb	perennial	Apr–July	moist	part shade–shade
ASSU	<i>Aster subspicatus</i>	Douglas aster	forb	perennial	July–Oct	dry	Wet-moist
ATFI	<i>Athyrium filix-femina</i>	lady-fern	fern	perennial		moist–wet	sun–shade
BEAQ	<i>Berberis aquifolium</i>	tall Oregon grape	shrub	perennial	Mar–Jun	dry–moist	shade-tolerant/intolerant
BENE	<i>Berberis nervosa</i>	dull/Cascade Oregon-grape	shrub	perennial	Apr–Jun	dry–moist	shade-tolerant/intolerant
BLSP	<i>Blechnum spicant</i>	deerfern	fern	perennial		dry–wet	part shade–shade
CAQU	<i>Camassia quamash</i>	common camas	forb	perennial	Apr–Jun	dry–moist	shade-intolerant
CASC	<i>Campanula scouleri</i>	Scouler's bellflower	forb	perennial		dry–moist	sun–part shade
CADE	<i>Carex densa</i>	dense sedge	grass	perennial		moist–wet	

Species Code	Botanic Name	Common Name	Growth Form	Life History	Flowering Period	Average Soil Moisture Regime	Shade Tolerance
CADE	<i>Carex deweyana</i> var. <i>deweyana</i>	Dewey's sedge	grass	perennial		dry-wet	sun-shade
CAME	<i>Carex mertensii</i>	Merten's sedge	grass	perennial		moist-wet	
CAOB	<i>Carex obnupta</i>	slough sedge	grass	perennial		moist-wet	sun-part shade
CAPA	<i>Carex pachystachys</i>	thick-headed sedge	grass	perennial		moist-wet	
CIAL	<i>Circaea alpina</i> ssp. <i>pacifica</i>	enchanter's nightshade	forb	perennial	May-Jun	dry-moist	sun-part shade
CONU	<i>Cornus nuttallii</i>	Pacific dogwood	tree	perennial	Apr-May	dry-moist	part shade
COSE	<i>Cornus sericea</i>	Red-osier dogwood	shrub	perennial	Jun-Aug	moist-wet	sun-shade
COUN	<i>Cornus unalaschensis</i>	western bunchberry	forb	perennial	May-Jun	moist-wet	part shade-shade
COCO	<i>Corylus cornuta</i> var. <i>californica</i>	beaked hazelnut	shrub	perennial	Feb-Mar	dry-moist	sun-shade
CRDO	<i>Crataegus douglasii</i>	black hawthorn	tree	perennial	Apr-May	moist-wet	sun-part shade
DECE	<i>Deschampsia cespitosa</i>	tufted hairgrass	grass	perennial	Jun	dry-wet	sun-part shade
DIFO	<i>Dicentra formosa</i> ssp. <i>formosa</i>	Pacific bleedingheart	forb	perennial	Apr-May	dry-moist	part shade-shade
DREX	<i>Dryopteris expansa</i>	spreading woodfern	fern	perennial	NA	moist	sun-shade
ERSP	<i>Erigeron speciosus</i>	showy fleabane	forb	perennial		dry-moist	sun-part shade
EROR	<i>Erythronium oregonum</i> var. <i>oreganum</i>	Oregon fawnlily	forb	perennial	Apr-May	dry	shade-part shade
FEOC	<i>Festuca occidentalis</i>	western fescue	grass	perennial	Jun	dry-moist	part shade
FERO	<i>Festuca roemerii</i>	Roemer's fescue	grass	perennial	May-July	dry-moist	shade-tolerant/intolerant
FRVE	<i>Fragaria vesca</i> ssp. <i>bracteata</i>	wood's strawberry	forb	perennial	Apr-Jun	dry-moist	shade-tolerant/intolerant
FRLA	<i>Fraxinus latifolia</i>	Oregon ash	tree	perennial	Apr-May	moist-wet	sun-part shade
GASH	<i>Gaultheria shallon</i>	salal	shrub	perennial	Apr-May	dry-moist	part shade-shade
GEMA	<i>Geum macrophyllum</i>	large-leaved avens	forb	perennial	May-Jun	moist-wet	sun-part shade
GLEL	<i>Glyeria elata</i>	tall managras	grass	perennial	May-July	moist-wet	sun-full sun
GRIN	<i>Grindelia integrifolia</i>	entire-leaved gumweed	forb	perennial	Jun	moist	sun-full sun
HODI	<i>Holodiscus discolor</i>	oceanspray	shrub	perennial	May-Jun	dry-moist	sun-shade
HYTE	<i>Hydrophyllum tenuipes</i>	slender-stem waterleaf	forb	perennial	Apr-May	moist-wet	part shade-shade
IRTE	<i>Iris tenax</i>	Oregon iris	forb	perennial	May-Jun	moist-wet	sun-part shade

Species Code	Botanic Name	Common Name	Growth Form	Life History	Flowering Period	Average Soil Moisture Regime	Shade Tolerance
LOCI	Lonicera ciliosa	orange honeysuckle	vine	perennial	May–Jun	moist	part shade–shade
LOHI	Lonicera hispidula	hairy honeysuckle	vine	perennial	May–July	dry–moist	sun–part shade
LOIN	Lonicera involucrata var. involucrata	black twinberry	shrub	perennial	Apr–July	moist–wet	sun–shade
LYAM	Lysichiton americanus	skunkcabbage	forb	perennial	Mar–May	wet	part shade–shade
MADI	Maianthemum dilatatum	false lily-of-the-valley	forb	perennial	Apr–Jun	moist	sun–shade
MARA	Maianthemum racemosum ssp. amplexicaule	large false Solomon's seal	forb	perennial	May–Jun	moist	Part sun–Shade
MYCA	Malus fusca	Pacific crabapple	tree	perennial	May–Jun	moist–wet	sun–part shade
MYCA	Myrica californica	Pacific wax myrtle	shrub	perennial	May–Jun	dry–moist	sun–part shade
MYGA	Myrica gale	Sweet gale	shrub	perennial	NA	moist–wet	sun–part shade
OECE	Oemleria cerasiformis	Indian plum	shrub	perennial	Feb–Apr	dry–moist	part shade–shade
OXOR	Oxalis oregana	redwood sorrel	forb	perennial	Apr–Sep	dry–moist	part shade–shade
PEOV	Penstemon ovatus	broad-leaved penstemon	forb	perennial	Jun–Aug	dry–moist	sun–part shade
PEFR	Petasites frigidus	coltsfoot	Forb	perennial	Feb–Mar	moist–wet	sun–shade
PHLE	Philadelphus lewisii	mockorange	shrub	perennial	May–July	dry–moist	sun–part shade
PHCA	Physocarpus capitatus	Pacific ninebark	shrub	perennial	May–Jun	moist–wet	sun–shade
PISI	Picea sitchensis	Sitka spruce	tree	perennial	NA	moist–wet	sun–part shade
PICO	Pinus contorta	shore pine	tree	perennial	NA	dry–wet	sun–part shade
PIMO	Pinus monticola	Western white pine	tree	perennial	NA	dry–moist	sun–part shade
POGL	Polypodium glycyrrhiza	licorice fern	fern	perennial		moist–wet	
POMU	Polystichum munitum	western sword fern	fern	perennial	NA	dry–moist	part shade–shade
PREM	Prunus emarginata var. mollis	bitter cherry	tree	perennial	Apr–Jun	dry–moist	sun–part shade
PSME	Pseudotsuga menziesii ssp. menziesii	Douglas fir	tree	perennial	Mar–May	dry–moist	sun–part shade
PTAQ	Pteridium aquilinum var. pubescens	bracken fern	fern	perennial		dry–moist	
QUGA	Quercus garryana	Garry oak, Oregon white oak	tree	perennial	Apr	dry	sun–part shade
RHPU	Rhamnus purshiana	cascara	tree	perennial	Apr–May	dry–wet	sun–shade
RHMA	Rhododendron macrophyllum	Pacific rhododendron	shrub	perennial	May–July	dry–moist	part shade–shade

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RILA	Ribes lacustre	swamp currant	shrub	perennial	Apr–May	moist–wet	sun–shade
RISA	Ribes sanguineum var. sanguineum	red-flowering currant	shrub	perennial	Feb–Apr	dry–moist	sun–part shade
ROGY	Rosa gymnocarpa	balldhip rose	shrub	perennial	May–Jun	dry–wet	sun–shade
RONU	Rosa nutkana	nootka rose	shrub	perennial	May–Jun	moist–wet	sun–part shade
ROPI	Rosa pisocarpa	clustered wild rose	shrub	perennial	May–July	moist–wet	sun–shade
RUPA	Rubus parviflorus	thimbleberry	shrub	perennial	May–July	dry–moist	sun–shade
RUSP	Rubus spectabilis	salmonberry	shrub	perennial	Mar–Jun	moist–wet	sun–shade
RUUR	Rubus ursinus	trailing blackberry	shrub	perennial	Apr–Aug	dry–moist	sun–shade
SAHO	Salix hookeriana	Hooker's willow	tree	perennial		moist–wet	sun
SALU	Salix lucida	Pacific willow	shrub	perennial	Apr–May	moist–wet	sun–part shade
SASC	Salix scouleriana	Scouler's willow	tree	perennial	Apr–May	moist–wet	sun–part shade
SARA	Sambucus racemosa var. racemosa	red elderberry	shrub	perennial	May–July	dry–moist	sun–shade
SCAC	Scripus acutus	hardstem bulrush	grass	perennial	Apr–May	wet	sun
SCMI	Scripus microcarpus	panicked bulrush	grass	perennial	May–Jun	wet	sun–part shade
SIKE	Sidalcea kendrsonii	checker mallow	forb	perennial	Jun–Aug	moist–wet	sun
SOCA	Solidago canadensis	Canada goldenrod	forb	perennial	Jun–Sep	dry–moist	sun–part shade
SPDO	Spirea douglasii	hardhack	shrub	perennial	May–July	moist–wet	sun–part shade
SYAL	Symphoricarpos albus var. laevigatus	common snowberry	shrub	perennial	May–Aug	dry–moist	sun–shade
TABR	Taxus brevifolia	Western yew	tree	perennial	NA	dry–moist	part shade–shade
TEGR	Tellima grandiflora	fringecup	forb	perennial	Apr–July	moist	part shade–shade
THPL	Thuja plicata	Western redcedar	tree	perennial	NA	moist–wet	part shade–shade
TITR	Tiarella trifoliata var. trifoliata	threeleaf foamflower	forb	perennial	May–Aug	moist	part shade–shade
TOME	Tolmiea menziesii	youth-on-age	forb	perennial	May–Aug	dry–moist	part shade–shade
TROV	Trillium ovatum ssp. ovatum	western trillium	forb	perennial	Mar–May	dry–moist	part shade–shade
VAOV	Vaccinium ovatum	evergreen huckleberry	shrub	perennial	Apr–July	dry–moist	part shade–shade
VAPA	Vaccinium parvifolium	red huckleberry	shrub	perennial	Mar–May	dry–moist	part shade–shade

WOODY INVASIVE PLANT LIST

Botanic Name	Common Name	Growth Form
Acer campestre	Hedge Maple	tree
Acer platanoides	Norway Maple	tree
Acer pseudoplatanus	Sycamore Maple	tree
Aesculus hippocastanum	Horse Chestnut	tree
Buddleia davidii	Butterfly bush	shrub/tree
Clematis vitalba	Traveler's Joy	shrub
Cotoneaster spp.	Cotoneaster	shrub
Crataegus monogyna	English Hawthorne	tree
Cytisus scoparius	Scotch Broom	shrub
Ilex aquifolium	English Holly	shrub/tree
Laburnum anagyroides	Golden Chain Tree	tree
Ligustrum sinense	Chinese Privet	forb
Populus alba	Silver Poplar	forb
Populus nigra	Black Poplar, Lombardy Poplar	forb
Prunus domestica	Domestic Cherry	tree
Prunus spinosa	Sloe	tree
Prunus avium	Wild Cherry	tree
Prunus cerasifera	Thundercloud Plum	tree
Prunus laurocerasus	Cherry Laurel, English Laurel	shrub/tree
Prunus lusitanica	Portuguese Laurel	shrub/tree
Pyracantha spp.	Firethorn	shrub
Robinia pseudoacacia	Black Locust	tree

Botanic Name	Common Name	Growth Form
Sorbus acuparia	Mountain Ash	tree
Tamarix ramosissima	Saltcedar	tree
Ulex europaeus	Gorse	shrub
Ulmus parvifolio	Chinese Elm	tree
Ulmus procera	English Elm	tree
Ulmus pumila	Siberian Elm	tree

My Park's Plants

Record invasive and native plants present in your restoration site and any notes on quantity or percent cover.

IMPORTANT NUMBERS

