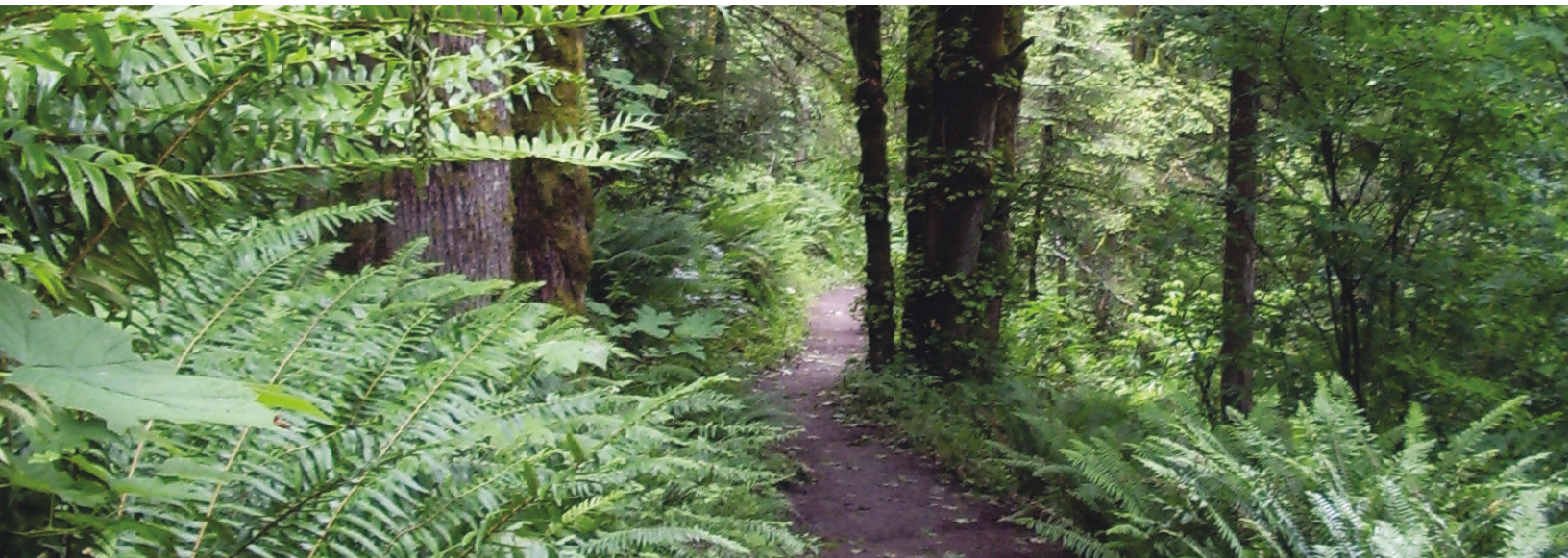
# APPENDIX A.
# CITY OF PORTLAND

## *2008 Invasive Plants Strategy* Audit

*Audit prepared for the City of Portland by*

Creative Resource Strategies



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*"Savvy states and communities are starting to think about green space in a more thoughtful and systematic way. They realize that green infrastructure is not a frill—it is smart conservation for the twenty-first century."*

-Mark A. Benedict and Edward T. McMahon, Conservation Fund

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# Executive Summary

The City of Portland Bureau of Environmental Services initiated an effort in early 2018 to audit and revise its *2008 Invasive Plants Strategy,* which resulted in substantial changes to city policy, code, management of natural areas, developed parks, hybrid parks, other city properties, and streets. The strategy identified regional capacity for managing invasive plants and made recommendations for implementation, including cost estimates and 10-year goals.

The city sought to review the *2008 Invasive Plants Strategy* and develop *Invasives 2.0,* a new strategy that addresses key gaps, builds on lessons learned, incorporates updated best management practices based on emerging science and technology, and articulates a cohesive, coordinated, collaborative effort across all city bureaus.

The audit included a review of the city's management plans and policies, an assessment of the status of actions completed since 2008, a survey and interviews with city employees, a survey of external stakeholders, and an assessment of pathways of invasive species introduction with the National Sea Grant Law Center. The audit incorporates a 10-year retrospective that documents key program accomplishments as well as key gaps and shortcomings identified through strategy implementation.

**Key areas of emphasis for *Invasives 2.0* include:**

- Adequate funding and resources to achieve priority actions;
- Development of performance metrics to assess progress in delivering on natural resource services on city-owned properties;
- Use of a comprehensive database to track and share invasive species information;
- Implementation of monitoring programs to assess the outcomes of invasive species treatments;
- Creation of a comprehensive communications strategy;
- Expansion of the current plant-focused program to incorporate a multi-taxa approach to address priority pathways of introduction;

- Achievement of consensus on the philosophy and approaches to city management of invasive species;
- Enhanced regulations to address pathways of introduction;
- Improved approaches to addressing eradication of invasive species on private land and incentives for voluntary cooperation by property owners;
- The development and implementation of rapid response plans and prevention strategies for high priority pathways and species;
- Incorporation of invasive species principles and actions in city management plans; and
- Adoption of invasive species best management practices by city staff.

In addition, *Invasives 2.0* should encourage or require the use of appropriate native vegetation on landscaped areas and encourage the protection of existing appropriate ecosystem function and services; fully protect and promote native ecosystems, particularly native species appropriate to a particular soil, topography, and hydrology of a site; provide adequate protections for threatened, endangered, and rare species; and result in the management of Portland's natural resource assets using an integrated multi-jurisdictional approach.

# Progress Made Achieving *2008 Invasive Plants Strategy* Goals

Major milestones were achieved implementing the *2008 Invasive Plants Strategy*, ranging from adoption of management plans and the launch of key initiatives, such as *Grey to Green,* to new policies and ordinances and updated plant lists *(Figure 1).*

The *2008 Invasive Plants Strategy* described a set of 10-year goals to advance invasive species plant prevention and control efforts in Portland. The milestones in Figure 1 describe key events to advance the strategy during the past 13 years.

The following are the four goals described in the *2008 Invasive Plants Strategy* and a description of the progress made in achieving those goals. Some objectives, after further analysis and implementation efforts, were deemed either inefficient in practice, or outside the scope of existing city programs to either complete, or to incorporate into *Invasives 2.0.*

## Goal 1. Program Development

**10-year objectives:**

- Implement code changes to improve invasive plant management.
- Develop desired future conditions for all natural areas and hybrid parks.
- Develop habitat management plans for 15 natural areas and hybrid parks.
- Secure adequate funding for invasives program.

Of the 14 3-year work plan actions (sidebar), a total of 7 were completed, 4 were partially completed and 3 were not completed. In addition, one of the actions that was completed prior to 2018, which included funding for the Portland Parks & Recreation (PP&R) *Protect the Best Program*, is no longer complete because of an overall $300,000 reduction in funding to that program since 2014.

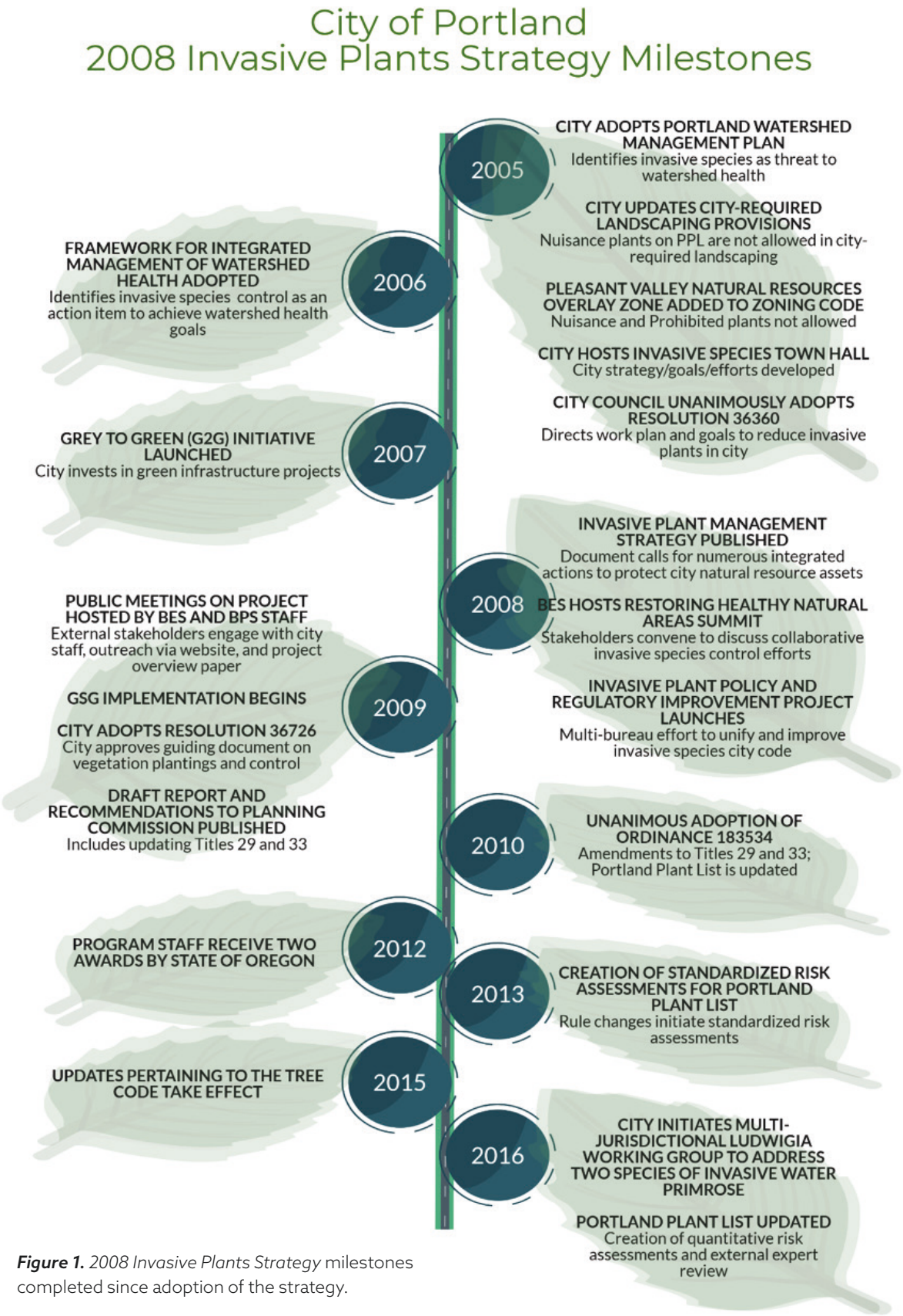



***Figure 1.*** *2008 Invasive Plants Strategy* milestones completed since adoption of the strategy.

## Goal 1: Three-year work plan actions

COMPLETED

- Incorporate invasive plant management into the Portland Plan (formerly the Comprehensive Plan).
- Incorporate invasive plant management into the PWMP update.
- Update city's nuisance and prohibited plant lists to include distribution and invasion potential.
- Ensure that recommended plant species are consistent in all city plant lists.
- Investigate feasibility of a local or regional weed law requiring private landowners to control new aggressive infestations.
- Evaluate potential ecological benefits, feasibility and costs of code changes requiring invasive plant removal in conjunction with development, redevelopment, and outdoor vegetation management requirements.
- Seek funding for Operations maintenance horticulturalist, Water Bureau invasive species coordinator, BDS and BES staff, EDRR program, outreach, and Protect the Best Program.

PARTIALLY COMPLETED

- Modify Greenway code to exempt herbicide application, when consistent with PP&R's IPM program, from Land Use Review in Greenway Zone overlay.
- PP&R to develop desired future conditions for natural areas and hybrid parks.
- PP&R to develop habitat management plans for 1–2 natural areas and hybrid parks per year.
- Secure ongoing funding for the EDRR program, Protect the Best program, and Wildfire Risk Reduction program.

INCOMPLETE

- Incorporate invasive plant management into the Action Plan update.
- Develop citywide 4(d) rule exemption for vegetation management, similar to PP&R's IPM Program exemption.
- Evaluate city's program for cleaning equipment to prevent spread and new introductions.

During the past 18 years, Portland has bolstered the efforts of the city to address invasive species via numerous ordinances and resolutions (Appendix A-1).

**Actions not fully achieved:**

- The Action Plan update did not incorporate invasive plant management. The new iteration of the Management Plan, scheduled for 2019, will incorporate invasive species issues.
- Best management practices for cleaning equipment were not fully developed, adopted, and implemented.
- The Greenway Code was not fully modified to allow for herbicide application exemption (note: this action did not occur because it would have put the TMDL program at risk).
- Level of services were not developed for all natural areas and hybrid parks.
- Habitat management plans were not developed for 1–2 natural areas and hybrid parks annually.
- Adequate funding for the EDRR Program, Protect the Best Program, and Wildfire Risk Reduction Program was not secured. The Protect the Best Program experienced a $300,000 budget reduction since 2014 as a result of a court judgment and corresponding PP&R budget reduction.

## Goal 2. Outreach, Education, and Coordination

**10-year objectives:**

- Develop a media strategy to create a critical mass of informed and motivated citizens.
- Reduce and/or prohibit sales of invasive species in Oregon.
- Coordinate with regional partners.
- Implement an invasive species outreach and education program.

The *2008 Invasive Plants Strategy* included actions to advance invasive plant information and education. A total of 12 of the 17 tasks were completed, four were partially completed, and one was not completed.

The degree to which invasive species communication efforts succeeds depends on the level of engagement and capacity for outreach work, including those

entities for which invasive species is not a primary concern (Lauber et al. 2015). In the case of the City of Portland, numerous bureaus are engaged in invasive species prevention and control activities, however, invasive species are not the primary focus of many of these programs.

For example, the Portland Water Bureau has a primary mission of delivering clean, safe drinking water (City of Portland 2016). Ancillary, but integral to that mission, is protecting the Bull Run watershed from invasive species, which have the capability of interfering with the delivery of clean, safe drinking water. Their development of an invasive species management plan is an acknowledgment by staff of the importance of this issue to their mission.

Numerous pathways of introduction are associated with recreational activities, such as boating, angling, hiking, and gardening/landscaping (Appendix A-4). Outreach messaging is most effective when tailored to specific recreational uses and settings (Sharp et al. 2016). For example, recognition of prevention slogans is significantly and positively associated with performing aquatic invasive species prevention behavior associated with the watercraft pathway (Cole et al. 2016).

The city has been engaged in a variety of invasive species outreach efforts since the adoption of the *2008 Invasive Plants Strategy*, including volunteer and restoration events, classroom instruction, trainings, and a variety of delivery systems used to distribute outreach materials (e.g., mailings, *GardenSmart* (Figure 2), BES City Green Blog). However, outreach metrics among city bureaus have been reported inconsistently on an annual basis.

**Actions not fully achieved:**

- 10 weed removal demonstration sites were not developed in the city.
- An outreach media strategy was neither fully developed nor implemented.
- A stakeholder outreach plan was not developed.
- An assessment of the city's invasive species outreach materials to identify gaps was not completed.
- Visible, successful, invasive species removal projects were not conducted and publicized to a broad audience.

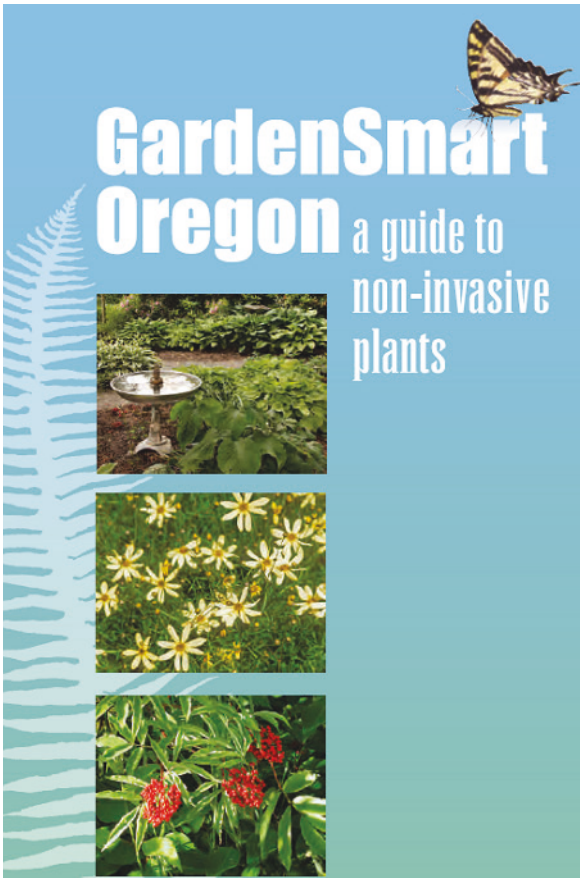



**Figure 2.** *GardenSmart Oregon* was published and distributed by the city to inform gardeners about smart choices for garden plants.

## Goal 2: Three-year work plan actions

### COMPLETED

- Partner with OPB, OISC, 4-County CWMA, ODA, and TNC to provide information about upcoming volunteer efforts, training, and outreach opportunities.
- Work cooperatively with OAN and ODA to enforce existing regulations and develop outreach materials for gardeners.
- Conduct outreach to gardeners to reduce trading of invasive plants and purchasing invasive plants online.
- Participate in quarterly OAN and OISC, and monthly CWMA meetings.
- Coordinate with other agencies, such as ODOT's invasive species coordinator, to obtain research results and project information.
- Work with the SWCDs and other stakeholders to determine how the City can provide additional technical assistance to landowners.
- Target outreach and education toward gardeners and to landowners with property adjacent to City natural areas.
- Add resources to the City's new invasive plant management website, such as a reporting feature.
- Partner with TNC to offer an EDRR workshop.
- Offer invasive plant identification and control methods workshops to city staff, and potentially others.
- Support the expansion of the Backyard Habitat Certification Program.
- Partner with nonprofits to participate in volunteer projects.

### PARTIALLY COMPLETED

- Develop a media strategy to inform the public about the issue and provide solutions and technical assistance for invasive species management.
- Develop a stakeholder outreach plan to help report illegal nursery sales.
- Review City's existing invasive species outreach materials for information gaps, and develop pieces as needed.
- Conduct and publicize visible successful removal projects for natural areas and hybrid parks.
- PP&R to develop habitat management plans for 1–2 natural areas and hybrid parks per year.
- Secure ongoing funding for the EDRR program, Protect the Best program, and Wildfire Risk Reduction program.

### INCOMPLETE

- Establish 10 weed removal demonstration sites within the City of Portland.
- Evaluate city's program for cleaning equipment to prevent spread and new introductions.

## Goal 3. Inventory and Assessment

**10-year objectives:**

- Inventory.
- Develop species-specific management plans on an as-needed basis.
- Prepare annual reports on the accomplishments and continuing efforts implemented by the Invasive Species Strategy.
- Evaluate the need for a city-wide invasive animal strategy.
- Identify research needs for implementing control methods.

Examples of programs with inventories conducted and associated databases that record and spatially display efforts include: Land Stewardship (PP&R), Protect the Best and Youth Conservation Crew, Watershed Revegetation Program (BES), Early Detection Rapid Response (BES), Bull Run watershed road projects (PWB). Some databases are comprehensive, such as the BES Early Detection Rapid Response (EDRR) inventory of 14 species, which informs priority and treatment locations. The Bull Run Watershed Management Unit created a list of 29 terrestrial and aquatic species that threaten the integrity of the city's drinking water sources.

**Action not fully achieved:**

- Species-specific management plans for two species were only partially completed.

## Goal 3: Three-year work plan actions

**COMPLETED**

- Update PP&R inventory data as needed to document coverage changes.
- Document continuing efforts and strategic accomplishments in monthly and annual reports; evaluate the success of the 3-year work plan in 2011.
- Hold invasive animal outbreak session at November 2008 summit.
- Hold breakout session on research needs at November 2008 summit.

**PARTIALLY COMPLETED**

- Develop a database, reporting system, and conduct expert interviews to compile an inventory of the locations of species designated as the highest priority for control (A and B).
- Develop species-specific management plans for garlic mustard and Japanese knotweed.

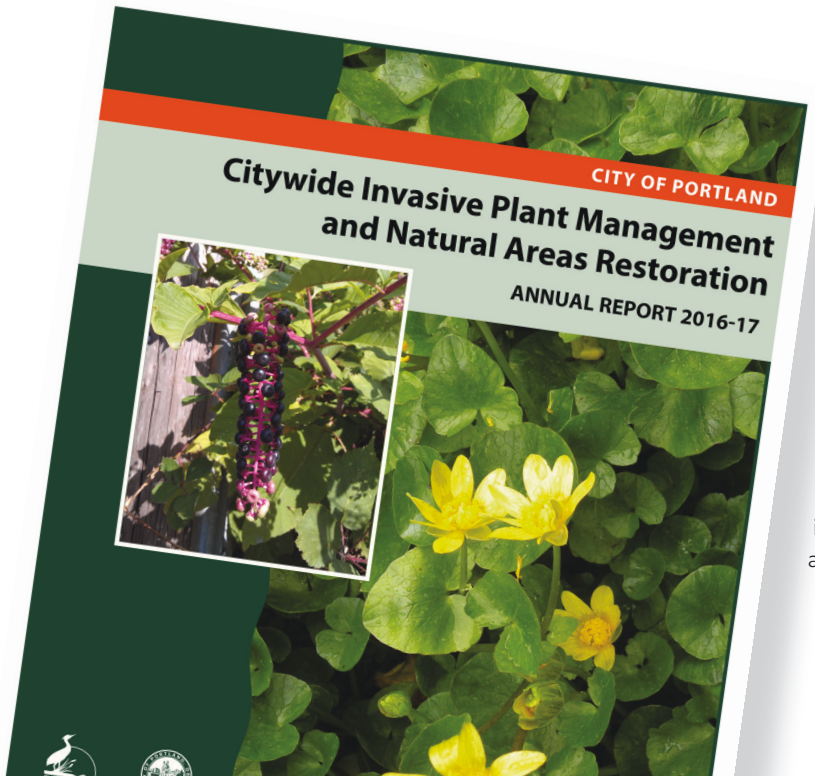



**Figure 3.** The city annually publishes a report documenting achievements in invasive plant management and natural areas restoration. *Source: City of Portland.*

## Goal 4. Invasive Species Control

**10-year objectives:**

- Develop and implement an Early Detection Rapid Response program to new invasions of Class A species and to reduce the level of Class B species in the city.
- Develop a work plan to control vertical coverage of ivy and clematis.
- Protect the best parks habitat by improving the ecological health score of 4,800 acres of parks and natural areas.
- Remove invasive species from the canopy of 300 acres.
- Remove invasive species and revegetate 700 acres.

**Action not fully achieved:**

- Evaluating the cost, feasibility, and bureau responsibility of control/eradication of vertical coverage of ivy and clematis within city-owned natural areas was partially completed.

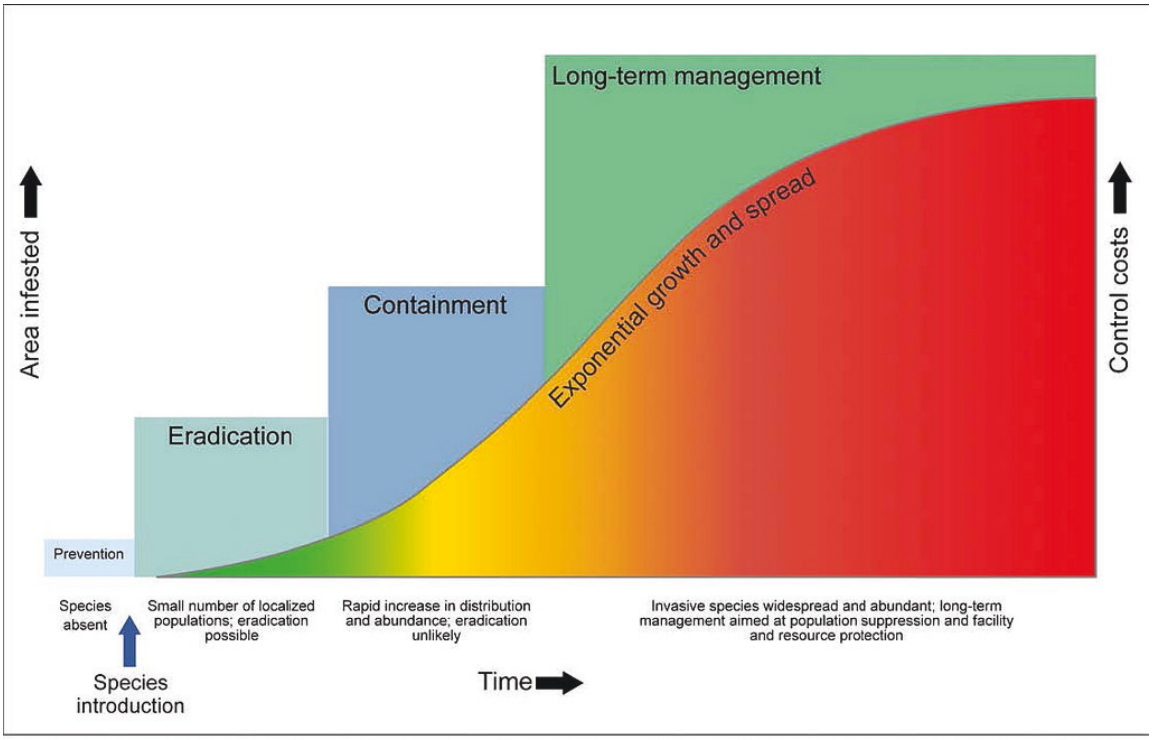
### Goal 4: Three-year work plan actions

**COMPLETED**

- Develop EDRR program.
- Protect the Best crews will remove invasive plants from 200—800 acres per year plus conduct monitoring and maintenance on previously treated areas.
- Parks Wildfire Risk Reduction program will remove invasive plants from 30 acres per year and conduct ongoing maintenance of areas previously treated.
- BES Revegetation program will remove invasive plants and re-plant native species on 70 acres per year.

**PARTIALLY COMPLETED**

- Inventory Class A and Class B species.
- Control Class A and Class B species.
- Evaluate the cost, feasibility, and bureau/ responsibility of control/eradication of vertical coverage of ivy and clematis within city-owned natural areas.




Sources: National Invasive Species Council; U.S. Department of Agriculture; National Park Service; U.S. Fish and Wildlife Service; Rodgers, L, South Florida Water Management District; Department of Primary Industries, State of Victoria, Australia; and GAO. | GAO-16-49

***Figure 4.*** Early Detection Rapid Response programs seek to eradicate small, localized invasive species populations, which results in long-term savings in financial and staff resources.

# Summary of Incomplete *2008 Invasive Plants Strategy* Actions

## Informing *Invasives 2.0*

Of the 44 objectives in the *2008 Invasive Plants Strategy*, a total of 27 (61%) actions were completed, 13 (30%) actions were partially completed, and four (9%) actions were not completed (Figure 5).

Several incomplete actions from the *2008 Invasives Plant Strategy* that remain relevant and are priorities should be carried forward and included in *Invasives 2.0* based on the guiding principles and expanded goals of the new strategy.

**These include:**

- The Action Plan update did not incorporate invasive plant management. The new iteration of the Management Plan, scheduled for 2019, should incorporate an all-taxa invasive species approach.
- Citywide 4(d) rule exemption for vegetation management was not created, and the Greenway Code was not fully modified to allow for herbicide application exemption. These issues should be re-evaluated to determine if the need remains to create the exemption and modification.
- Best management practices for cleaning equipment were developed in 2016 and incorporated into city construction specifications. An updated version should be adopted as city policy.
- Level of services was not articulated and habitat management plans were not developed for all natural areas and hybrid parks. This task should be evaluated in the context of the emphasis in *Invasives 2.0* to achieve ecosystem function for the city's natural assets.
- Adequate funding must be identified and secured to fully implement, on a long-term sustainable basis, the goals and priority strategies in *Invasives 2.0*.
- Stakeholder engagement objectives should be implemented to achieve the community engagement goals described in *Invasives 2.0*.


Figure 5. Completed, partially completed, and incomplete 3-year invasive species work plan actions.

# Bureau and Program Accomplishments

The *2008 Invasive Plants Strategy* describes the primary city bureaus that manage vegetation and control invasive plant populations based on their land management responsibilities, including Bureau of Environmental Services (BES), Portland Parks & Recreation (PP&R), Portland Development Commission (PDC), Portland Bureau of Transportation (PBOT), Water Bureau (PWB), Bureau of Planning and Sustainability (BPS), Bureau of Development Services (BDS), and Office of Management & Finance (OMF). Four city bureaus control invasive plant species on city-owned property (10,843 acres), city rights-of-way, and occasional private property; three additional bureaus have invasive species-related authorities.

The following are key invasive species-related achievements since 2008. A more detailed description and summary of these accomplishments can be found in Appendix A-2.

**Bureau of Environmental Services (BES)**

BES provides sewage and stormwater collection and treatment services, protects surface and ground waters, and conducts activities that plan and promote healthy ecosystems in watersheds. The bureau:

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CITY OF PORTLAND
working for clean rivers

- Operates an Early Detection and Rapid Response (EDRR) program to prevent establishment of new invasive plants—eradicates new infestations, maps known infestations.
- Removes invasive plants on a minimum of 70 acres annually and manages those sites to restore native plant communities.
- Operates the Watershed Revegetation Program—Works on restoration and stabilization projects with other bureaus/groups.
- Works with city staff and property owners to promote awareness and knowledge of invasive plants.

- Engages students in classroom and field programs that teach natural history, such as native plant identification and site restoration methods.
- Conducts outreach in the watersheds to promote invasive plant removal and native plant community establishment.
- Houses the city-wide Invasive Species Program, which reports annually on city invasive species efforts, focuses on plant and non-plant taxa, and coordinates with regional groups, such as the Oregon Invasive Species Council, 4-County Cooperative Weed Management Area, Oregon Department of Agriculture, Metro, Multnomah County, soil and water conservation districts, and Oregon Department of Fish and Wildlife.

## Early Detection and Rapid Response Program

Early Detection Rapid Response (EDRR) prevents the establishment of new invasive species by quickly coordinating all stakeholders that may be involved to control and prevent the spread of new biological invaders (North American Invasive Species Management Association).[1] A well-implemented EDRR program protects investments made by other conservation and restoration programs and prevents future costs and damages from these invasive species (US Department of the Interior 2016) through well-informed surveillance and avoidance of costly long-term control efforts (Cal-IPC).[2] Considered the second line of defense after prevention, EDRR is a critical component of any invasive species program.[3] EDRR results in an estimated 1:34 cost-benefit ratio (i.e., for every dollar spent on EDRR, there is a cost savings of $34) (ODA 2017). The city's EDRR program is responsible for discovering and mapping new invasive plant species; managing those species; engaging the public about invasive species; and working with partner organizations on each of the three aforementioned activities. The goal is to potentially eradicate species during early stages of detection to avoid the increased costs associated with managing and controlling established invasive populations, thus maintaining existing levels of ecosystem services. The city maintains three categories of species associated with EDRR efforts:

- **Eradication Species**—Species being managed for eradication purposes (Figure 6).
- **Containment Species**—Species being mapped and managed in limited circumstances (Figure 6).
- **Localized Species**—Species the city is encouraging landowners to both avoid planting and carefully manage.

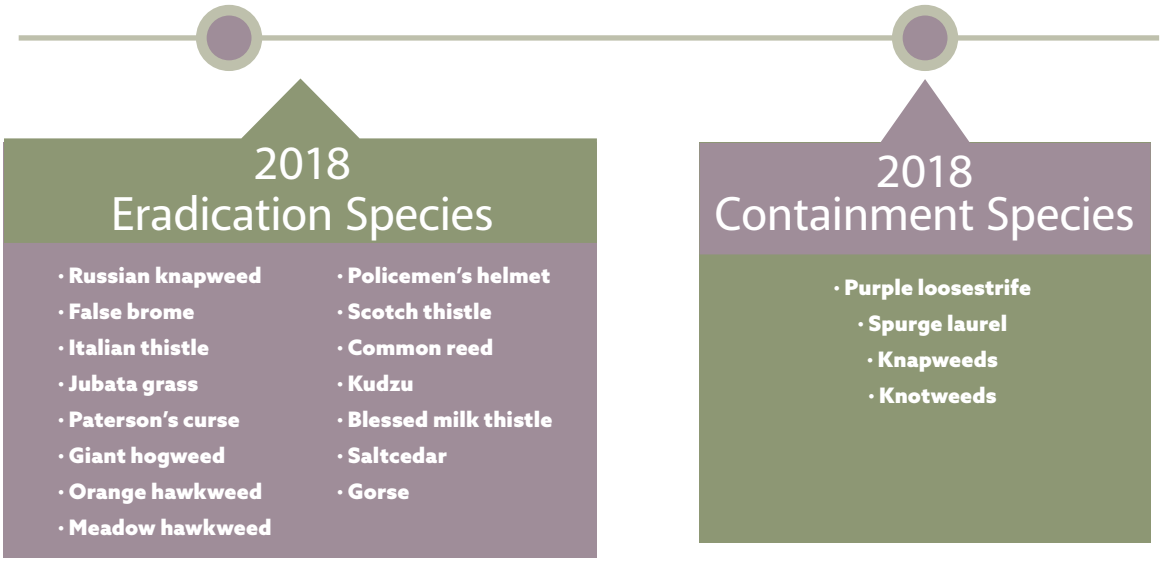


***Figure 6.*** Identifying eradication and containment species based on risk of introduction and establishment are key tasks associated with the Early Detection Rapid Response Program.

[1] *https://www.naisma.org/. Accessed June 17, 2018.*

[2] *http://www.occnps.org/invasives/what-is-edrr.html. Accessed June 17, 2018.*

[3] *https://www.fs.fed.us/invasivespecies/earlydetection.shtml. Accessed June 17, 2018.*

**Key accomplishments in the EDRR Program in the past 10 years include:**

- From 2009 through 2017, the EDRR program treated a total of 1,666.83 acres on 17 species (note: many of the acres include retreated acres) (Appendix A-2).
- Staff reported that numerous high-risk invasive species did not become established in key natural resource city assets.
- There is a broader understanding and awareness in the Portland metropolitan area about invasive species and the role of the city in prevention efforts.
- There is seamless coordination among city staff and entities in the region, such as cooperative weed management areas and soil and water conservation districts, implementing invasive species initiatives.

### Watershed Revegetation Program

The Watershed Revegetation Program restores city, private, and public properties to transform disturbed areas into quality fish and wildlife habitat as well as improve water quality, reduce erosion, and reduce stormwater pollution. Program staff seek to restore and enhance ecological resilience and function as a key outcome of their revegetation efforts, navigating the challenging conditions of working in a highly urbanized area.

From 2009 through 2017, the Watershed Revegetation Program initiated vegetation treatments on a total of 4,588.90 acres and conducted maintenance treatments on a total of 16,636.08 acres (Appendix A-2). In addition, staff increased overall structural diversity of habitat in riparian areas and implemented the initial phase of the River View Natural Area Management Plan.

Revegetation staff are evaluating long-term assumptions, e.g., if invasive species are removed, then other, higher quality, plants will return to the site. Staff recognize that removal of invasives is not an objective, rather, staff seek to focus on particular ecosystem services they seek to enhance, such as bird habitat, water quality, and pollinator habitat. Describing green assets and the ecosystem services staff seek to achieve on a site-by-site basis is critical to the development of *Invasives 2.0*.

### Willing Seller Program

In 1997, Environmental Services developed the Johnson Creek Willing Seller Land Acquisition Program. The program helps move people and property out of areas that frequently flood.

Restoration projects on land acquired through the program increase flood storage, improve fish and wildlife habitat, restore wetlands and create passive recreational activities for city residents.

Environmental Services offers willing sellers fair market value for their property. Owners are under no obligation to sell to the city. The city places deed restrictions on purchased properties designating them as open space in perpetuity and ensuring no future expenditure of federal disaster assistance funds for the property.

The Johnson Creek Willing Seller Land Acquisition Program is an implementation strategy for the 2001 Johnson Creek Restoration Plan, which addresses nuisance flooding, water quality problems, and fish and wildlife declines. The plan identifies common solutions to restore natural floodplain functions.

Environmental Services land-banks acquired properties while designing floodplain management projects and securing funding. The city uses many of the properties to create constructed wetlands, floodplain terraces and open space for flood management, habitat and passive recreation.

## *Portland Parks & Recreation (PP&R)*

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Healthy Parks, Healthy Portland

Portland Parks & Recreation (PP&R) is the steward of more than 11,500 acres of land at more than 250 locations including regional, community and neighborhood parks, natural areas, recreational facilities, special gardens, and trails. These areas contain about 8,000 acres of natural areas (of the 11,500 total acres), 1.2 million trees, six botanic gardens including three specialty rose gardens containing 20,000 roses, 237 baseball/softball fields and soccer/football fields, and six 18-hole golf courses. PP&R is charged with management of the entire, including trees on public and private lands through the city's tree code, Title 11. This forest includes millions of trees in all areas of the city that provide significant benefits to Portlanders where they live and play.

PP&R provides safe places, facilities, and programs that promote physical, mental, and social activity by establishing, safeguarding, and restoring outdoor places, developing and maintaining facilities and places for public recreation and community building, providing recreational programs and services, and partnering with communities. The bureau:

- Protects the highest quality PP&R habitat by removing invasive plants to improve the ecological health rating of those lands. Protect the Best launched in 2007, and was a founding program of the city's *Grey to Green* Initiative, and seeks to protect PP&Rs healthiest natural areas by preventing small infestations of invasive plants from spreading into core healthy habitat, while treating buffer zones around the core habitat to reduce infestation.
- Implements land stewardship activities to control invasive species. PP&R staff not specifically housed in the Protect the Best Program also maintain and improve natural areas via the control of invasive species.
- Develops restoration strategies for more than 8,000 acres of PP&R-managed natural areas.
- Reduces the risk of wildfire in 300 acres (in 10 years) by removing invasive plants from the forest canopy in high-risk areas.
- Engages volunteers in PP&R stewardship programs aimed to remove invasive plants and restore native plant communities.
- Focuses environmental education and youth stewardship programs on education and eradication of invasive species.
- Facilitates partnerships with non-profit organizations to conduct invasive plant removal and native plant restoration in parks.
- Oversees and coordinates implementation of the city's integrated pest management program.

## Integrated Pest Management (IPM)

Integrated Pest Management (IPM) is a science and ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques, such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties, applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment (University of California–Integrated Pest Management).[4] The Environmental Protection Agency[5] and Oregon Statutes (ORS 262.1, Chapter 943)[6] also provide definitions for IPM.

The Portland City Council passed a resolution in 1998 that directed PP&R to "adopt and begin implementation of a grounds maintenance policy embodying the principles of IPM." The mission of the program is to manage pests harmful to the health, function, or aesthetic value of park landscapes in an efficient, effective, and environmentally responsible manner, while tending to public and employee safety.

[4] *http://ipm.ucanr.edu/IPMPROJECT/contact.html*

[5] *IPM is the coordinated use of pest and environmental information with available pest control methods to prevent unacceptable levels of pest damage by the most economical means with the least possible hazard to people, property, and the environment. The goal of IPM is to manage pests and the environment so as to balance costs, benefits, public health, and environmental quality. IPM systems use all available technical information on the pest and its interactions with the environment. Because IPM programs apply a holistic approach to pest management decision making, they take advantage of all appropriate pest management options, including, but not limited to pesticides. IPM is: A system using multiple methods; A decision-making process; A risk reduction system; Information intensive; Cost-effective; Site specific.*

[6] *Integrated pest management' means a coordinated decision-making and action process that uses the most appropriate pest control methods and strategies in an environmentally and economically sound manner to meet pest management objectives. The elements of integrated pest management include: (a) preventing pest problems; (b) monitoring for the presence of pests and pest damage; (c) establishing the density of pest population, which may be set at zero, that can be tolerated or corrected with a damage level sufficient to warrant treatment of the problem based on health, public safety, economic or aesthetic threshold; (d) treating pest problems to reduce population below those levels established by damage thresholds using strategies that may include biological, cultural, mechanical and pesticidal control methods and that shall consider human health, ecological impact, feasibility and cost effectiveness; and (e) evaluating the effects and efficacy of pest treatments.*

IPM incorporates a progressive and sustainable approach, using multi-faceted strategies that minimize economic, health, and environmental risks (City of Portland 2016). The city evaluates risk using a Nuisance Plant Risk Assessment that was modified by the City of Portland from the USDA-APHIS Risk Assessment for the Introduction of New Plant species and the Oregon Department of Agriculture's Noxious Qualitative Weed Risk Assessment v. 3.6 using *An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity* (Appendix A-3).

Pest prevention is achieved through:

- **Policy**—Prioritizing parks for control measures and establishing thresholds for action.
- **Design and plant selection**—Using disease or pest resistant or tolerant plant species or varieties, removing pest-susceptible plants, maintaining species diversity and eliminating monocultures.
- **Cultural practices**—Adequate site, soil, and grade preparation before landscape installation, raking and debris removal to eliminate pest sources, and proper timing and use of water.
- **Mechanical and physical controls**—Clearing of weeds, traps for insects and mammalian pests.
- **Biological controls**—Introducing insect or disease parasitoids, predators, and microbial products and minimizing use of disruptive techniques and materials in landscapes that may destroy natural pest organisms.
- **Pesticides**—Placement of pheromone traps, disinfecting materials and equipment, and applying pesticides.

Choosing a pest management approach is based on the site, potential health, safety, and environmental effects, cost, product characteristics, and other considerations.

## Protect the Best Invasive Plant Management Program

The PP&R Protect the Best Invasive Plant Management Program initiates and accelerates natural area enhancement and restoration in PP&R's ecologically healthiest habitats, with a primary focus on removing invasive plants early during establishment and creating "buffers" of native vegetation around them. Targeting 'healthy' vs. 'degraded' sites is a cost-effective strategy of inputting a relatively small level of resources to maintain existing healthy habitats, rather than waiting for them to reach a more degraded state before investing a substantially higher level of resources to move them back to a desired healthy state. This is a form of invasive vegetation control that is an important facet of the *2008 Invasive Plants Strategy*. This program identifies and prioritizes ecologically healthy core habitats while simultaneously controlling invasive species in buffer areas adjacent to these core natural assets. Protecting buffer areas lessens the chance that invasives will be introduced to the core areas.

Protect the Best selects sites based on ecological health (documented in baseline vegetation surveys), large areas of invasive-free habitat, proximity to and contiguity with other natural areas, geographic distribution of work throughout Portland, and unique and special habitats.

From 2006–2016, the Protect the Best Program treated 4,029 new acres and retreated a total of 5,113 acres (Appendix A-3). From 2017–2018, program staff treated 656.69 acres.

In 2014, the program incurred a $125,000 reduction from BES. In 2018, the program incurred an additional $125,000 reduction from BES. In 2018, the program incurred a $50,000 reduction from PP&R. These reductions significantly affect the ability to prevent the introduction and spread of invasive species in some of the city's most treasured natural assets.

A key lesson learned from implementation of the Protect the Best program is that the current undersized work force is not adequate to sustainably address large-scale projects and protect past investments made in reducing risk from invasive species. Larger long-term projects are best institutionalized within the city by cultivating contract crews to ensure they have the technical skills and experience to support city projects.

In addition to the total number of acres treated from 2007–2017, the key accomplishments in PP&R during the past 10 years include:

- Implementation of Restore Forest Park, a long-term, landscape-scale initiative to restore Forest Park by removing invasive species, enhancing pollinator habitat, and treating ground cover invasives. The scale of the work has allowed the city to address and treat large acreages of invasives, which complements

the work of volunteers implementing invasives treatments at smaller scales.

- Efforts with partners to connect the city's habitats, improving wildlife corridors and green spaces across the landscape.
- Outreach and advertising generated from individuals within programs that are physically managing PP&R properties.
- Cooperative efforts with partner to work together to address emerging priorities, e.g., garlic mustard, as well as implement new initiatives (e.g., Restore Forest Park with the Forest Park Conservancy and others).

## Urban Forestry

Invasive forest pests and diseases pose the single greatest threat to forests in the United States (Gulick 2014), and the number of invasive species worldwide is expected to grow (Aukema et al. 2010). The drivers of forest pest pathways of introduction include worldwide travel and commerce such as containerized cargo transport (Gulick 2014). Major port cities, such as the City of Portland, are at the greatest risk of nonnative forest pest and disease introduction and establishment (Gulick 2014). Once introduced, other pathways, such as firewood movement, allow these species, such as Asian long-horned beetle *(Anoplophora glabripennis)* and emerald ash borer *(Agrilus planipennis)*, to spread.

The Program achieves its goals through three primary avenues:

- **Operations**—Includes emergency response and maintenance functions, including work for other bureaus.
- **Regulatory**—Reviews development permits and inspects trees for tree protection.
- **Outreach and Education**—Engages the public in education and stewardship activities, tree monitoring, inventory, policy, and community science. In 2017, volunteers contributed 14,000 hours, participating in pruning street trees, inventorying trees, and other activities.

Key accomplishments since the passage of the 2008 *Invasive Plants Strategy* include:

- Title 11 provided additional flexibility via programmatic permits.
- Nuisance species were once exempt from non-development private property tree removal; currently, the permit requires all trees to be replaced.
- Completion of an updated inventory of street trees using volunteers.
- The partnership with the US Forest Service; Portland is the first city in the Pacific Northwest to participate in establishing permanent monitoring plots to assess forest composition on private and non-federal public lands.
- Management of Dutch elm disease, although funding from BES for these efforts has been eliminated.

Title 11 provided the program with new tools, including the ability to issue programmatic permits to land managers, including other city bureaus.

Title 33 has facilitated the removal and replacement of invasive trees across the city, advancing the protection and improvement of the city's urban canopy. Fundamental to Title 33 is the acknowledgement that trees:

- Protect public health through the absorption of air pollutants, contamination, and capturing carbon dioxide;
- Buffer from noise, wind, and storms;
- Provide visual screening and summer cooling;
- Reduce energy demand and urban heat island impacts;
- Filter stormwater and reducing stormwater runoff;
- Reduce erosion, siltation, and flooding;
- Stabilize slopes;
- Enhance property values;
- Provide fish and wildlife habitat, including support for native species biodiversity through the preservation and planting of native trees;
- Provide food for people and wildlife;
- Contribute to the beauty of the City, its natural heritage, and the character of its neighborhoods.

Several challenges the program faces:

- The replacement of large canopy trees with smaller, species, such as crepe myrtle and 'Snowbell' (S*tyrax* spp.), which occurs

when species, such as horse chestnut, are replaced—landowners frequently select smaller, flowering species, which contributes to a reduction in canopy in the city.

- A lack of clear funding to address emerging and anticipated invasive species insect invasions, such as emerald ash borer. Staff participated in the development of the statewide emerald ash borer plan. In anticipation of an introduction of emerald ash borer, the program is removing ash trees, which currently comprise less than five percent of all city street trees (most are in riparian natural areas), from the list of approved species.
- Compliance with tree planting faces enforcement challenges. New development is required to plant street trees, and tree are required to be replaced when a removed is permitted in non-development. Compliance rates are currently 75%.
- The perception that the locations of different nuisance plant lists for the city are housed in different parts of government bureaucracy (some administrative, some policy, some code) make it difficult to prioritize. For example, tree of heaven is ranked the same as Norway maple, but tree of heaven is a greater challenge in a built environment.
- Adequate resources—the program seeks to ensure that the scope of their responsibility matches the capacity of their resources.
- Lack of clarity between the program and BPS regarding the provisions of the Portland Plant List. For example, tree species on the Nuisance Plant List can be planted as part of new developments and significant structural improvements, except in rights-of-way.
- Occasionally conflicting goals with other city plans and documents. For example, city goals of eliminating designated Nuisance Plant Species has resulted in decreased tree mitigation requirements for removal of trees, affecting city canopy goals.

The current Urban Forestry Management Plan (UFMP) was created in 2004, and is scheduled to be updated in 2019. The UFMP is the City's guide for maximizing ecosystem services and functions that the urban forest provides across all parts of the city, including reducing risk from, and building resilience to, invasive pests and diseases. Elements of the city's invasive species strategy that directly support those goals are:

- The emphasis on community and public engagement.
- The goal of articulating a suite of desired levels of service provided by the city's green assets.
- Development and incorporation of rapid response plans for the highest risk categories of forest-related pests and pathways.
- Best management practices for tree planting, management, and care.
- An adaptive management approach that provides for continual evaluation and course corrections, emphasizing the latest science.
- A focus on pathways of introduction.
- Enhanced collaboration and cooperation with other city bureaus.

## Land Stewardship Program

The Land Stewardship Program within Portland Parks & Recreation manages lands in three categories:

- Westside Lands, which includes the management and stewardship of natural areas and park lands west of the Willamette River, a Washington Park liaison, a Soft Surface Trails Team, and the Hoyt Arboretum (Figure 7).
- Eastside Lands, which includes the management and stewardship of natural areas and park lands east of the Willamette River as well as the Protect the Best program.
- Land Services, which includes Turf Maintenance, Irrigation, and Horticultural Services, Community Gardens, Environmental Education, and the Integrated Pest Management program.

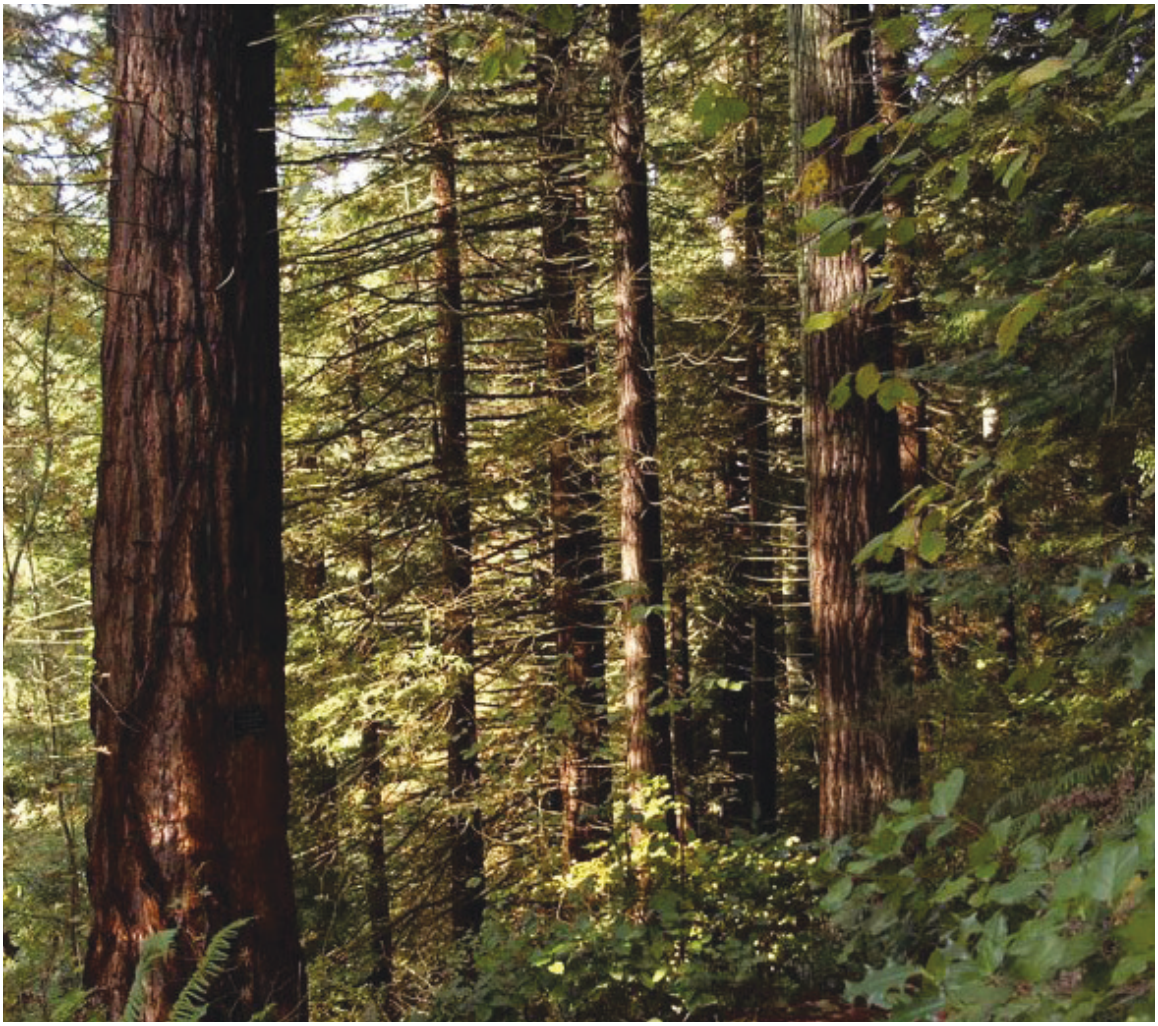


***Figure 7.*** The Hoyt Arboretum is part of the City's Westside Land Stewardship Program. Source: City of Portland.

## *Portland Water Bureau (PWB)*

The Portland Water Bureau's mission to deliver clean, safe drinking water depends on the health of the Bull Run Watershed Management Unit, which was established in 1977 by the Bull Run Act (Public Law 95-200). The Bull Run Watershed unit includes three water bodies containing a combined reservoir storage of 10 billion gallons of water. Land within the watershed is co-administered by federal agencies and the city. The Water Bureau:

- Controls, eradicates or prevents the introduction of City of Portland Ranked A Nuisance Species in the Bull Run Watershed.
- Develops a management plan for invasive species control and eradication on lands managed by the Water Bureau in the 102 square-mile Bull Run watershed.
- Controls invasive plants in riparian easements in the Sandy River watershed in compliance with the Bull Run Water Supply Habitat Conservation Plan.
- Coordinates invasive species management with regional weed groups, such as the Cooperative Weed Management Area and the Sandy Basin Partners in the Metro Region.

Invasive species have the potential to interfere with forest health in the Bull Run watershed. In 2016, the Water Bureau developed an Invasive Species Management Plan to articulate a suite of preventive actions associated with the introduction and spread of invasive species into the watershed. In addition, the Water Bureau adopted operating protocols for early detection and treatment of 27 priority aquatic and terrestrial invasive species in the unit that could detrimentally affect the water supply system and ecosystem health. Monitoring, information sharing, risk assessments, and protocols are foundational to watershed protection goals (Figure 8).

The Water Bureau uses a pathways framework to address invasive species. Natural vectors (e.g., wind, birds, and wildlife) and anthropogenic vectors (e.g., all human activities occurring in the unit such as road use, maintenance and construction, powerline maintenance, and maintenance and monitoring of the water supply system) have been identified. Management strategies to address these pathways include EDRR and coordination with other land managers to leverage resources for prevention and control efforts.

Key accomplishments:

- In 2013, PWB finalized an Invasive Plant Standard Operating Protocol (SOP) consistent with US Forest Service requirements for invasive plant management within the BRWMU. Since 2013, the PWB annually:
- Implements the SOP, which includes identifying high priority invasive plant species based on establishment potential and the potential to affect water supply operations;
- Removes reed canary grass;
- Coordinates with the Oregon Department of Agriculture on the control of A-listed noxious weeds and the release of biocontrols for scotch broom; and
- Implements preventative measures for boat and equipment decontamination for reservoir use.
- In 2015, the PWB installed a vehicle wash station at the entrance to the watershed and required contracted equipment to be inspected and cleaned.

## *Portland Bureau of Transportation (PBOT)*

PBOT plans, builds, manages, and maintains an effective and safe transportation system. The bureau develops a schedule for roadside brush cutting operations that minimizes the spread and growth of invasive species.

The Bureau's Street Cleaning Program manages vegetation within city street rights-of-way.

The Roadside Vegetation Program manages vegetation along 337,920 linear feet of ditches, 175 miles of roadsides, 171 pedestrian areas, and 12 off-street bike paths to foster a safe, healthy, attractive environment. Techniques used to manage vegetation include mechanical (mowing), cultural (hydroseeding and plantings), biological, and chemical.

PBOT reports on their invasive species efforts through three activities:

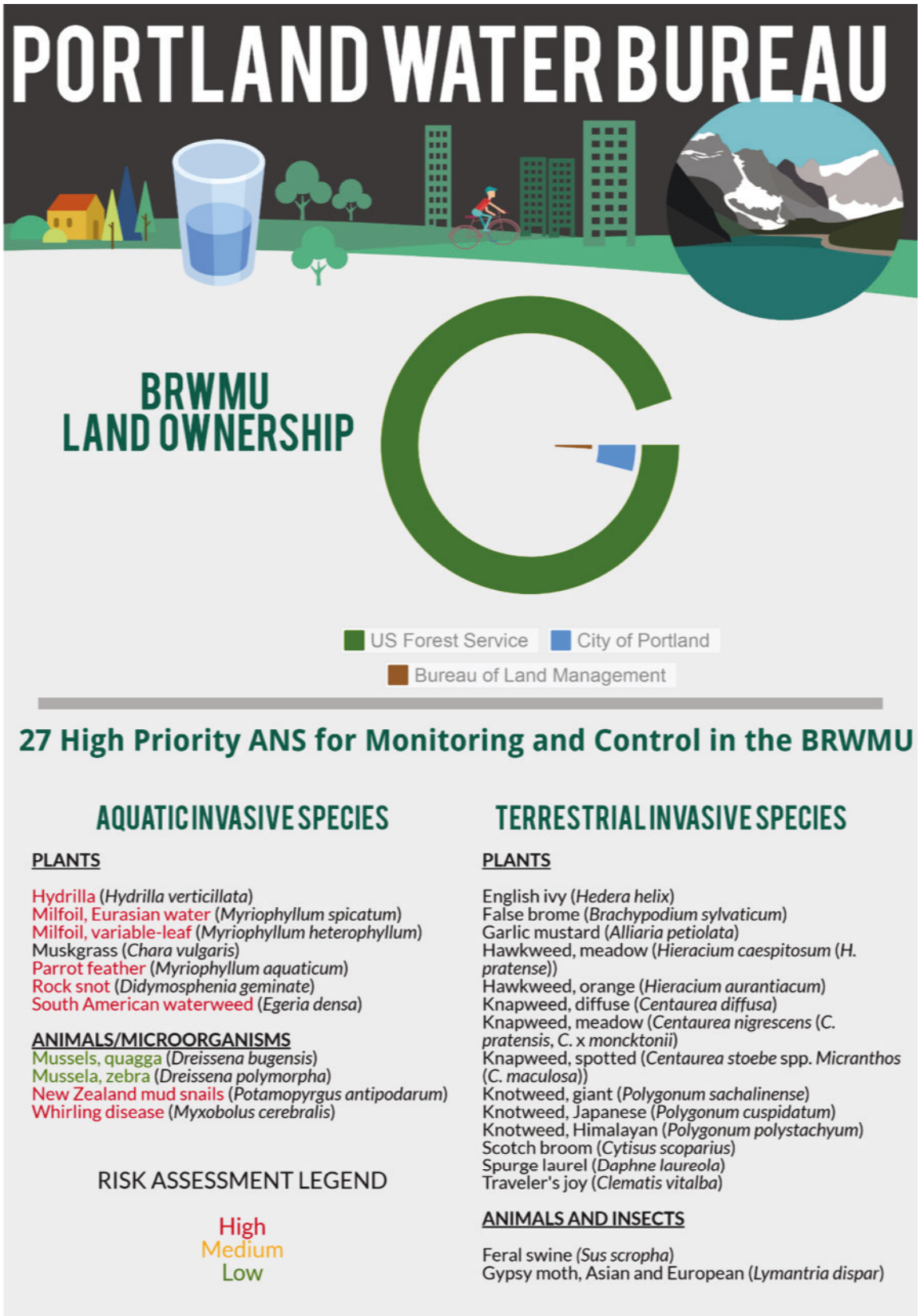



***Figure 8.*** High priority invasive species for the Portland Water Bureau.

- **Brush Cutting**—Machine mowing of prioritized safety sensitive areas and machine cutting of roadside/ditch vegetation for the purpose of managing overgrowth of vegetation and to prevent the disruption of drainage. This activity occurs primarily during the months of June–September using heavy equipment, flail mowers, and backpack blowers.
- **Roadside Weed Control**—Herbicide application for noxious weed control along ditches/ roadsides, transportation sites, bike paths, pedestrian areas to control the growth of noxious, troublesome weeds and reduce the disruption of drainage. This activity occurs year-round using heavy equipment as well as Glyphosate, Garlon 3A, Snapshot, and Surflan.
- **Green Spaces**—Mowing and turf maintenance of high visibility Transportation Maintenance Sites (TMS), including city-maintained bike paths, removing safety hazards on medium visibility TMS, and hand cleaning, hose flushing, and minor hand brush cutting along pedestrian travel areas to manage vegetation and clean hard surface areas. Work occurs year-round, and includes heavy equipment as well as backpack blowers, grass seed, and weed eaters.

Similar to other bureaus, PBOT staff need to ensure that sanitation and IPM measures are consistently implemented during maintenance activities.

It is difficult to identify the actual costs for noxious weed treatment and removal because PBOT conducts their maintenance activities, which are numerous and varied, on a site-by-site basis. In 2017, PBOT staff invested 692 hours and expended $35,435 maintaining green spaces; 3,225 hours and $156,318 brush cutting, and 1,894 hours, and $138,063 performing weed control.

## *Bureau of Development Services (BDS)*

Bureau of Development Services FROM CONCEPT TO CONSTRUCTION

The Bureau of Development Services promotes safety, livability and economic vitality through efficient and collaborative application of building and development codes. BDS implements codes carried out via the strategy, such as implementing and enforcing Titles 29 and 33.

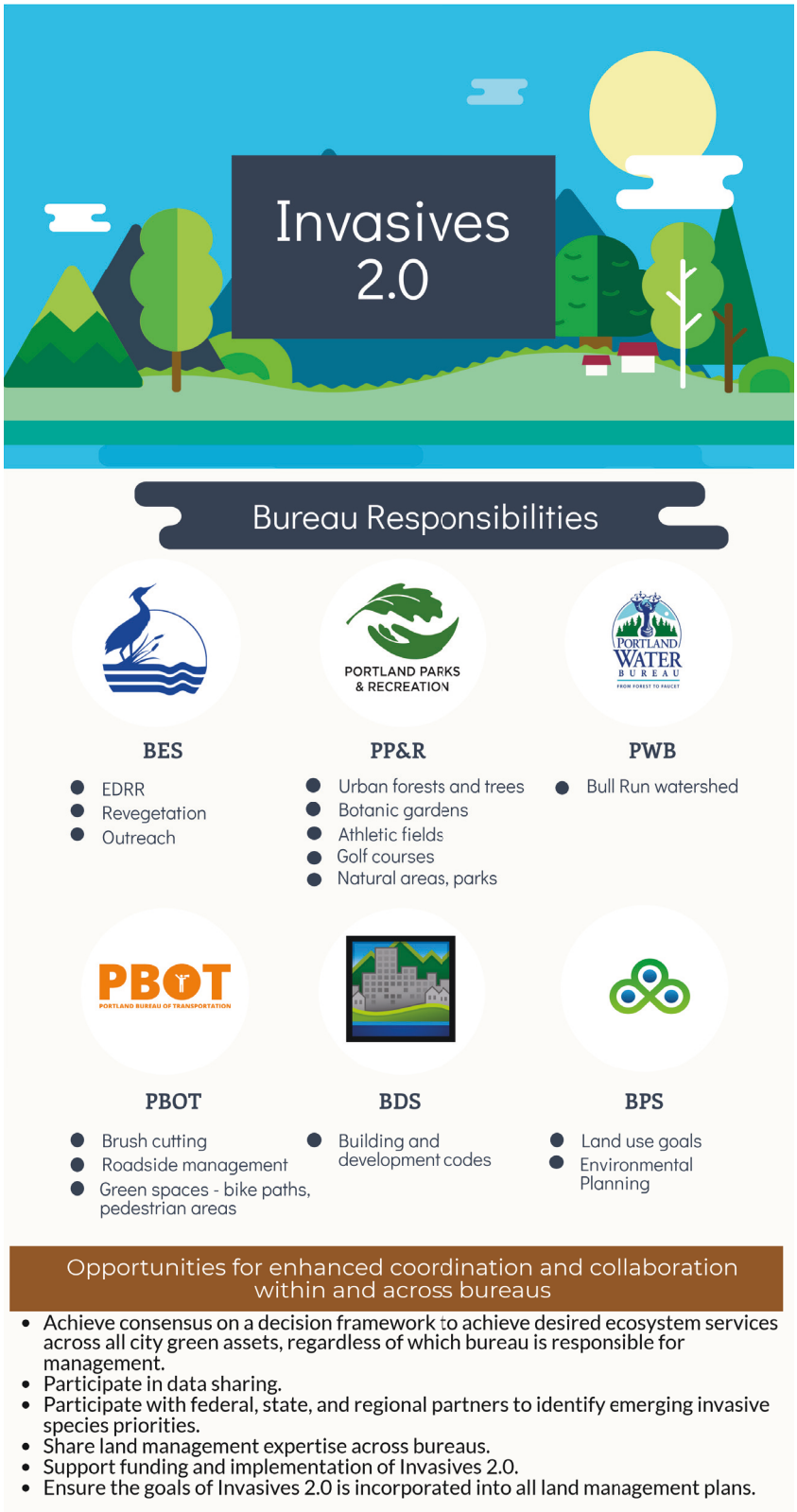
- **Zoning and Land Use**—City planners within the Land Use Services Division guide applicants, residents, and other governmental agencies through all phases of the development review process as they relate to zoning regulations. Zoning regulations are land use regulations and policies that implement community goals and protect community resources while guiding new development. Zoning regulations affect all new construction, most alterations, commercial occupancy changes, property line changes and most site development activity including some tree cutting and landscaping.
- **Permits**—Construction code regulations affect all construction/site development activity.
- **Enforcement**—The Compliance Services section enforces compliance with the city codes and the State building codes. Each year BDS inspectors respond to over 10,000 inquiries pertaining to zoning, construction, dangerous buildings and other violations.
- **Fees**—Fee-related services include Permits related for new and altered buildings and their properties, land use reviews, certificates and registrations, inspections and other compliance services, and fees collected for other city bureaus.
- **Codes, Rules and Guides**—Administers and enforces the city and state codes and administrative rules linked on this page. This page also contains code and program guides that aid in understanding how BDS applies these codes and rules.

## *Bureau of Planning and Sustainability (BPS)*


The Bureau of Planning and Sustainability's Environmental Planning Program meets the requirements of Statewide Land Use Goals. Environmental Planning contributes to the implementation of the Comprehensive Plan, Climate Action Plan, River Renaissance, Portland Watershed Management Plan, and Management Plan. The program also helps the city comply with Metro Titles 3 and 13, the Clean Water Act, and the Endangered Species Act, and informs discussions about community goals and actions to achieve them. BPS processes legislative projects to amend some city codes, which are then adopted by the City Council. The program team works collaboratively with other city bureaus and government agencies, community organizations and individuals on a range of projects, helping to ensure that city watershed and environmental health goals are met, along with goals for livable neighborhoods, a prosperous economy and community equity.

Primary activities include updating the Portland Plant List to assign ranks to nuisance plants, add and remove nuisance plants, and recommend changes to city codes and policies consistent with the strategy; producing or updating citywide or area-specific natural resource inventories, environmental overlay zone maps and regulations; leading projects, such as the overhaul of tree code as well as rules addressing the planting and removal of invasive plants; and developing and codifying land use policy such as the Greenway Plan, River Plan, and Central Reach Plan.

# Bureau Coordination




Each city bureau delivers discrete and important functions that contribute to the management of the city's green assets (Figure 9). Although each city bureau has distinct roles and responsibilities, significant potential exists to enhance cooperation and collaboration across bureaus to deliver the services desired by city residents and communities (Figure 9).

**Figure 9.** Bureau responsibilities and opportunities for enhanced coordination.

# Pathways of Introduction

The Era of Globalization has accelerated transportation of commodities throughout the world, contributing to the quantity of biological invasions (Hulme 2009). Focusing on vectors, or pathways of introduction, helps to identify the potential sources of invasive species (Convention on Biological Diversity 2014). A focus on species, such as quagga and zebra mussels, should be balanced with a focus on pathways of introduction and spread, such as transporting watercraft, to prevent propagules from arriving and disbursing (McGeoch et al. 2015).

The primary challenge associated with invasive species ecology is management of introduction vectors (Sylvester et al. 2011). The primary pathways of introduction to Portland are: Air transportation/ cargo, water transportation, land transportation, items used in shipping, travel tourism/relocation, plant pathways-plant trade, food pathways, non-food animal pathways, and ecosystem disturbances.

Table 1 illustrates the framework used to describe invasive species pathways and threats to the City of Portland, including the primary pathways of introduction as well as the techniques commonly used to manage the threats, and the priorities for protection from threats.

This audit further analyzes the pathways of invasive species introduction, including pathway specifics, organisms transported, and examples of invasive species associated with pathways. The audit also describes the responsible city departments, state laws or regulations, local authorities and recommendations the city has the authority to take to enhance prevention efforts and the introduction and spread of invasive species to the city.

A comprehensive approach is required to addressing pathways of introduction, including public outreach and engagement, best management practices (see Best Management Practices section of this document), incentives, policies at the local, state, and federal level, and other approaches. Although some activities, such as international commerce, lie outside the jurisdiction of the City of Portland, the city can influence the outcomes of these activities through partnerships, legislative influence, and its own policies and regulations.

Each of Portland's major pathways of introduction have at least one "sub-pathway" that is deemed a priority based on risk assessments completed by federal and state agencies, and emerging threats identified to the region by agencies, Canadian partners, and others. The identified pathways are those that the city can influence, and the suggested actions are those that the city could take to enhance prevention efforts focused on pathway introduction.

Appendix A-4 provides a detailed analysis of each pathway of introduction, the responsible city or department, specifics on state and local authorities, and recommendations the city can consider to lessen the threat of an introduction, or spread, of invasive species by each pathway. Table 1 is a summary of the detailed analysis.

Table 1. Pathways, responsible city departments, state laws or regulations, local authorities and recommendations for local action to enhance prevention efforts and the introduction and spread of invasive species to the City of Portland.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Air transportation/ cargo** | Bureau of Planning<br><br>Port of Portland | LCDC Airport Planning Rule<br><br>State seaplane and invasive species laws | Portland Zoning Code<br><br>Portland International Airport Rules | § Consider applying to the State Aviation Board for regulations relating to the operation of seaplanes on city waters.<br>§ Add provision to Portland International Airport Rules to address invasive species risks from aviation services.<br>§ Emphasize that airport users are required to comply with all federal, state, and City of Portland invasive species laws and regulations. Airport users are encouraged to review their operations for invasive species risks and implement best management practices to mitigate identified risks, including:<br>§ Visually inspecting the exterior and interior of aircraft for invasive species.<br>§ Use bait, traps, or other barriers to prevent infestations.<br>§ Decontaminate aircraft, cargo holds, or cargo if feasible if invasive species are present.<br>§ Require vendors or service providers to be WPM compliant.<br>§ Train personnel to detect invasive species. |
| **Ballast Water** | Portland Fire & Rescue (Harbor Master)<br><br>Port of Portland | State ballast water management law<br><br>(Or. Rev. Stat. Ann. §§ 783.620 – 783.640) | State statutes and regulations are silent. Local authority may be preempted due to comprehensive nature of the state law. DEQ regulations state that "DEQ or its agent is authorized to board and inspect vessel..." | § Consider options for city officials to become authorized agents to conduct ballast water inspections.<br>§ Add provision to Port of Portland Marine Terminal Operations Ordinance to address ballast water. |
| **Hull/Surface Fouling** | Bureau of Parks and Recreation<br><br>Port of Portland | State AIS laws re: shipbreaking and watercraft inspections<br><br>State pesticide law re: marine antifouling paints | Marine Terminal Operations<br><br>Ordinance 426-R<br><br>Parks and Recreational Dock and Boat Ramp Rules (PRK-1.17) | § Require underwater hull cleaners operating in city port facilities to follow best management practices.<br>§ Add provisions addressing invasive species risk, such as requirements for vessels to be "Clean, Drain, and Dry" before launch, to Portland Parks and Recreation's Shore Term Boat Launch and Moorage Rules (PRK-1.17).<br>§ Consider implementing a watercraft inspection program at city waters used for recreational boating. |

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Dredge Spoil Material** | Port of Portland | Removal-Fill Law<br>Solid and<br>Hazardous Waste Rules | Prohibition on dredging near power mains | § Consider enacting an ordinance restricting the placement of dredge materials or requiring a risk assessment before placement.<br>§ Consider amendment zoning code to provide authority to city to review dredging projects for invasive species risks. |
| **Anglers—Live Bait (G/AA)** | Bureau of Parks and Recreation | ODFW<br>regulation re: nonnative wildlife; OARD regulation re: pest and disease control | State statutes and regulations silent. Cities have broad home rule authority to address local affairs. Local peace officers have authority to enforce state wildlife laws. | § Add provision to Parks and Recreation Code addressing use of live bait.<br>§ Consider options for city enforcement of state wildlife rules regarding restricted wildlife. |
| **Land transportation (vehicles, equipment, people, etc.)** | Bureau of Transportation<br>Bureau of Parks and Recreation | State noxious weed,<br>non-native<br>wildlife, and aquatic invasive species laws | Portland City Code Ch. 16 | § Consider adopting city ordinances requiring the use of best management practices when moving mowers, backhoes, tractors, and other equipment between sites.<br>§ Consider adopting a Parks and Recreation invasive species policy to address invasive species risks from recreational activities (firewood, hiking/fishing gear). |
| **Shipping containers, wooden pallets and crates, other solid wood packaging materials, spools, dunnage** | Port of Portland | Oregon Department of Agriculture (ORS 570.305)<br>Oregon Department of Fish and Wildlife (ORS 635-056)<br>Department of State Police (ORS 496.610) | Marine Terminal Ordinance<br>Portland International Airport Rules | § Consider amending Marine Terminal Ordinance and Portland International Airport Rules to require carriers to ensure international shipments are ISPM-15 compliant.<br>§ Consider adding a clause to marine terminal leases and leases for air cargo operations regarding ISPM-15 compliance.<br>§ Consider using the latest research and science to define best management practices and protocols for pallet storage to reduce the likelihood of post-treatment re-infestation.<br>§ Consider requiring packaging materials that are not made from solid wood for international shipping.<br>§ Consider promoting voluntary use of lower-risk alternatives to wood packaging materials, informing shippers of the benefits that include fewer inspections, cost savings on shipping lighter materials, and support by consumers for products that are both green and sustainable. |
| **Plant Parts** | Bureau of Planning and Sustainability | Weed Control Law | Portland Plant List | § Consider adding provisions restricting the sale of noxious weeds in city ordinances.<br>§ Require garden centers and other stores where plants and seeds are sold to notify customers at point of sale regarding city planting restrictions and state noxious weed laws. |
| **Pathway** | **Responsible City Department** | **State Law or Regulation** | **Local Authority** | **Recommendation for Local Action** |

| | | | | |
|---|---|---|---|---|
| **Live Food Animals** | Bureau of Planning<br><br>Multnomah County Health Department | ODFW Prohibited, Controlled Species List<br><br>Livestock import permits<br><br>ODFW rules re: propagation of wildlife | Portland City Code Title 13<br><br>Portland Zoning Code | § Consider amending Title 13 to prohibit possession of animals identified on city's "Invasive Animal Lists." |
| **Live Fish** | Bureau of Planning<br><br>Bureau of Health* | ODFW Fish Transport Permit<br><br>ODFW<br><br>Prohibited<br><br>Species List | Portland Zoning Code | § Consider including provisions regulating or restricting the sale of live fish in zoning code or city ordinances.<br><br>§ Require educational signage at locations where live fish are sold notifying customer of invasive species risks or state laws prohibiting release.<br><br>§ Increase awareness among city inspectors relative to invasive fish and fish that cannot be imported without an ODFW permit. |
| **Pet/Aquarium Trade** | Bureau of Planning<br><br>Multnomah County Health Department (implements Title 13 provisions) | State law prohibits release of live fish.<br><br>ODFW Prohibited, Controlled Species List | Portland City Code Title 13 (Animals)<br><br>Portland Zoning Code | § Consider including provisions regulating the sale of aquaria fish in city ordinances (for example, in Chapter 13:10 General Animal Regulations).<br><br>§ Require pet and aquarium store owners to notify customers at point of sale about state laws prohibiting release and disposal options.<br><br>§ Require pet and aquarium store owners to develop programs to take back unwanted aquarium fish.<br><br>§ Require educational signage at pet and aquarium stores notifying customer of invasive species risks or state laws prohibiting release. |
| **Firewood, landscaping, nursery stock** | Bureau of Parks and Recreation<br><br>Bureau of Environmental Services<br><br>Bureau of Transportation<br><br>Bureau of Development Services<br><br>Bureau of Insect Control | State noxious weed and plant pest laws.<br><br>State laws re: firewood and feral swine<br><br>ODF regulation re: introduced pests<br><br>ODA regulation re: plant pests<br><br>ODA regulation re: firewood | Portland Tree Code<br><br>Integrated Pest Management Program | § Consider adding provisions to Parks and Recreation Code to place restrictions on use of firewood or livestock forage. |

*[1] Listed because they would be responsible for health inspections and could see live fish and ask for documentation.*

# Standards and Protocols

## Best Management Practices

Agencies throughout North America institute best management practices to reduce the likelihood of introducing invasive species, particularly via plant seed or propagules, during maintenance, construction and vegetation management activities. One key priority that was not completed as part of *2008 Invasives Plant Strategy* implementation was to evaluate the city's program for cleaning equipment to prevent spread and new introductions.

Several entities in the Portland metropolitan area currently have the following guidelines for equipment sanitation associated with activities:

- The Port of Portland's Vegetation Management Plan (2016) for mitigation sites and natural areas includes a section on equipment sanitation protocols to prevent the spread of two diseases by improperly cleaned clothing and equipment that can carry zoospores—Ranavirus and Chytrid fungus. Although Ranavirus affects invertebrates and cold-blooded vertebrates (Johnson et al. 2007), amphibians are particularly susceptible to the pathogen. Chytrid is an invasive fungus and an emerging World Health Organization designated infectious disease (Olson et al. 2013). The protocol listed in the plan provides guidance on equipment, chemicals, and cleaning process to prevent the spread of these diseases. In addition, there is mention of a seed cleaning protocol as part of a suite of best management practices to prevent the spread of invasive plants.
- The Portland Water Bureau finalized an Invasive Plant Standard Operating Protocol in 2013 consistent with US Forest Service requirements (Portland Water Bureau and US Forest Service 2014).

The following general best management practices, adapted from a variety of sources (Halloran, Anderson, and Tassie 2013; Creative Resource Strategies, LLC 2016; Elwell and Phillips 2016; Port of Portland 2016; US Forest Service 2016; Washington Invasive Species Council 2016), including a draft *City of Portland Best Management Practices for Preventing the Spread of Invasive Species,* should be integral to maintenance, construction, vegetation management and other activities on city lands and waters. These guidelines are intended for City of Portland Staff and city contractors who manage vegetation as part of their work in parks, natural

areas, or rights-of-way. Portland Parks and Recreation (PP&R), Portland Bureau of Transportation (PBOT), Bureau of Environmental Services (BES), and Portland Water Bureau (PWB) are the primary bureaus with vegetation management responsibilities.

## A. Education and Support

Knowledge of invasive species and techniques to avoid their spread is critical to the implementation of all BMPs.

**A.1 Provide trainings and educational materials for staff and contractors.**

- Conduct training sessions on sanitation procedures for mowers and other equipment.
- Provide brochures and other materials on weed identification. Keep materials updated with current weeds of concern.
- Provide checklists and instructions for execution of BMPs in the field.
- Communicate the impact of invasive species and the importance of prevention in trainings and educational materials.
- Provide contact information for reporting invasive species observations.

## B. Planning and Records

These BMPs apply to the early phases of construction, restoration, or maintenance projects. They are directed at individuals involved in planning project activities and setting maintenance schedules, and primarily pertain to work on rights-of-way and natural areas. Prompt and detailed reporting of invasive species significantly enhances the ability of the city to respond to the introduction and spread of invasive species.

**B.1 Include an invasive species risk evaluation as a component of initial project planning.**

- Evaluate the risk of:
  - Spreading invasive seeds and other propagules from the project site to new areas. Identify invasive species in and surrounding the site. Identify control and sanitation measures that would reduce this risk.
  - Bringing invasive propagules into the site during project activities. Consider any use and transportation of project vehicles outside of the project area. Identify sanitation measures that would reduce this risk.
  - Introducing invasive species to the site as part of long-term use and maintenance. Evaluate different points of entry. Consider design options which would reduce this risk.
- Identify locations most at risk for contamination by invasive propagules, including areas near invasive patches, access points, or streams. Prioritize monitoring and any necessary treatment in these areas.

**B.2 Incorporate design components that minimize the movement of invasive propagules into or out of the site.**

Install boot brushes and educational signage at the entrances of natural areas that are used by the public. If dogs are allowed, include rules regarding mandatory leashes and dog waste removal.

**B.3 Incorporate sanitation and invasive control measures into plans, budgets, and contracts.**

- Consider the use of specialized gear and clothing, tools for sanitation, and any staff training.
- Allocate time for prevention and sanitation activities into schedules.
- If at all possible, plan for the time and costs of monitoring for invasive species before and after the project activities.

**B.4 Schedule activities to minimize the potential for spread of invasive propagules into or out of the site.**

- Consider life stages of invasive plants. Avoid activities that may spread propagules when plants are fruiting.
- Check existing invasive plant control schedules. Avoid activities that would nullify weed treatments. For example, avoid mowing a patch immediately after it has been treated with herbicides.
- Consider the toxicity, ecological fate, persistence, and unintended consequences of pesticides. Consider timing to avoid impacts to pollinators, nesting birds and mammals, and to trail users, medicine and food harvesters, and other public use.

**B.5. Record observations of all suspected ODA and City of Portland A-ranked species and others of concern.**

- Note the date, location in as much detail as possible, approximate size of the

patch, species identity if known, and stage of the plant (flowering, fruiting, etc.).

- Take photos of the invasive species. Be sure to get photos of leaves and fruits or flowers.
- Report invasive species observations to the appropriate vegetation manager for identification and treatment. Report all observations to a vegetation manager in your program for identification and treatment.

## C. Soil Disturbance

Disturbing soil creates opportunities for the establishment of weed species. These BMPs are intended for workers involved in road maintenance, vegetation clearing, moving of vehicles and heavy equipment, or other activities that disturb soil to prevent weed establishment.

**C.1 Minimize soil disturbance—Whenever possible, activities should be avoided in areas containing fruiting, or rhizomatous invasive plants.**

- When soil must be disturbed, use proper erosion control practices—Minimize soil disturbance in areas containing invasive plants. Should invasive plants be detected early, use a certified pesticide applicator and spray within limits of pesticide permit, and/or take other actions as may be deemed appropriate.
- Stabilize disturbed soils as soon as possible by seeding, mulching or using stone or other materials that are free of invasive plant materials—Plant species on the prohibited invasive plant list should never be planted. Site-specific revegetation efforts should address site preparation, species selection, and overall maintenance of the area. The activities to reduce invasive plants are intended to compliment other practices addressing erosion control, proper drainage, and protecting the initial investment in the infrastructure. Materials, such as fill, loam, gravel, mulch or hay should not be brought into project areas from sites where invasive plants are known to exist or have existed.

**C.2 Manage and contain any water runoff, which can carry weed propagules.**

**C.3 Plan for cleaning time when you estimate travel to and from project sites.**

## D. Project Materials

Project materials are common dispersal vectors for weed propagules to new locations. Soils, erosion control materials (especially if reused), landscape materials, water, and other materials can all contain propagules. Use of these BMPs can prevent the introduction of weed species to a project site through contaminated materials.

**D.1 Use project materials that are known to be weed free.**

- Whenever possible, re-use weed-free materials from onsite rather than importing new materials.
- When re-using materials is not possible, obtain materials from local vendors, ideally those offering weed-free materials. Inspect materials for weed propagules.
- Use certified weed-free seed.
- Monitor for weeds after the installation of new materials. Treat any Rank A and Rank B weeds found at early stages to maximize effectiveness of control.

**D.2 Prevent contamination and germination of weed propagules in unused stockpiles of materials.**

- Cover exposed materials to protect from wind and rain.
- Inspect stockpiles prior to use. Treat any weeds found before the material is used.

**D.3 Prevent contamination when transporting project materials.**

- Never move materials from a weed-infested to an un-infested location.
- Cover materials during travel to prevent either contamination of clean materials, or spread of propagules from infested materials.

## E. Travel and Maintenance of Equipment—Disinfection Protocols

City staff and contractors can spread invasive species as they travel from site to site. These BMPs should be implemented at all visits to sites known to, or suspected to, contain invasive species. All contractor vehicles, especially those arriving from outside Portland, should be examined for potential weed propagules: mud, soil, vegetation on vehicle undercarriages, wheel wells, bumpers and grills. Wearing appropriate clothing, boots, and other gear, and cleaning them before leaving a site can prevent them from transporting weeds to new sites. Following these BMPs will minimize introduction of invasive species by equipment, vehicles, and people traveling among project sites.

**E.1 Locate and use a staging area that is free of invasive plants.**

**E.2. Consider where you drive.**

- Avoid driving off-road, or parking in areas

infested with invasive species.

- Arrange routes to travel to uninfested sites first, when the vehicle is clean. Visit weedy/infested sites last.

**E.3. Inspect and Clean**

- Designate cleaning areas for tools, equipment and vehicles—Ideal locations include paved or sealed surfaces. Avoid waterways and sensitive habitat areas.
- If equipment must be used or staged in areas where invasive plants occur, all equipment, gear (i.e., boots), machinery, and hand tools should be cleaned of all viable soil, plant, and animal material before leaving the project. Acceptable methods of cleaning include but are not limited to:
    - Portable wash station that contains runoff from washing equipment (containments must be in compliance with wastewater discharge regulations). If on-site cleaning is not an option, clean equipment at a commercial car wash facility. For vehicles and other large equipment, pay particular attention to the undercarriage and treads of tracks and tires.
    - High pressure air.
    - Brush, broom or other tool (used without water)—this is likely to be the BMP most practiced to avoid unintentional transport of invasive species as equipment moves from site to site.
- If equipment must be used in areas containing Japanese knotweed or Purple loosestrife, aboveground plant material should be cut and properly disposed of (see Transport & Disposal of Plants section) prior to the start of work. If excavation occurs in these areas, see Transport & Disposal of Plants and Excavated Material sections.
- Aquatic sites— Before leaving any aquatic site or any site in wet condition, thoroughly remove all organic matter (e.g., mud, plants, algae) from nets, sampling devices, boots (especially the tread), and any other equipment or clothing that has come into contact with water or aquatic sediments. Follow the equipment decontamination protocol recommended by the US Fish and Wildlife Service for Yosemite National Park).
- Watercraft—Inspection and decontamination procedures for watercraft entering and leaving waterbodies should follow the Uniform Minimum Standards and Protocols for Watercraft Inspection and Decontamination Programs for Dreissenid Mussels in the Western United States (Elwell and Phillips 2016).
- Firefighting activities—US Forest Service and Bureau of Land Management prevention activities associated with the transport of water during firefighting activities should be used to prevent the spread of invasive species, sanitize equipment, and address disposal and safety concerns.
- Working in water bodies:
    - Sample from least to most invasive species-contaminated areas within the waterbody, for example, sample upstream to downstream or from areas of less weed growth to dense weed growth.
    - Minimize wading and avoid running boats onto sediment. For example, use bank sampling poles instead of wading.
    - Avoid getting plants, sediment, and fish inside boats or other sampling gear.
    - Use a catch pan underneath dredges, etc., to keep potential invasive species off boat decks and out of bilges.
    - Clean, Drain, Dry—
        - CLEAN—Remove any visible vertebrates, invertebrates, plants, plant fragments, seeds, algae, and dirt. If necessary, use a scrub brush and rinse with clean water either from the site or brought for that purpose. Continue this process until the equipment is clean.
        - DRAIN all water in bilges, samplers, and other equipment that could hold water before leaving the site.
        - DRY— Fully wipe down all equipment until dry.
    - Decontaminate, if possible— Decontamination options for aquatic invasive species include Vegetation management primarily includes mowing, clearing, trimming, and herbicide application. hot water wash or soak,

cold/freezing drying, Formula 409 All-Purpose Cleaner, Sparquat 256, Quat 128, or hydrogen peroxide (Washington Invasive Species Council 2016).

## F. Transport & Disposal of Plants

After invasive plant removal, plant parts must be properly disposed of to prevent establishment in other locations.

**F.1 When disposing on site, minimize the chance of viable material spreading by choosing a location where viable plant material will be contained, buried, or destroyed. Conduct monitoring at and near debris piles to treat any weeds that may have spread during the disposal and degradation process.**

- Drying/Liquefying: For large amounts of plant material, or for plants with rigid stems, place the material on asphalt, and under tarps, or heavy plastic to prevent the material from blowing away. For smaller amounts of plant material, or for plants with pliable stems, bag the material in heavy- duty (3 mil or thicker) garbage bags. Keep the plant material covered or bagged for at least one month and up to 3 months. Material is nonviable when it is partially decomposed, very slimy, or brittle. Once material is nonviable, it can be disposed of in an approved landfill or brush pile.
- Brush Piles: Plant materials from most invasive plants can be piled on site to dry. However, for some species, care must be taken to pile stems so that the cut surfaces are not in contact with soil. This method is not recommended for any invasive plant with seeds or fruit attached, unless plants can be left within the limits of the infestation.
- Burying: Plant material from most invasive plants can be buried a minimum of three feet below grade. This method is best used on a job site that is already has disturbed soils. Recommended for any invasive plant except Japanese knotweed, unless it can be buried at the site of infestation at least five feet below grade.
- Burning: Plant material should be taken to a designated burn pile. (All necessary permits must be obtained before burning). Recommended but often not feasible for any invasive plant, especially Japanese knotweed.

**F.2 Herbicide**

- If herbicides are applied at the disposal sites, only licensed applicators are allowed to apply herbicide treatments.

**F.3 When disposing off site, select appropriate disposal locations and transport properly.**

- Invasive plant material must be covered during transport and transport vehicles swept clean at the transported location.

## G. Vegetation Management—Impacts of Mowing Invasive Plants

Mowing—Few studies have been conducted on the effects of mowing plant communities and invasive plants. What is known is that maintenance roadside mowing, although essential for safety, aesthetic, operational and environmental purposes, can, has and does play a significant role in the introduction, spread, and proliferation of invasive plants. To the extent practicable, mowing should be avoided in areas containing invasive plants.

**G.1 When using motorized tools such as mowers, always treat the most weedy/ invasive areas last to avoid spreading weeds over a larger area.**

**G.2 Timing**

- Mowing can serve as a control method for invasive plants during certain periods of their reproductive cycles, but repeated mowing and attention to timing will be required. Mowing is most effectively used in combination with other vegetation management and invasive species control techniques. Mowing of large infestations of invasive plants is a long-term commitment, which drops mowing down the list of preferred control methods for any particular site. Timing is primarily based on the growth stage of the plants to be mowed (mowing should always be done prior to seed maturation), which typically occurs later in the last half of the summer, secondarily, on the growth stage of the desired plants. If mowing occurs after seed maturation, hand clean, with brush or broom, upper parts of contaminated mowing equipment prior to moving to new locations, especially uncontaminated locations.

### G.3 Mower Height

- Most grasses can tolerate short mowing once dormant. If the dominant vegetation has not yet shifted to invasive species and still contains adequate grass cover, mowing should generally be timed so the invasive plants are at the flowering stage and grasses are dormant. When the dominant vegetation is heavily infested with invasive plants, mowing height should be set at two inches high when the invasive plant is at the flowering stage. However, in some cases invasive species will reach the appropriate stage for mowing, but the grasses have not reached dormancy. If so, mow the invasive plants at a height above the desired plants. Mowing above the height of actively growing grasses allows seed production and unrestricted growth; this maintains vigor needed to minimize reinvasion. Defoliating the invasive plants reduces seed production and vigor, increasing resources available for neighboring grasses.

### G.4 Mowing Frequency

- Mowing frequency for invasive species control should depend upon precipitation and the mowing tolerances of the vegetational function of relative growth rates, leaf replacement potential and the plant's ability to increase photosynthesis after mowing to compensate for leaf loss. Particularly important are the number, location and source of growing points on plant stems. An effective mowing strategy minimizes the removal of growing points of the desired plants and maximizes removal of growing points of the invasive plants. In addition, for annual, biennial, and tap rooted perennials the frequency of mowing will depend on precipitation. A single midsummer mowing after flower production can reduce or eliminate seed production and shift the balance in favor of desired plants in areas with little to no summer rain. However, as summer rains increase, regrowth potential increases, and mowing may increase plant vigor and seed production similar to pruning, requiring additional mowing.

### G.5 Cleaning

- To avoid spreading invasive plants when mowing, invasive plant seeds and other plant material must be removed from mowing equipment. Equipment must be cleaned at least daily, as well as prior to transport. This can be done with a brush or broom at the mowing site. Water should not be used unless a portable wash station is used. Maintenance personnel should avoid coming in direct contact with poisonous invasive plants and wear appropriate clothing (i.e., long sleeve shirt and gloves).

### G.6 Avoid Mowing Certain Invasive Species

- Some invasive plants, such as Japanese knotweed and Purple loosestrife, can sprout from small fragments of stem. If these plants are not causing a safety concern, mow around them where possible. If these plants are causing safety concerns (blocking signs or sight distance, or encroaching on the roadway or shoulders), they should be removed using one of these methods. If plant populations are deemed too large, then consider the next two best management practices listed here.
- Whenever possible and to the extent practicable these plants should be cut with hand tools or line trimmers.
- Whole, intact stems can be left at the site of infestation, or stems can be bagged in heavy duty plastic bags and allowed to rot in the bags prior to disposal, burned off-site, or buried at least three feet below grade; five feet below grade for Japanese knotweed.
- If plants are deemed too large to manage by hand, they can be mowed preferably prior to seed maturation, (approximately August 1st). All equipment must be cleaned thoroughly before leaving the site of infestation. Mowing should be limited to only the portion of the patch that is impacting safety.

### G.7 Herbicide Use

- The intent to use herbicides to control invasive plants in the highway rights-of-ways is specific to preventing highway infrastructure damage and costly maintenance. Most importantly, it is intended to protect the traveler by addressing safety concerns and highway worker health when threatened by poisonous plants.

## H. Excavated Material (includes ditching)

### H.1 Reuse of excavated material

- Excavated material from the areas containing

invasive plants may be reused within the exact limits of the infestation. Excavated material taken from the sites that contain invasive plant materials cannot be used away from the site of infestation until all viable plant material is destroyed.

**H.2 Excavated material used outside the limits of the infestation**

- Any excavated material that contains viable plant material and is not reused within the limits of the infestation must be stockpiled on an impervious surface until viable plant material is destroyed, or the material must be disposed. Material must be disposed of by burying a minimum of three feet below grade. Japanese knotweed must be buried at least five feet below grade.
- Excavated materials including soil and other materials containing invasive plants must be covered during transport.

**H.3 Avoid excavation in certain areas**

- Whenever possible, excavation should be avoided in areas containing Japanese knotweed and Purple loosestrife.

## I. Revegetation and Landscaping

Proper revegetation and landscaping work can create weed-resistant plant communities. Without proper care, however, landscaping activities and materials can serve as vectors for invasive species.

**I.1 Select vegetation appropriate to the site to maximize weed resistance.**

- For roadsides use low-growing plants that are adapted to disturbance and require little mowing or trimming.
- When possible plant trees or shrubs along the borders of natural areas to serve as a barrier to invasive propagules, keeping them out of the interior of the site.
- Use a plant palette that will occupy a variety of planting zones.

**I.2 Use plants from a local source.**

- Use local ecotypes whenever possible for best plant establishment.
- Verify the taxonomy of species to be planted.
- Ensure all species to be used are approved on the Portland Plant List.

**I.3 Mitigate the risks of unintentional invasive species introductions during site preparation activities.**

- Whenever possible, time site preparation activities when invasive species are not producing seed.
- Treat any invasive species found during the site preparation process.
- Minimize soil disturbance to the amount necessary for planting.

# 2018 City Employee Survey

## *Summary*

In April of 2018, a survey instrument (Appendix A-5) was distributed to a list of city employees that have a nexus with invasive species—employees from Bureau of Environmental Services (BES), Portland Parks and Recreation (PP&R), Portland Bureau of Transportation (PBOT), Portland Water Bureau (PWB), Bureau of Development Services (BDS), and Bureau of Planning and Sustainability (BPS). The survey instrument was designed to solicit information on priorities, regulations and policies, partnerships, funding, evaluating program effectiveness, and challenges. The following highlights the key points from the survey:

- The predominant criteria used to prioritize invasive species work is characteristics of a plant, or infestation, however, four other categories placed second in terms of importance—management plan/project goal, impact/threat to an asset, level of service, and regulatory requirements. This finding underscores the value of planning and policy; when plans and project goals are developed, level of service/desired ecosystem services is determined, and regulatory requirements are established, and the drivers are in place for land management staff to take actions to achieve success based on those parameters.
- The top three most common species staff spent time and resources on in 2017 are recognized by many staff as being firmly established species in the Portland metropolitan area. A shift in focus from species-specific thresholds to desired ecosystem services could potentially allow for a redirection of resources to other species on higher priority sites.
- EDRR species lists need to be updated, with increased flexibility to add new species in a timely manner as well as remove those when eradication or containment is not feasible. Periodic science reviews and a multi-disciplinary, multi-bureau team to vet the process and approach for listing and delisting EDRR species could help advance collaboration and cooperation. One standardized city list would promote a shared understanding of priorities and collaboration among bureau staffs.
- Of the eight well-recognized categories of invasive species activities (e.g., prevention, monitoring, coordination, etc.), most survey respondents affirmed EDRR is the highest priority, followed by management/

control, monitoring/surveillance, and prevention.

- Maintenance of natural resource assets requires a consistent, long-term effort and adequate funding to achieve desired ecosystem services goals. Some programs receive short bursts of funding (13–24 months) for invasive species removal and vegetation management, however, lack of long-term funding has resulted in several sites reverting to dominance by invasive species when resources are no longer available to manage the site.
- Portland's invasive species laws and regulations were rated excellent or good by 58% of respondents. Changes to the Portland Plant List, tree code mandates that limit management flexibility on a site-by-site basis, lack of enforcement, need for an all-taxa approach, prohibiting local control of pesticide use, enhanced regulations and guidelines to protect aquatic environments, changing the requirement for native plant establishment on mitigation sites, and updating Environmental Overlay Zone recommendations were some of the most common recommendations for improving laws and regulations.
- There is a philosophical approach spectrum to invasive species management as well as uncertainty relative to roles and responsibilities among bureau staffs that share management responsibilities on city lands. Although most peer-reviewed science indicates that invasive species have deleterious effects, several studies have documented positive effects from the existence of invasive species. For example, in highly urbanized and fragmented systems where native species are rare, the presence of a non-native fruiting shrub provides essential food resources to migratory birds (Gleditsch and Carlo 2010).
- Siloes exist relative to management and tracking performance metrics and control actions on city properties.
- There is a need for consistent messaging to the public regarding the harm and control of invasive species.
- There are different definitions of success and different goals for site health.
- Invasive species priorities need to be articulated for each of the programs.
- Insufficient resources exist to monitor the effectiveness of treatments, making it difficult to support continuous improvement and assess future resource allocation via funding investments.
- Inadequate funding, followed by public awareness, and political will, were identified as the top three obstacles to effectively implementing invasive species programs in the City of Portland.
- The four most common suggestions to improve how the City of Portland addresses invasive species were: providing additional funding and capacity; developing a cohesive, consistent approach/best management practices/goals across all bureaus and programs; changing the goals of management to focus on ecosystem functions, not species origin, and changing the paradigm to include ecosystem complexity and resiliency as well as adaptability in the face of climate change; and supporting more outreach and education.

## *Survey Result Details*

A total of 36 individuals representing six bureaus in the city completed the survey. (Figure 10).

### 1. Criteria used to prioritize

Respondents were asked to describe the criteria they used to prioritize work. Characteristics of the plant/infestation was the most common criteria (Figure 11). The second tier of criteria used included management plan or project goal; impact, or level of threat to an asset; desired future condition, and regulatory requirements.

### 2. Management Plans and Guidance Documents

Survey respondents were asked to describe the

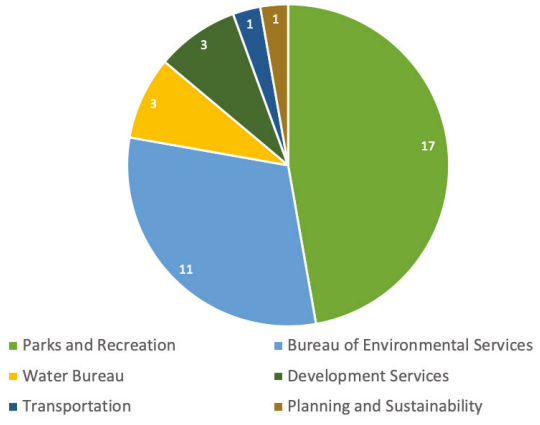



***Figure 10.*** City employee survey respondents included 36 individuals representing six city bureaus.

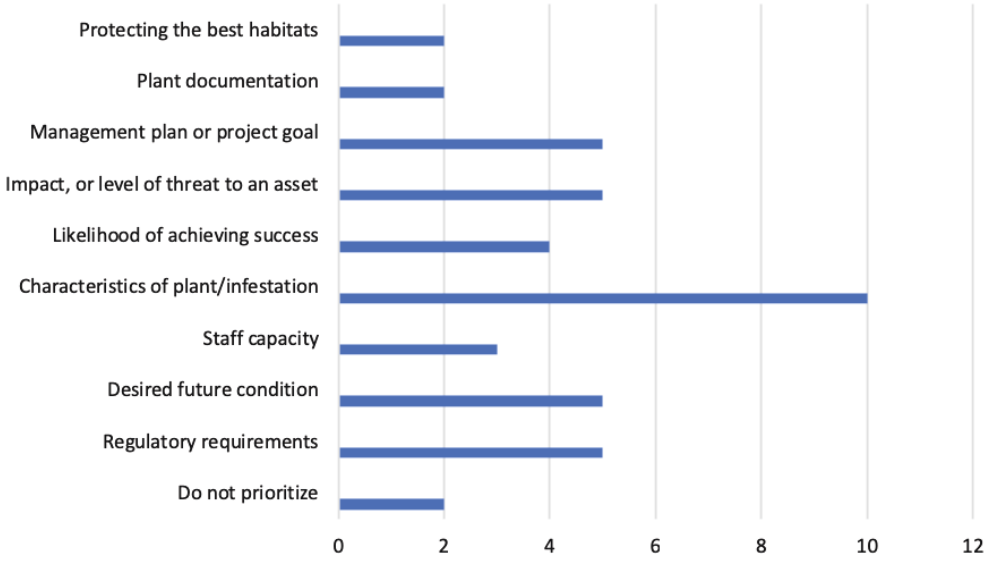



***Figure 11.*** Criteria used to prioritize invasive species work.

management plans or guidance documents used to guide invasive species work. A total of 35 respondents answered the question, and many provided more than one source.

Examples of lists provided include Portland Plant List, Oregon State Noxious Weed List, ISSP lists for the Bureau of Land Management, and the EDRR List. Examples of management plans provided included the Management Plan, Watershed Management Plan, Bull Run Invasive Species Management Plan, Bull Run Habitat Conservation Plan, Forest Park Natural Resource Management Plan, River View Natural Area Management Plan, other management plans, BES Strategic Plan, Erosion and Sediment Control Manual, and Integrated Pest Management Plans (Figure 12). Two individuals described a diversity of tools they use to guide their work, including, the 2035 Comprehensive Plan, State Land Use Goal 5, Environmental Overlay requirements; knowledge of colleagues; desired future conditions; Title 1; PBOT Maintenance Environmental Handbook, cooperative agreements, observations, Cooperative Weed Management Area goals, Oregon Department of Agriculture, Oregon State University, Bureau of Environmental Services, Natural Resource Matrix, stewardship agreements with partners, Department of State Lands/US Army Corps of Engineers permits, and Bureau of Development Services land use reviews.

**Species in which 10 or more respondents stated they spent resources on in 2017.**

- Atlantic/Irish/Common/English ivy (*Hedera hibernica/helix*) (17)
- Blackberry—Himalayan/Armenian blackberry (*Rubus* spp.) (16)
- Garlic mustard (*Alliaria petiolata*) (15)
- Lesser celandine (*Ficaria verna*) (13)
- Common holly (*Ilex aquifolium*) (10)
- Old Man's Beard (*Clematis vitalba*) (10)

**Species in which 4–9 respondents stated they spent resources on in 2017.**

- Knotweeds (*Polygonum* spp.) (9)
- Slender false brome (*Brachypodium sylvaticum*) (8)
- Canada thistle (*Cirsium arvense*) (6)
- Reed canary grass (*Phalaris arundinacea*) (6)
- Impatiens (*Impatiens glandulifera, I. bicolor, I. parviflora*) (6)
- English laurel (*Prunus laurocerasus*) (6)
- Hawkweed (*Hieracium* spp.) (5)
- American pokeweed (*Phytolacca americana*) (4)
- Hawthorn (*Craetagus* spp.) (4)
- Water primrose (*Ludwigia* spp.) (4)
-

**Species in which 1–3 respondents stated they spent resources on in 2017.**

- Butterfly bush (*Buddleia davidii*) (3)
- Drooping sedge (*Carex pendula*) (3)
- Goats rue (*Galega officinalis*) (3)
- Italian arum (*Arum italicum*) (3)
- Blessed milk thistle (*Silybum marianum*) (3)
- Norway maple (*Acer platanoides*) (3)
- Purple loosestrife (*Lythrium salicaria*) (3)
- Shiny geranium (*Geranium lucidum*) (3)
- Tree of heaven (*Ailanthus altissima*) (2)
- Bittercress (*Cardamine hirsuta)* (2)
- Chickweed (*Stellaira media*) (2)
- Common holly (*Ilex aquifolium*) (2)
- Dutch elm disease (2)
- Giant hogweed (*Heracleum mantegazzianum*) (2)
- Oblong spurge (*Euphorbia oblongata*) (2)
- Poison hemlock (*Conium maculatum*) (2)
- Teasel (*Dipsacus fullonum*) (2)
- Weedy grasses (2)
- "Blackberries" (2)
- All trees on the PPL, Nuisance Plant List (1)
- Bindweed (*Calystegia sepium*) (1)
- Bittersweet (*Solanum dulcamara*) (1)
- Crabgrasses (*Digitaria* spp.) (1)
- Creeping fescues (1)
- Foxtail grass (*Alopecurus pratensis*) (1)
- Herb robert (Geranium robertianum) (1)
- Japanese hedge nettle (Stachys palustris) (1)
- Jewelweed (*Impatiens capensis*) (1)
- Mint (*Mentha* spp.) (1)
- Money plant (*Lunaria annua*) (1)
- Quack grass (*Elymus repens*) (1)
- Scotch broom (*Cytisus scoparius*) (1)
- Sulfur cinquefoil (*Potentilla recta*) (1)
- Tall fescue (*Festuca arundinacea*) (1)
- Tansy (*Tanacetum vulgare*) (1)
- Vetch (*Vicia* spp.) (1)
- Wild chervil (*Anthriscus sylvestris*) (1)
- Yellow archangel (*Lamium galeobdolon*) (1)
- Linden tree (*Tilia* spp.) (1)

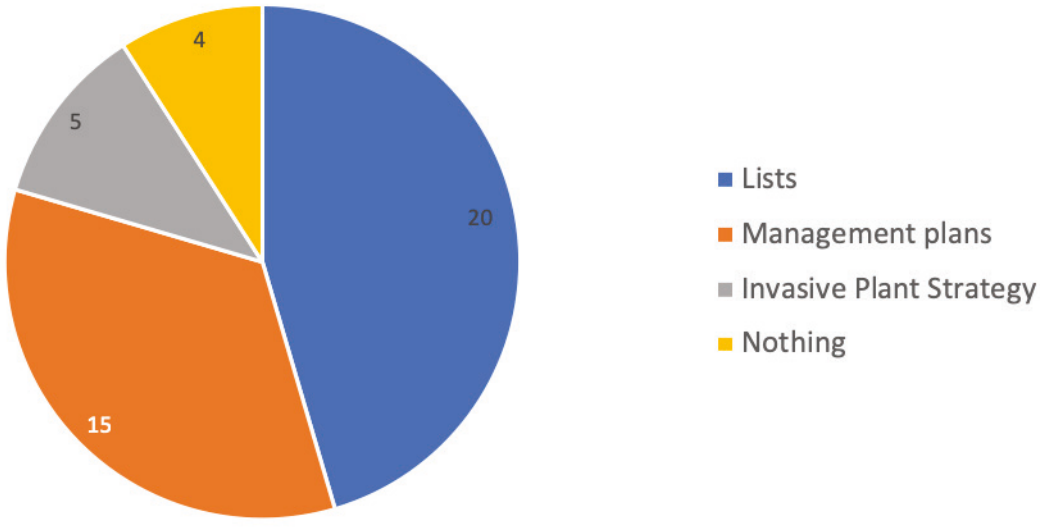



***Figure 12.*** Respondents described documents used to guide invasive species work.

### 3. Describe up to 10 invasive or nuisance species/weeds resources were expended in 2017.

A total of 29 of 36 individuals provided a list of species. The following list is organized by number of individuals (in parentheses) that listed a species. In addition, six individuals referenced their efforts associated with emerald ash borer planning work.

### 4. List up to 10 species the bureau, or program, should prioritize if those species were not included in the list in the previous question.

A total of 10 individuals suggested the following species should be priorities:

Spurge laurel, yellow archangel, tree of heaven, Dutch elm disease, emerald ash borer, Asian longhorned beetle, bronze birch borer, lesser celandine, poison hemlock, Himalayan blackberry, English/Irish ivy, reed canary grass, common holly, money plant, slender false brome, drooping sedge, Norway maple, American pokeweed, cotoneaster, Asian gypsy moth, earthworms.

Several respondents indicated their priorities were not as focused on species but more on other factors:

- Thresholds—Use thresholds per site as well as management goals to establish priorities. For example, one respondent noted a priority is placed on weeds in flower or setting seed, with a minimum threshold of 25% of an area consisting of these weeds. For weeds with no immediate risk of spreading, the threshold is 50% of the area.
- Effects on property, infrastructure, and ecosystem function—One respondent stated EDRR species should be the priority as well as those that do damage to property, infrastructure, or habitats. Another noted that assessing the ability of the species to impede the fulfilment of maximizing ecosystem services at the site, and promoting using a complex adaptive systems framework to establish priorities were important. This respondent also states that species with the greatest impact would likely be emerald ash borer, Asian longhorned beetle, gypsy moth, introduced earthworms, slugs, bivalves, and pathogens. This same respondent indicated invasive plants should be prioritized based on their ability to change systems.
- Site specific—One respondent noted prioritization should be site-specific.

One respondent requested an updated list of EDRR species, noting there are numerous species beyond the early detection phase, and attempts to eradicate them are not feasible. One example provided was garlic mustard.

### 5. Rank the following by importance: Monitoring or Surveillance, EDRR, Prevention Activities, Management or Control Activities, Outreach and Education, Research, Coordination, and Policy Work. Note: Ranking of 1 = most important; ranking of 8 = least important.

A total of 36 individuals (100%) responded to this question. Early Detection Rapid Response was selected as the most important by 13 of 36 (36%) of respondents (Figure 13). The second and third most important categories listed by respondents was Management or control (26%) and Monitoring or surveillance (22%). Categories of average importance (categories 4 and 5) included Prevention (19%) and Outreach and Education (18%). Policy work, Research, and Coordination were the bottom three ranked categories.

### 6. List the species of focus for EDRR efforts in 2017 (if applicable).

A total of 17 individuals responded to this question. The most common EDRR species were garlic mustard (14 of 17 respondents, or 82%), slender false brome (8 of 17 respondents, or 47%), and Japanese knotweed (7 of 17 respondents, or 41%).

- Garlic mustard (*Alliaria petiolota*) (14)
- Slender false brome (*Brachypodium sylvaticum*) (8)
- Japanese knotweed (*Polygonum cuspidatum*) (7)
- Lesser celandine (*Ficaria verna*) (5)
- Hawkweeds (*Hieracium* spp.) (4)
- Impatiens (*Impatiens glandulifera, I. bicolor, I. parviflora*) (4)
- Water primrose (*Ludwigia* spp.) (3)
- American pokeweed (*Phytolacca americana*) (3)
- Italian arum (*Arum italicum*) (3)
- Goatsrue (*Galega officinalis*) (2)
- Blessed milk thistle (*Silybum marianum*) (2)

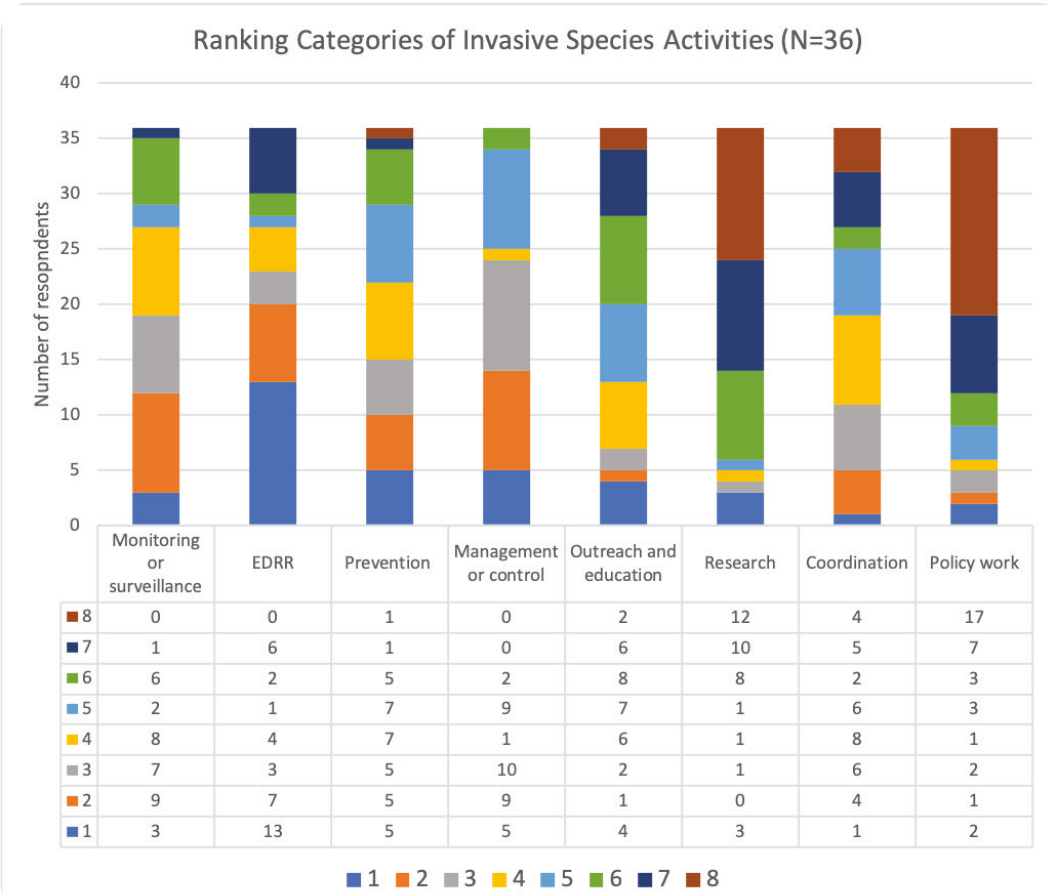



***Figure 13.*** Ranking invasive species by importance.

- Purple loosestrife (*Lythrium salicaria*) (2)
- Spurge laurel (*Daphne laureola*) (2)
- Yellow archangel (*Lamium galeobdolon*) (2)
- Atlantic/Irish/Common/English ivy (*Hedera hibernica/helix*) (1)
- Giant hogweed (*Heracleum mantegazzianum*) (1)
- Shiny geranium (*Geranium lucidum*) (1)
- Japanese hedge nettle (*Stachys palustris*) (1)
- Herb robert (*Geranium robertianum*) (1)
- Leather flower (*Clematis vitalba*) (1)
- Sulfur cinquefoil (*Potentilla recta*) (1)
- Drooping sedge (*Carex pendula*) (1)
- Asian gypsy moth (1)
- Spotted knapweed (*Centaurea stoebe*) (1)

## 7. Provide additional information about species worked on, or priorities.

A total of 17 individuals provided information, which included insights into how people view managing invasive species in an adaptive management context. One respondent described "disheartening trends," in which sites where short-term invasive species control projects were implemented are now overrun with invasive plants, emphasizing the importance of long-term efforts and adequate funding. One supervisor noted that staff are observing declines in the amount/presence of EDRR species being treated with herbicide, with the exception of Italian arum. One respondent commented on the importance of ensuring treatments offer the "biggest lift", emphasizing monitoring and adaptive management whereas another respondent described the importance of documenting decision-making criteria used to establish prioritization.

One respondent described the recognition of interconnectedness of lands in the Portland metropolitan area, and the reliance on communities to highlight EDRR species to ensure Bull Run watershed and other areas are protected.

One respondent highlighted the differences of opinion among the bureaus on the existence and role of invasive species in an urban ecosystem. For example, one respondent noted that invasive species have been in the area for a considerable time, and likely will not be eradicated, therefore, removal of species should be based on meeting a specific goal, versus controlling them with the assumption that it will improve ecological function. Another respondent commented that, in the past, significant resources were spent conducting large-scale invasive plant removal to reduce the coverage of that particular species on the landscape, however, invasive weed removal is currently being conducted in locations where there is a "demonstrable site-specific reason" to remove the species. One respondent noted there has been a focus in the past on invasive plants, but emerging trends relative to invasive insects and invertebrates require prevention, and ultimately, management efforts. It was also noted that stricter policies at the municipal level would provide more enforcement in the removal and control of invasives.

## *Regulations and Policies*

### 8. Laws, or policies, that provide authority to engage in nuisance species and weed activities.

A total of 32 respondents provided the following policies and documents that guide their efforts: city codes, ordinances, and resolutions, federal and state laws, management plans, the *2008 Invasive Plants Strategy*, intergovernmental agreements, manuals, the Portland Plant List, the 2035 Portland Comprehensive Plan, program goals and guidelines, worker protection standards, state applicator licensing laws, maintenance standards, organizational mandates, and land use reviews.

### 9. Rate the effectiveness of laws and regulations that govern invasive or nuisance species/weed work in Portland.

A total of 36 individuals (100%) responded. Portland's invasive species laws and regulations were rated excellent (2), good (19), fair (11), and poor (4) (Figure 14).

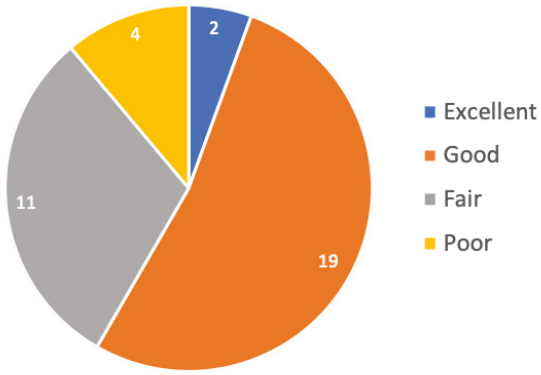



***Figure 14.*** Respondents rated the effectiveness of laws and regulations that govern their invasive species work in Portland.

### 10. Existing regulations pertaining to invasive species in the City of Portland, and/or State of Oregon, that need to be improved—and why.

A total of 19 respondents (53%) provided suggestions relative to Portland's existing regulations, including:

**Species Lists**

- BES EDRR Program List
- EDRR species need to be updated, with increased flexibility to add new species in a timely manner, as well as the ability to remove those when eradication or containment is no longer feasible. Consider periodic science reviews and a multi-disciplinary team to vet the approach for EDRR species and required eradication species.
- Classification of species for management based on origin is nonsensical for an urban area. Policies that categorize sites based on percent native and non-native, or evaluations that use this, don't consider site-specific ecosystem function. There are some benefits to banned, or invasive plants; some required eradication species, such as blessed milk thistle, have medicinal values, and are constantly introduced through a railroad pathway, making eradication unrealistic. Impacts of removal and techniques should be weighed against potential harm of invasive species.
- Portland Plant List and State Noxious Weed List—Both should include more species and be enforced. Rank species by ecological impact, not distribution and abundance. Performance metrics based on percent native versus non-native cover are unrealistic, or not ecologically justified.

**Tree Code—**The tree code is limiting the ability to manage a diversity of habitats. Mandating replacing invasive trees with trees does not consider the suite of solutions for restoring functional plant communities. Alternatively, there are unintended canopy consequences and impacts on tree mitigation as a result of new species being added to the Portland Plant list, e.g., horse chestnut trees can now be removed with decreased mitigation requirements, affecting canopy maintenance

**Enforcement**—The source of many weeds is property owners that fail be to accountable for weeds on their lands—mandate that people remove them or pay the city to remove them. Outreach and education needs to be a component of enforcement.

**All-taxa approach**—Expand the city's focus to include all invasive species, and provide adequate funding for implementation.

**Pesticide use**—Prohibit local control of pesticide use.

**Aquatic invasive pathways**—Implement fishing regulations that preclude the removal of invasive game fish; change Marine Board funding guidelines to mandate boat wash stations for all new or improved water access sites.

**Mitigation sites**—Change the BDS and DSL requirement for native plant establishment on mitigation sites to manage listed noxious weeds instead; this considers that most sites have established seed banks and are surrounded by weed-infested sites.

**Planning and Zoning**—Environmental Overlay Zone regulations need to be updated and reviewed from the perspective of invasive/nuisance plants. Invasive species control should be required in all areas of the city.

Several individuals commented on the desire to focus on ecosystem services and functions, especially as it relates to improving the quality of air, water, and soil. Restricting permitted projects to native species often requires additional maintenance and herbicide, with lesser overall ecosystem benefits than some non-native plants. Additionally, plants procured as native may negatively impact built and natural areas due to misidentification of weedy exotics, introduction of plant pathogens and pests, and introduction of deleterious genetic material.

### 11. Provide additional comments relating to invasives.

- A total of eight respondents provided additional comments, including:
- **Neonicotinoids**—Questioned the development and implementation of policy PRK 3.10 (Prohibition on Use and Purchase of Neonicotinoid Pesticides by City of Portland), which prohibits the use and purchase of neonicotinoid pesticides by the city (although the individual did not comment further). This emergency ordinance (#187078) was passed by City Council and effective April 1, 2015.
- **Regulations**—Strengthen regulations and penalties across jurisdictions while fostering relationships with private landowners, seek enhanced mechanisms to incentivize private property owners to manage high priority invasive species, and strengthen enforcement of invasive species trade.
- **Tracking progress**—Scientifically track progress and improvements across the landscape.
- **Resources**—Funding is insufficient for prevention, treatment, and maintenance.
- **Approach**—All organisms need to be considered; use containment lines.
- **Asset management**—Include decisions that account for species/species interactions, accelerating change in human impacts, and trade-offs of different management approaches and how they affect overall watershed health.

One respondent commented on the conflicting mission to provide fishing opportunity, even for invasive game fish, such as bass. Agency staff may euthanize the most aggressive game fish, such as goby, but not impactful invasive fish, such as bass, which provide angler opportunity. Agreements with the Port of Portland regarding imported species could improve prevention efforts association with initial regional introductions.

## *Partnerships*

### 12 and 13. List any formal partnerships/ cooperative agreements with organizations during the past three years.

Individuals responded to this question by providing examples of formal partnerships, and several commented that although no formal partnerships or agreements exist, they partner with numerous

organizations (Table 2). Some non-formal agreements are species-focused, e.g., garlic mustard control whereas others are site-specific.

All of the partnerships and cooperative agreements described included an element of management and control. The second most common category included outreach and education (9 of 13) and monitoring/surveillance (8 of 13). Coordination and EDRR partnerships and agreements were described for 6 of the 13 entities. Research (4 of 13) and prevention (2 of 13) efforts had the fewest partnerships and agreements.

## *Funding*

One of the most difficult tasks of any invasive species management assessment is identification of how and where funds are expended because most organizations do not line-item budget using invasive species as a category. Rather, organizations incorporate invasive species costs into overall aspects of land management and facilities maintenance.

Table 3 incorporates the responses to survey questions relating to personnel and operational expenses associated with key city land stewardship and maintenance programs that incorporate elements of invasive species management. Tracking personnel and operational expenses through time, and evaluating the level of these costs with associated performance metrics, will best inform strategic investments associated with desired service levels of the city's natural assets.

## *Evaluating Program Effectiveness*

### 25. Document how effectiveness of invasive plant efforts is evaluated.

A total of 34 respondents described how they evaluate program effectiveness. Of those 34 respondents, 19 use two or more methods to evaluate their effectiveness. Effectiveness, compliance monitoring, and outcome-based performance objectives were the three most common methods used to evaluate effectiveness (Figure 15). Opinion surveys, or local sentiments, were not used by any respondents to evaluate effectiveness.

| | Outreach/ Education | Monitoring/ Surveillance | EDRR | Research | Prevention | Management/ Control | Coordination |
|---|---|---|---|---|---|---|---|
| Federal Agencies | X | X | X | X | | X | |
| State Agencies | X | X | X | | | X | X |
| City bureaus | X | X | X | X | X | X | X |
| Metro | | | | | | X | |
| SWCD | X | X | X | | | X | X |
| Watershed Councils | X | X | X | | | X | X |
| Nonprofit Organizations | X | | | | | X | |
| Friends and Community Groups | X | X | | | | X | X |
| School Groups | X | | | | | X | |
| CWMAs | X | X | X | X | X | X | X |
| County Drainage Districts | | | | | | X | |
| Private Businesses and Landowners | | | | | | X | |
| Universities | | X | | X | | X | |

***Table 2.*** Invasive species partnerships and cooperative agreements.

| | PP&R | PP&R | PP&R | PP&R | PP&R | BES | BES | Bureau of Development Services |
|---|---|---|---|---|---|---|---|---|
| | Natural Areas (East) | Natural Areas (West) | Natural Areas | Urban Forestry | Community Gardens | Revegetation Program | Science Integration Division | |
| Geographic area | 1,200 acres of natural areas across three watersheds | | Youth Conservation Crew | Parks, rights-of-ways, private property | Land managed by community garden program; urban, city, private lands | Natural areas and parcels (e.g., stormwater facilities) | Natural areas and stormwater management facilities, EDRR | Private development activities within the city |
| **Operational Budget** | | | $90,000 | | | $335,000 | | |
| **Salaries** | $700,000 | $500,000 | | $100,000 | $65,971 | $600,000 | $338,415 | $5,000 |
| FTE | 12 | 6 | | | | 5 | 2.5 | |
| Monitoring/surveillance | 20% | 15% | | 10% | 20% | 2% | 3.5% | |
| EDRR | 20% | 15% | | - | - | 5% | 40% | |
| Prevention | 2.5% | 1% | | 50% | 30% | - | 20% | 100% |
| Management/control | 40% | 40% | 70% | 20% | 30% | 60% | 10% | |
| Outreach/education | 5% | 5% | 20% | 5% | 20% | 0% | 10% | |
| Research | - | 2% | | - | - | 3% | 2% | |
| Effectiveness monitoring | 5% | 5% | 10% | - | - | 25% | 2.5% | |
| Coordination | 2.5% | 2% | | 5% | - | 5% | 10% | |
| Fundraising | - | 10% | | - | - | - | - | |
| Policy work | 2% | 5% | | 10% | - | - | 5% | |
| **Operational** | | | | | | | | |
| Monitoring/surveillance | | | | | | | | |
| EDRR | | $5,000 | | | | | $25,500 | |
| Prevention | | $500 | | $30,000 | $500 | | $125,000 | |
| Management/control | | $2,000 | $7,000 | | | | $5,000 | |
| Outreach/education | | $2,000 | $1,000 | | $200 | | | |
| Research | | $1,500 | | | | | $2,000 | |
| Effectiveness monitoring | | $250 | $500 | | | | | |
| Coordination | | | | | | | $2,000 | |
| Fundraising | | | | | | | | |
| Policy work | | | | | | | | |

***Table 3.*** City of Portland program budgets associated with invasive species prevention and control efforts, 2017.

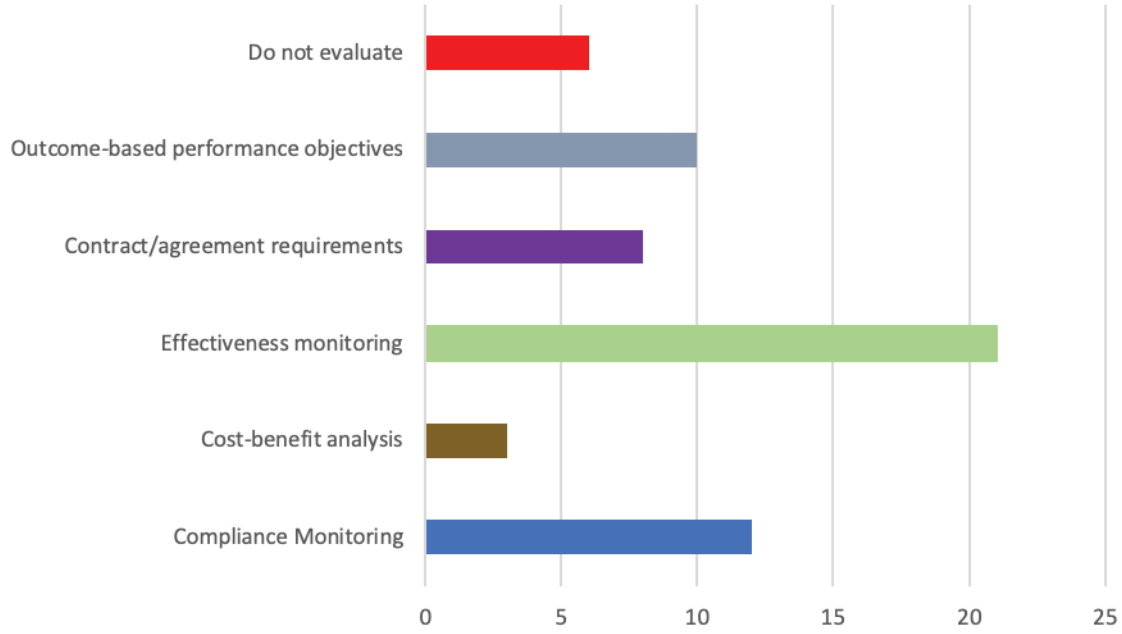



***Figure 15.*** Respondents described how they evaluate the effectiveness of their invasive species efforts (N=34) via a drop-down list of the categories shown.

## 26. Invasive species program strengths.

A total of 30 respondents provided up to three strengths relative to their invasive species programs.

Responses emphasized staff knowledge and experience (6), experienced professional contractors (1), dedicated volunteers (1), and coordination with partners (5). Outreach and education and community engagement were considered strengths by seven respondents. Elements of program implementation were listed, including inventory and prevention efforts, implementation of integrated pest management and best management practices, clear program goals, adaptive management, the ability to evaluate ecological function and recognize and respond to drivers, the use of an experimental approach, consistency, institutional awareness, clearly defined nuisance species, and novel approaches at large scales. Two respondents described accomplishments relative to budget as well as resources available. Other strengths included a strong stewardship ethic, education for pesticide applicators, management of a portfolio of properties for the long term, enforcement protocols, and policies that mandate invasive species removal.

## 27. Invasive species program weaknesses.

Of the 28 respondents, 14 described inadequate funding and limited resources/capacity as a weakness.

- Tools to track progress, address pathways, and assess level of invasiveness (4);
- Inconsistency within and among bureaus (4);
- Waning program support within bureau leadership (2 or fewer);
- Limited control of management plans (2 or fewer);
- No bureau-wide invasive species lists (2 or fewer);
- Isolation within and among bureau (2 or fewer);
- Reliance on the knowledge of a few staff (2 or fewer);
- Lack of a robust regulatory framework for invasive animals (2 or fewer);
- Agreements with other entities that mandate unnecessary treatments (2 or fewer);
- The use of contract crews, which makes addressing small infestations difficult (2 or fewer);
- Training for inspectors (2 or fewer);
- Public awareness and outreach as well as community engagement (2 or fewer);

- No post-development monitoring (2 or fewer);
- A poor understanding of the systemic effects of city interventions (2 or fewer);
- Activities limited to development situations (2 or fewer);The lack of a full inventory of species (2 or fewer);
- Enforcement (2 or fewer); and
- Considerable effort expended on EDDR species, which some perceive are established (2 or fewer).

### 28. Additional comments relative to strengths and weaknesses.

One individual noted that staff operate very efficiently for an underfunded invasive species program, emphasizing the importance of effective partnerships and outreach and education. Program effectiveness monitoring is improving as condition assessments are linked to priority ecosystem services.

## *Challenges*

### 29 and 30. Rank the obstacles to effectively implementing invasive species programs.

A total of 29 respondents ranked obstacles. Funding was the top obstacle to effectively implementing programs, followed by public awareness, and political will (Figure 16). Other obstacles not listed included contractor resources available during ideal treatment time, conflicting objectives among partners, lack of information, not understanding the drivers of change, public opposition to herbicide use, lack of understanding of city program priorities by management, difficulties communicating the trade-offs of different approaches, lack of complete information on chemicals in herbicides and their effects, emerging research and concepts that don't align with current regulations, and the political will and time it takes to update environmental overlay zones.

### 31. Changes that programs should be making to address challenges.

A total of 29 respondents provided insights, many of which mirrored the challenges described in previous questions. Responses included improving coordination, engaging adjacent landowners in control efforts, increasing funding and capacity, researching impacts on ecological function, supporting the Protect the Best program (which is aimed at protecting Portland's best habitats, decreasing pesticide use, and maintaining healthy ecosystems), improving prioritization and resource allocation, transitioning from EDDR species to site-based management, building capacity to engage volunteers, increasing monitoring and experimenting with new management approaches, more education,

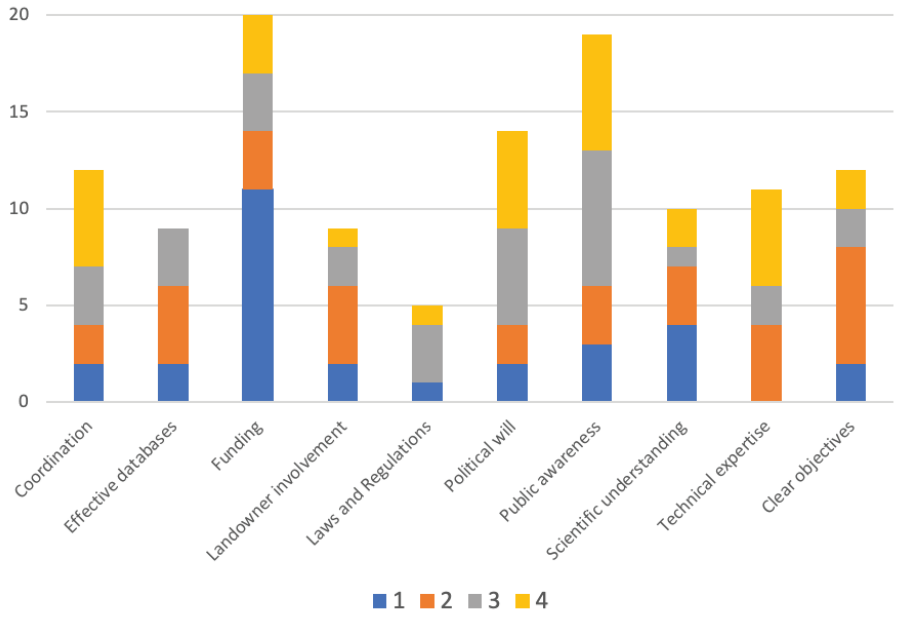



***Figure 16.*** The top four ranked obstacles, by category, to implementing invasive species programs in the City of Portland.

more direction on bureau priorities, enhancing political will, establishing an asset management approach, ensuring consistency in invasive species priority across city bureaus, improving communication, updating approved tree lists, increasing flexibility to address issues, enforcing existing laws, presenting a unified city front, and improving articulation of land management goals.

## 32. Improving how the City of Portland address invasive species.

Respondents were asked, "If you could do one thing to improve how the City of Portland addresses invasive species, what would it be?"

- Additional funding and capacity (10)
- Develop a cohesive, consistent approach/BMPS/ goals across all bureaus and programs—distribute a priority list of invasives to city workers (4)
- Change the goals of management to focus on ecosystem functions, not species origin—change the paradigm to include complexity, ecosystem resilience, and adaptability in the face of climate change (3)
- Additional outreach and education (3)
- Recognize the potential ecological services invasive species provide and replace those services through planting or seeding when invasives are removed (1)
- Consolidate invasive species requirements, which are currently scattered across numerous titles (1)
- Change pesticide application signage to be more visible to parks users (1)
- Create an improved system/resources for tracking and reporting existing work (1)
- Develop consistent guidelines and messaging relative to disposal of invasives (1)
- Establish an asset management approach (1)
- Additional community partners and collaboration (1)
- City-wide surveys for species to better understand extent of populations (1)
- Additional sharing of information (1)
- Clean up the ivy on the "West Side" and along the highways (1)
- Create an all-city Weed Fighter Unit (1)
- Expand the Environmental Overlay Zone requirement such that when development occurs on a site, invasive plants must be removed, and native plants must be planted (1)
- Develop a way to intervene when landowner plants become a cost to neighbors (1)

# 2018 Stakeholder Survey

## *Summary*

The *2008 Invasive Plants Strategy* included an evaluation of regional invasive plant programs via interviews conducted with 18 local, state, and federal organizations. The process to review the *2008 Invasive Plants Strategy* and develop *Invasives 2.0* included a review and analysis of recommendations made in 2008 and implementation of an external stakeholder survey intended to reach a broad suite of stakeholders that manage invasive species taxa in the region.

External stakeholders partner with the City of Portland and/or are engaged in invasive species-related activities in and around the Portland metropolitan area and region. A total of 42 individuals representing 35 organizations/categories (e.g., private landowners) completed the 14-question survey (Appendix A-6). The following highlights the key points from the survey results:

- Most respondents described using a combination of "management plan," "EDRR," and "Noxious Weed List" in combination with "level of threat and ability to control" as key criteria that drive their management actions. Cooperative agreements were listed as well, and are reflective of the type of survey respondents, most of them being local/county governments and nonprofits, many of which have cooperative agreements with agencies. This result underscores the importance of careful preparation of management plans, lists, and cooperative agreements to align with desired ecosystem function goals.
- EDRR was designated as the top-ranked invasive species activity performed, followed by prevention and management (tie for 2nd ranking), and then monitoring or surveillance.
- Portland's invasive species laws and regulations were rated excellent or good by 38% of respondents (significantly lower than the 58% rating by city staff). Suggestions for improving laws and regulations included preventing new introductions via pathways, such as nurseries, online trade, pond supply outlets, solid wood packing materials, and the pet trade, followed by the need to enforce existing noxious weed laws, and providing more resources to survey, prevent, and control invasive species. (Note: Appendix A-4 includes an analysis of pathways and the regulatory authority the city

has to address some of these key issues).

- Suggestions to improve communication and cross-program coordination include encouraging meeting participation in regional and other meetings to share information, providing more attention to aquatic invasive species, outreach to landowners, cross-training of city employees, and following through on invasive plant treatments to ensure long-term vegetation management.
- Monitoring is the most common way entities evaluate their effectiveness, followed by evaluating the success in meeting objectives, meeting the requirements of a contract/agreement, and cost-benefit analysis.
- Inadequate funding, followed by landowner involvement, and then political will and public awareness, were identified as the top obstacles to effectively implementing invasive species programs in the City of Portland. The landowner involvement obstacle, which ranked much higher in the external stakeholder survey, is likely a result of the amount of work external stakeholders conduct on private lands compared to city staff (who completed the internal stakeholder survey).
- The majority (62%) of external stakeholders support the expansion of a city invasive species strategy to include all taxa.
- When asked if one thing could be done to improve how the city addresses invasive species, respondents emphasized the need for increased funding and capacity, particularly if the city is going to expand its invasives efforts to include all taxa. In addition, more and better public outreach, particularly for detections of new species, was emphasized.

## *Survey Result Details*

External stakeholders consisted of entities that partner with the City of Portland and/or are engaged in invasive species-related activities in and around the Portland metropolitan area and region. A total of 42 individuals representing 32 organizations/categories (e.g., private landowners) (Table 6, Figure 17) completed the 14-question survey (Appendix A-6). Table 6 lists external stakeholder organizations that completed the survey—those listed in bold also participated in the development of the *2008 Invasive Plants Strategy*.

- Center for Lakes and Reservoirs (Portland State University)
- City of Wilsonville
- City of Wood Village
- Clackamas SWCD
- Clean Water Services
- Columbia Land Trust
- Columbia River Inter-Tribal Fish Commission
- Columbia Slough Watershed Council
- East Multnomah SWCD
- Friends of Terwilliger
- Friends of Zenger Farm
- GroundSpring Healing Center, P.C.
- Heritage Seedlings
- Johnson Creek Watershed Council
- Leach Botanical Garden
- Lower Columbia River Estuary Partnership
- Metro
- North Clackamas Parks and Recreation
- Oregon Department of Environmental Quality
- Port of Portland
- Private homeowners
- Sage Environmental Services
- SOLVE
- The Nature Conservancy
- Tryon Creek Watershed Council
- Tryon Creek Watershed Stewards
- Urban Greenspaces Institute
- USDA Animal Plant Health Inspection Service – Plant Protection and Quarantine
- USDA Forest Service
- West Multnomah SWCD
- Wisdom of the Elders, Inc.

***Table 6.*** Organizations/entities that completed the 2018 external stakeholder survey.

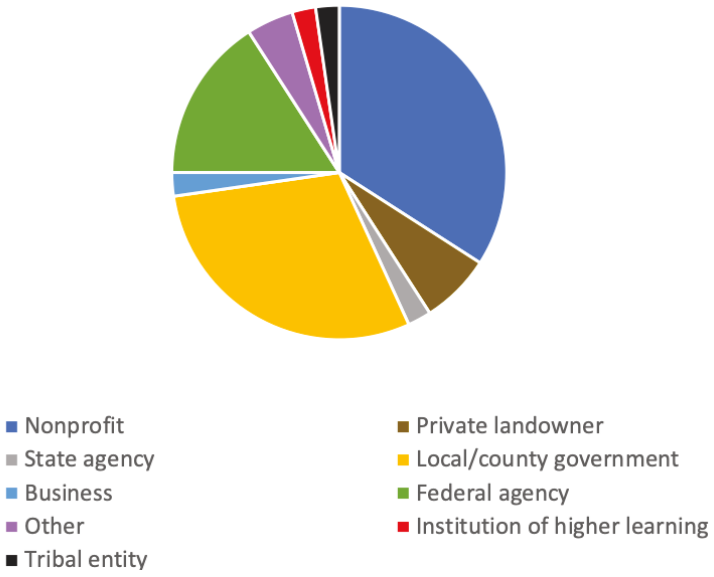



***Figure 17.*** Entities/organizations that completed the external stakeholder survey (42 individuals representing 32 organizations).

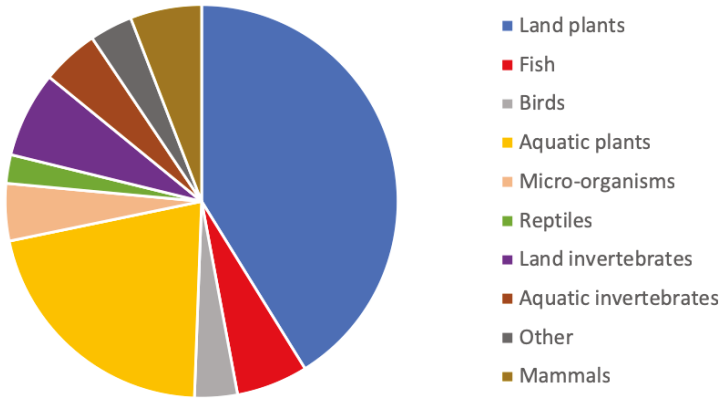



***Figure 18.*** The taxa associated with invasive species activities in 2017 (N=42).

The geographic scope entities described ranged from backyards to watersheds, city properties, the state, and the region.

## Criteria used to prioritize invasive species work (N=41).

A majority of respondents (29) use "level of threat and ability to control" as key criteria, however, most respondents described using a combination of "management plan (22)," "EDRR (26)," and "Noxious Weed List (26)" in combination with "level of threat and ability to control" for a suite of criteria they consider. Cooperative agreements (14) were important criteria, and are reflective of the type of survey respondents, most of them being local/county governments and nonprofits, many of which have cooperative agreements with other agencies. Other criteria described included "Availability of Resources and Capacity" (2), "Request of Partners" (1), "Backyard Habitat Program – Portland Audubon Society" (1), "State Aquatic Invasive Species Plan" (1), "Public feedback" (1), "Watershed Priority" (1), and "Habitat Type and Integrity" (1).

## The top five invasive species entities spent time and resources on in 2017 (N=38).

More than half of the respondents invested time and

resources on blackberry (22) and ivy (21), followed by reed canary grass (14), garlic mustard (15), knotweeds (13), common holly (10), Canada thistle (7), lesser celandine (4), knapweeds (3), emerald ash borer (3), gypsy moth (3), and slender false brome (2). Other species listed once include *Phytophthora ramorum, Xylella fastidiosa,* quagga and zebra mussels, invertebrates, nipplewort, teasel, geranium spp., watercress, creeping buttercup, clematis, orange hawkweed, policeman's helmet, exotic grasses, other mustards, wild carrot, weedy trees (hawthorn, laurel), spurge laurel, yellow flag iris, ludwigia, flowering rush, water primrose, and yellow floating heart.

## Ranking invasive species by importance (N=42).

EDRR was designated as the top-ranked invasive species activity, followed by prevention and management (tie for 2nd ranking), and then monitoring or surveillance (Figure 19).

Respondents described the taxa associated with their invasive species efforts in 2017 (Figure 18).

## Species that were the focus of EDRR efforts in 2017 (for those that participated in EDRR efforts) (N=31).

- Garlic mustard (*Alliaria petiolota*) (22)
- Japanese knotweed (*Polygonum cuspidatum*) (13)
- Slender false brome (*Brachypodium sylvaticum*) (11)
- Giant hogweed (*Heracleum mantegazzianum*) (7)
- Knapweeds (*Centaurea* spp.) (8)
- Spurge laurel (*Daphne laureola*) (8)
- Blessed milk thistle (*Silybum marianum*) (6)
- Water primrose (*Ludwigia* spp.) (5)
- Impatiens (*Impatiens glandulifera, I. bicolor, I. parviflora*) (2)

Other species mentioned once included American pokeweed *(Phytolacca americana*), shiny geranium *(Geranium lucidum*), herb robert *(Geranium robertianum)*, sulfur cinquefoil *(Potentilla recta)*, goatsrue *(Galega officinalis*), hawkweeds *(Hieracium spp.)*, purple loosestrife *(Lythrium calicaria)*, impatiens *(Impatiens glandulifera, bicolor, parviflora)*, flowering rush *(Butomus umbellatus)*, yellow floating heart *(Nymphoides peltata)*, oblong spurge (Euphorbia oblongata), common reed *(Phragmites australis ssp. australis),* yellow starthistle *(Centaurea solstitialis)*, watercress *(Nasturtium officinale)*, zebra/quagga mussels *(Dreissena spp.)*, Asian gypsy moth *(Lymantria dispar asiatica)*, sudden oak death *(Phytophthora ramorum)*, emerald ash borer *(Agrilus planipennis*), light brown apple moth *(Epiphyas postvittana*).

## Rating the effectiveness of laws and regulations that govern invasive or nuisance species/weed work in Portland.

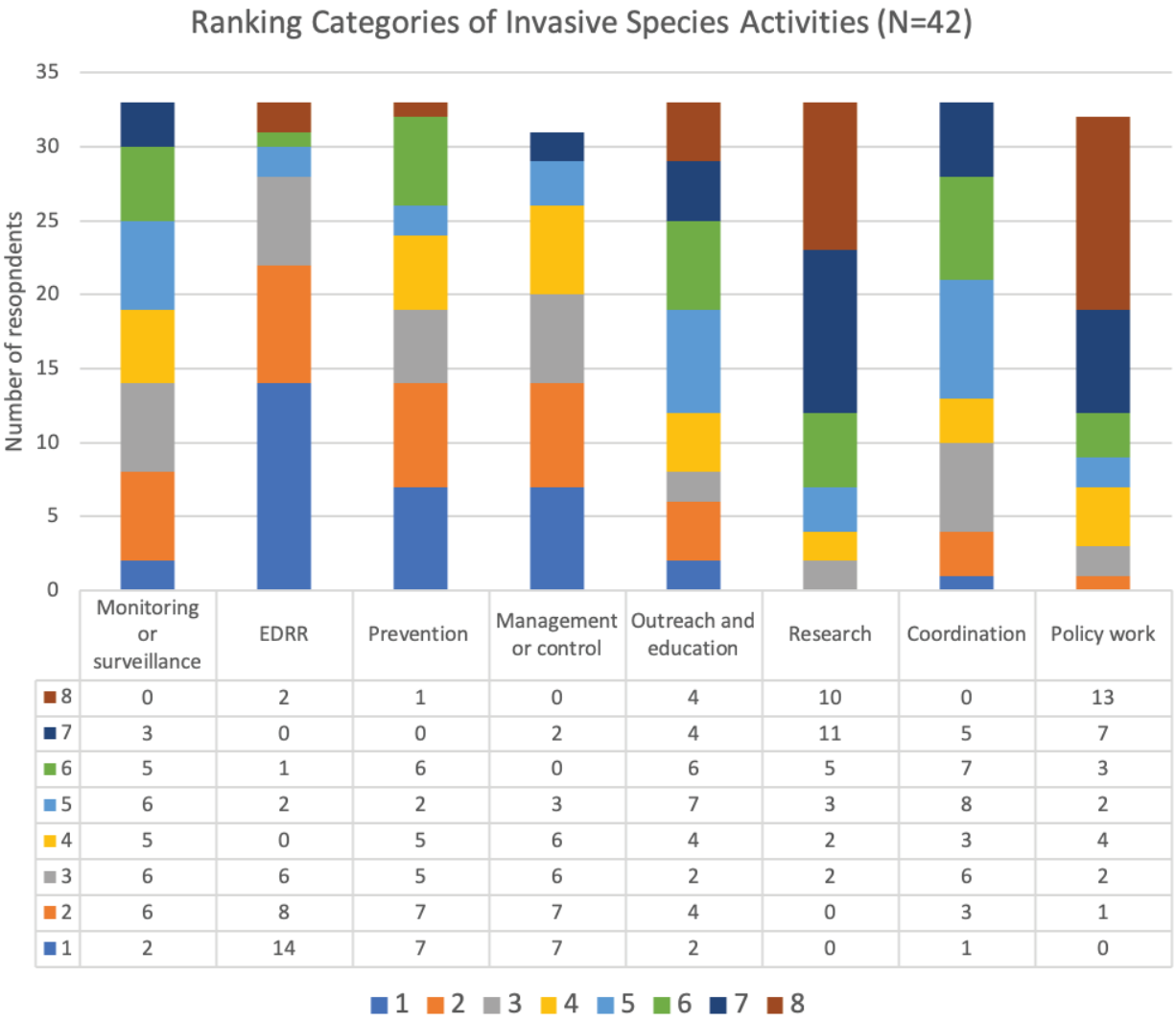
A total of 58% of respondents rated the effectiveness of laws and regulations that govern invasive species work in Portland as excellent or good (Figure 20).

## Regulations that need to be improved or that respondents would like to see enacted include (N=25).

- Preventing new introductions via pathways, such as nurseries, online trade, pond supply outlets, solid wood packing materials, and the pet trade (6);
- The need to enforce existing noxious weed laws (5); and
- Provide increased resources to survey, prevent, and control invasive species (3);

The following suggestions were each made by two respondents:

- Lessen tree permit requirements that make it easier to remove invasive trees (e.g., black locust);
- Create a banned plant list to change public behavior and stock suppliers;
- Form a weed board with enforcement authority in Washington County;
- Control invasives on state property;
- Enact a state requirement to control invasives on private properties;
- Require local jurisdictions to enforce local nuisance plant ordinances;
- Adopt standards for cleaning equipment; and
- Incentivize landowners to plant and maintain native species.




| | Monitoring or surveillance | EDRR | Prevention | Management or control | Outreach and education | Research | Coordination | Policy work |
|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 2 | 1 | 0 | 4 | 10 | 0 | 13 |
| 7 | 3 | 0 | 0 | 2 | 4 | 11 | 5 | 7 |
| 6 | 5 | 1 | 6 | 0 | 6 | 5 | 7 | 3 |
| 5 | 6 | 2 | 2 | 3 | 7 | 3 | 8 | 2 |
| 4 | 5 | 0 | 5 | 6 | 4 | 2 | 3 | 4 |
| 3 | 6 | 6 | 5 | 6 | 2 | 2 | 6 | 2 |
| 2 | 6 | 8 | 7 | 7 | 4 | 0 | 3 | 1 |
| 1 | 2 | 14 | 7 | 7 | 2 | 0 | 1 | 0 |

***Figure 19.*** Ranking invasive species activities by importance.

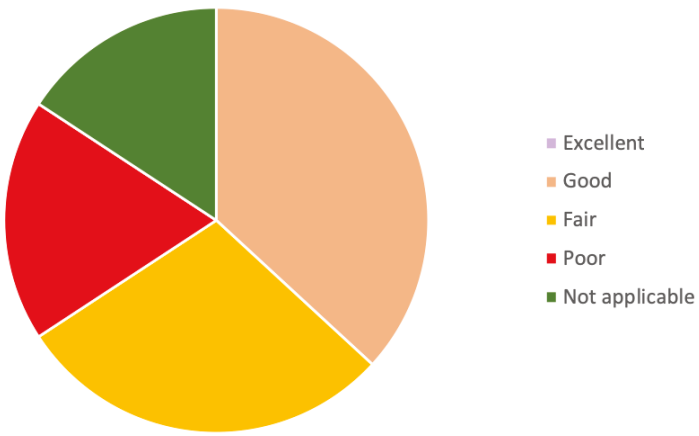



***Figure 20.*** The effectiveness of laws and regulations that govern invasive or nuisance species/weed work in Portland were rated as Excellent (0), Good (15), Fair (11), Poor (7), and Not Applicable (7) (N=40).

The remaining suggestions were each supported by individuals:

- Use less pesticides and herbicides;
- Add species to the Required Eradication List;
- Expand the list of EDRR species and include other taxa;
- Expand partnerships with state and federal agencies on aquatic invasive species;
- Engage the MS4 regulatory community in helping to combat invasive species;
- Mandate the use of native species for ornamental landscaping;
- Create a single point of contact for invasive species;
- Expand outreach for homeowners;
- Enhance federal regulations;
- Develop strong county-level weed districts;
- Ensure ODOT sets aside adequate funding for invasive weed management;
- Rectify the NOAA programmatic to allow mechanical or herbicide use for invasive plant removal on seasonally tidal floodplains; and
- Improve the use of weed free rocks, sand, and gravel supplies.

## Deficiencies relative to communication or cross-program invasive species coordination.

Suggestions to improve communication and cross-program coordination include encouraging meeting participation in regional and other meetings to share information, providing more attention to aquatic invasive species, increasing outreach to landowners, cross-training of city employees, and following through on invasive plant treatments to ensure long-term vegetation management.

## Effectiveness of invasive species efforts.

Respondents primarily evaluate the effectiveness of their invasive species efforts using monitoring, evaluating the success in meeting objectives, meeting the requirements of a contract/agreement, and cost/benefit analysis (Figure 21). Numerous respondents use more than one approach to evaluate effectiveness.

## Obstacles to implementingt invasive species programs.

A total of 29 respondents ranked obstacles. Funding was the top obstacle to effectively implementing programs, followed by public awareness, and political will (Figure 22). Other obstacles not listed included contractor resources available during ideal treatment time, conflicting objectives among partners, lack of information, not understanding the drivers of change, public opposition to herbicide use, lack of understanding of city program priorities by management, difficulties communicating the trade-offs of different approaches, lack of complete information on chemicals in herbicides and their effects, emerging research and concepts that don't align with current regulations, and the political will and time it takes to update environmental overlay zones.

## Pursuing an all-taxa invasive species strategy.

The majority of respondents support an all-taxa invasive species strategy to protect the city's natural resource assets (Figure 23).

When asked if one thing could be done to improve how the city addresses invasive species, respondents stated (N=33):

- Increase funding and capacity (N=13), particularly if the city is going to expand its invasive species efforts to include all taxa;
- Improve public outreach (N=3), particularly for detections of new species (e.g., Neighborhood Watch program for invasives);
- Use less herbicides and pesticides (N=2);
- Encourage private and public businesses to remove invasives in front of their property (N=2); and
- Include all taxa (N=2) in city efforts.

## The remaining suggestions were made by individuals:

- Develop landowner agreements that do not expire;
- Simplify the permitting process for the removal of invasive trees;
- Train unemployed/homeless people in invasive species removal, and compensate them;
- Revitalize the No Ivy League;

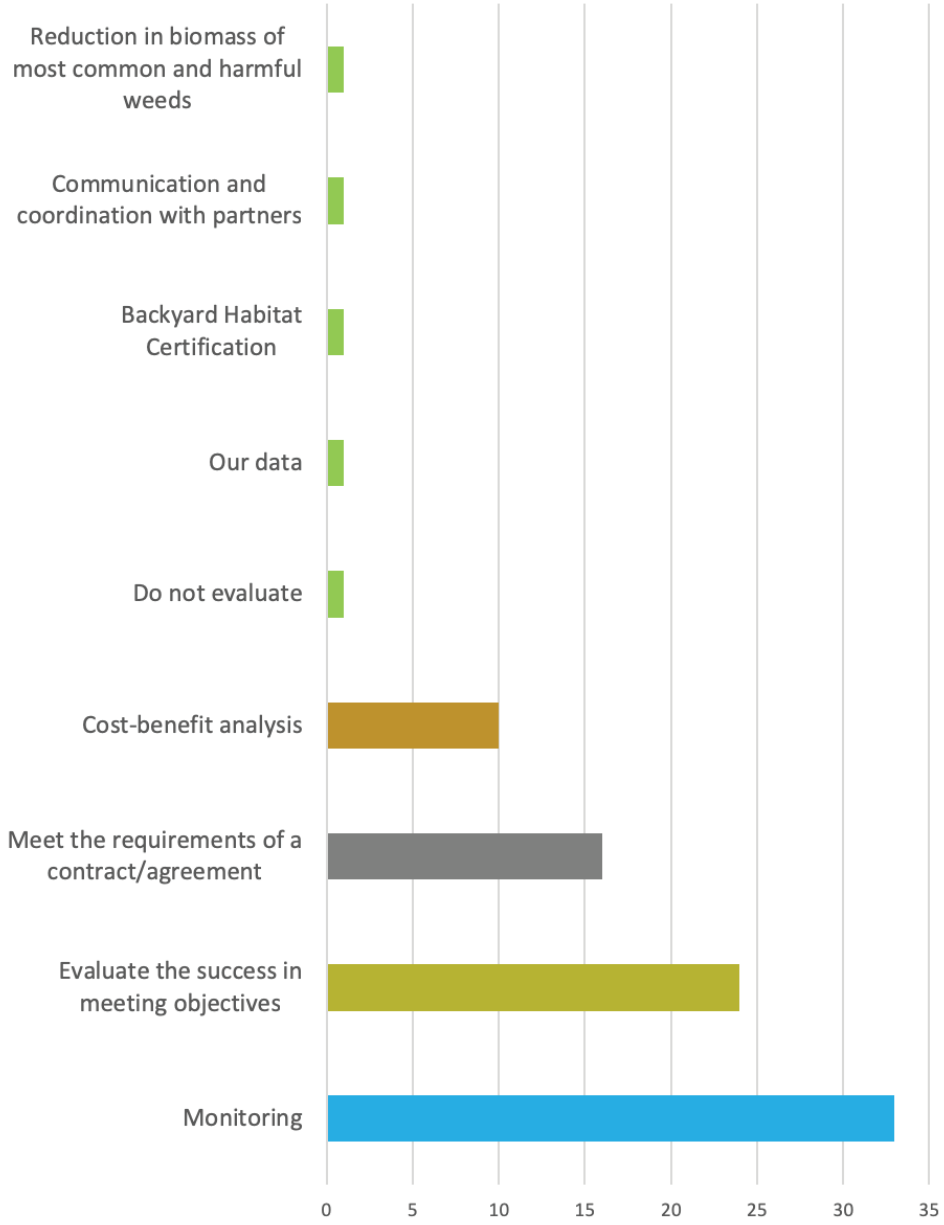



***Figure 21.*** Respondents described how they evaluate the effectiveness of their invasive species efforts (N=41). The bottom five categories in the chart were included in a drop-down list; the additional categories were added by respondents.

- Follow up on large-scale control efforts with repeat visits to maintain progress;
- Focus more on aquatic invasive species;
- Implement penalties for landowners that allow invasive species on their property;
- Focus on ecosystem disrupters;
- Improve coordination with PBOT on road rights-of-way;
- Broaden and strengthen nuisance plant ordinances;
- Enhance policies at all political levels to end the importation and sale of invasives;
- Think carefully when adopting treatments to include the overall plan for replacing weeds with native vegetation—not all plants on the EDRR list are truly EDRR species; and
- Think through what types of situations trigger weed treatment and what weeds we can live with and where.

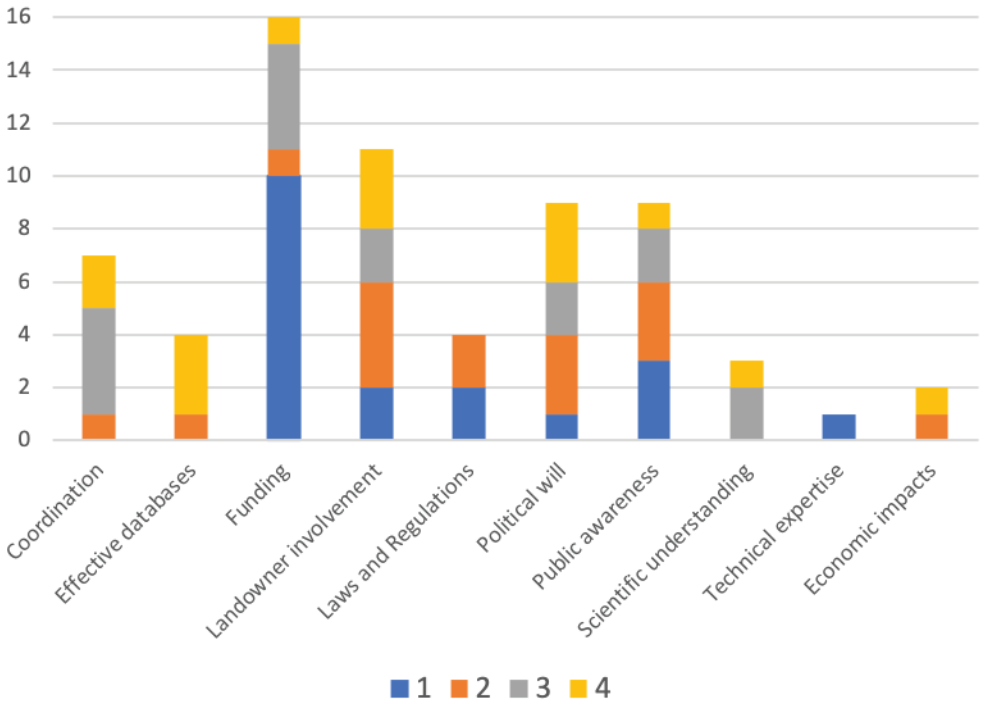



***Figure 22.*** The top four ranked obstacles, by category, to implementing invasive species programs.

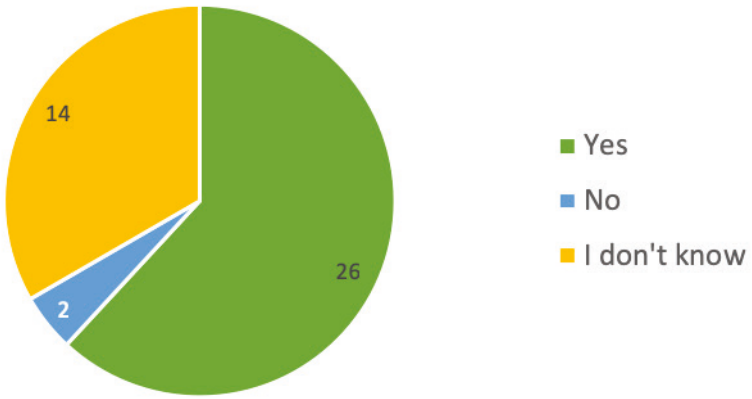



***Figure 23.*** An all-taxa invasive species strategy is supported by the majority of respondents (N=42).

# Lessons Learned

## Key Takeaways from Implementing the *2008 Invasive Plants Strategy*

The major bureau accomplishments achieved in the past 10 years are described in this section. This compilation, in addition to the survey results, inform lessons learned in implementing the *2008 Invasive Plants Strategy*.

- The tension that has developed within bureaus, among bureaus, and with partners relative to how urban ecosystems should be managed, and whether there should be threshold levels for individual invasive species or an approach that focuses on ecosystem function in highly disturbed urban ecosystems, needs to be addressed to enhance collaboration, planning, and management actions.
- The process used to update the Portland Plant List needs to be revised on a more regular basis and using a team approach.
- EDRR species lists need to be updated, with increased flexibility to add new species in a timely manner as well as remove those when eradication or containment is not feasible.
- Maintenance of green assets requires a consistent, long-term effort and adequate funding to achieve desired ecosystem services goals, including funding for monitoring to evaluate success through time.
- To enhance the ability of the city to address invasive species and achieve ecosystem function goals for its green assets, the silos that have been created within and among bureaus must be addressed.
- The city's policies, codes, and ordinances need to be strengthened to address key pathways of introduction.
- The city needs to incorporate an all-taxa approach to its portfolio.
- Using a database/data portal to track all information associated with invasive species and city efforts is needed.

- Coordination and collaboration within and among bureaus must be enhanced to effectively manage the city's green assets, especially as it relates to addressing invasive species.

## Key Areas of Emphasis for *Invasives 2.0*

The *2008 Invasive Plants Strategy* was viewed as groundbreaking because of its commitment to protecting and enhancing Portland's natural resource assets from the ongoing threats of invasive species. Numerous municipalities throughout North America have replicated elements of the strategy. At the time, the Strategy was the first of its kind for a major municipality. Since then, technology, techniques, best management practices, and approaches to managing invasive species have evolved and matured, and emerging threats have been identified. The following is a gap analysis that identifies shortcomings in implementing the Strategy, and key areas of emphasis for *Invasives 2.0*.

- **Funding and resources**—Lack of a comprehensive budget analysis and budget commitment, which has led to uncertainty, reductions in budgets through time, and short-term commitments to address long-term maintenance needs. A sustained funding source does not exist to invest adequately in natural resource assets, resulting in high priority projects that compete with one another for funding. The natural areas addendum ensures the pool of funding for s is primarily for trees (although in many instances, what is lacking is an adequate diverse understory)—this limits the ability of staff to use mitigation funds to restore ecological function. System Development Charges can improve new assets, but the city is growing quickly, and natural areas are being removed as part of the development process, homelessness is increasing, and visitor use of natural areas and parks is increasing—where is the opportunity to manage and maintain the city's natural assets?
- **Performance metrics**—Lack of appropriate performance metrics to assess progress in achieving level of services, including a holistic evaluation of system components and processes that result in a more complete understanding of ecosystem function.
- **Database**—The city lacks a comprehensive database or portal to document and share invasive species inventory, assessment, monitoring, control, and treatment information. Lack of a data system contributes to siloed programs within and among bureaus, and difficulty in sharing information with regional partners. Management of data and information on invasive species, including annual reports, inventory information, treatment outcomes, risk assessments (Appendix A-3) , and other information is currently housed within each city bureau. Entering data into a common database would facilitate communication, planning, accomplishment reporting, and a variety of other tasks and create city-wide efficiencies to maximize use of limited existing resources. In addition, use of a common database among city bureaus would allow the city to connect with regional and national partners to report outcomes and prepare for emerging trends and new invasive species. One common database also creates an opportunity to use data-sharing programs, smart phone applications to record and report invasive species, coordinated efforts with other agencies in the region, inventories of city lands, and tracking high priority species at specific sites (Invasive Species Council of British Columbia 2014). Other entities in the region are using databases to record and share information, including EDDMaps and iMapInvasives (managed by the Institute for Natural Resources).
- **Monitoring**—Adequate resources need to be available to monitor the outcomes of a variety of invasive species treatments at various sites.
- **Community engagement**—Lack of a comprehensive communications strategy that addresses both inreach and outreach needs—a focused, targeted set of messages that conveys the intent and approach of the city relative to improvement of ecosystem function and services through invasive species management, with an emphasis on ecosystem drivers and site-context specifics (assessment, monitoring, replacement vegetation). Effective messaging associated with EDRR to ensure people understand why a species may ultimately be removed from the list.
- **Plant-only approach**—Lack of a multi-taxa approach, which results in a failure to identify existing and emerging significant invasive species risks to the city's natural resource assets. A multi-taxa approach can only be considered with additional financial and staffing resources.

- **Continual assessment of priorities/continuous improvement**—Lack of a consistent annual or biannual review to evaluate successes, challenges, emerging threats, and to implement needed course corrections with partners in the region. Periodic review and analysis of priority species on city lists and priority natural assets for management actions would assist in identifying priority actions.
- **Consensus on invasive species management approach**—Lack of consensus on the philosophy and approaches to managing invasive species has led to internal disagreements and ongoing tension within and among bureau. *Invasives 2.0* should chart a path forward that clarifies a philosophy and approach that could be accepted and implemented by city staff. Opportunities for consensus exist in the developing a city-wide green management plan which the risks posed by invasive species to the city's critical assets.
- **Regulations**—Invasive species regulations are dispersed among numerous city ordinances, codes, and bureaus, which results in lack of clarity and emphasis. In addition, some city codes, such as the Title 11 ("Tree Code"), require staff to replant a tree when a tree is removed: if sites lack understory or historically lacked canopy, planting only trees puts native biodiversity at risk.
- **Timeliness in addressing required eradication on private land**—A lengthy and cumbersome process under Title 29 exists to notify a landowner of a Nuisance Plant, Required Eradication species on their property before action can be taken to eradicate the species.
- **Rapid response plans and prevention strategies**—Emphasis is not placed on the development of rapid response plans and prevention strategies to address high-risk species, such as emerald ash borer and Asian gypsy moth, which would decimate a significant portion of the city's.
- **Alignment with overarching city plans**—The 2013 Comprehensive Plan acknowledges the ecosystem services and functions of the  and the desire to increase both tree canopy and tree species diversity (policy 7.11). Chapter 7 of the 2035 Comprehensive Plan, Environment and Watershed Health, identifies city policies associated with environment and watershed health to "prevent incremental environmental degradation, including the spread of invasive species, loss of habitat, and adverse impacts of additional impervious surfaces. Policy 7.12: Invasive species—Prevent or reduce the spread of invasive plants, remove infestations, and support efforts to reduce the impacts of invasive plants, animals, and insects, through plans, investments, and education.
- **Policy 7.18: Community stewardship**—Encourage voluntary cooperation between property owners, community organizations, and public agencies to restore or re-create habitat on their property, including removing invasive plants and planting native species.
- **Best Management Practices**—Adopt best management practices, standards and protocols associated with invasive species management actions.

***Invasives 2.0* should:**

- Encourage or require the use of appropriate native vegetation on landscaped areas and encourage the protection of existing appropriate ecosystem function and services;
- Fully protect and promote native ecosystems, particularly native species appropriate to a particular soil, topography, and hydrology of a site; and
- Provide adequate protections for threatened, endangered, and rare species (incentivize this via expedited review, fee waivers, and other incentives).

# APPENDICIES

**Appendix A-1.** City of Portland Ordinances and Resolutions

**Appendix A-2.** Bureau Accomplishments, 2008—2018

**Appendix A-3.** City of Portland Risk Assessment Form

**Appendix A-4.** Pathways of Introduction

**Appendix A-5.** City Employee Survey

**Appendix A-6.** External Stakeholder Survey

**Appendix A-7.** Portland Plans

**Appendix A-8.** Descriptions of Natural Assets in City Management Plans

# Appendix A-1. City of Portland Ordinances and Resolutions

During the past 18 years, Portland has bolstered the efforts of the city to address invasive species via numerous ordinances and resolutions, including:

**25 October 2000**—Ordinance #175008 - Authorizes application to National Fish and Wildlife for a grant in the amount of $150,000 for integrated approach to invasive species management for the Office of Transportation, Bureau of Maintenance, Street Cleaning Division (Ordinance). Required a $150,000 match from the city.

**30 November 2005**—Resolution #36360 —Invasive Plant Species Management Resolution – Creates an effective strategy for the management of invasive plant regulations —commits the City to a 10-year goal to reduce noxious weeds on it lands, including developing a 3-year ongoing work plan that includes invasive weed management as part of regular operations and a city-wide coordinated effort as well as supporting invasive weed management efforts within city bureaus and among cooperative weed efforts in the region. Commits to partnering with federal and state agencies to investigate sources of sustainable funding.

**25 July 2007**—Ordinance #181164—Invasive plant species reduction grant application ordinance—Authorizes a grant application with the Oregon State Weed Board for control of garlic mustard.

**14 May 2008**—Ordinance #181822—Three Rivers Land Conservancy control of invasive garlic mustard species grant ordinance—Accepts a sub-recipient grant from the Three Rivers Land Conservancy originating from the Oregon Department of Agriculture in the amount of $9,710 for control of invasive garlic mustard species.

**3 September 2008**—Ordinance #182156—East Multnomah Soil and Water Conservation District Rocky Butte Invasive Species Control Project grant contract—Agreement between the City of Portland BES and East Multnomah Soil and Water Conservation District for $15,000 to implement the Rocky Butte Natural Area Invasive Plant Removal project. City of

Portland Watershed Revegetation Program to design and implement an adaptive revegetation plan to manage aggressive invasive species on about 150 acres of forested uplands.

**3 June 2009**—Ordinance #182875—Oregon Department of Agriculture Invasive Animal Assessment Contract Information—Agreement between BES and ODA (contract amount $9,500) to prepare an invasive animal assessment to determine the status and threats and to identify and guide management actions. Ordinance resulted in an intergovernmental agreement between the City and ODA.

**26 August 2009**—Resolution #36726—Invasive Plant Management Strategy Resolution – Adopts the City of Portland Invasive Plant Management Strategy and establishes 10 years goals to reduce the level of invasive plants in Portland natural areas. Strategy includes all City bureaus, all City-owned and managed lands free from invasive Rank A nuisance species, limited spread of Rank B nuisance species, and removal of Rank C nuisance species as funds permit. By 2020, remove invasive plants from 40% of city-owned and managed land to improve the ecological health rating of those lands.

# Appendix A-2. Bureau Accomplishments 2008-2018

## *Bureau of Environmental Services*

### EDRR

From 2009 through 2017, the EDRR program treated a total of 1,666.83 acres on 17 species. Garlic mustard (93.03%), giant hogweed (2.74%), and knotweed (2.47%) comprised 98.24% of EDRR efforts (Table 1, Figures 1 and 2). The remaining 1.76 consisted of spurge laurel (0.48%), water primrose (0.39%), blessed milk thistle (0.19%), knapweeds (0.15%), slender false brome (0.12%), American pokeweed (0.1%), Balfour's touch-me-not (0.09%), goatsrue (0.08%), sulfur cinquefoil (0.05%), policeman's helmet (0.05%), two-colored jewelweed (0.04%), orange hawkweed (0.03%), oblong spurge (0.01%), delta arrowhead (less than 0.01%).

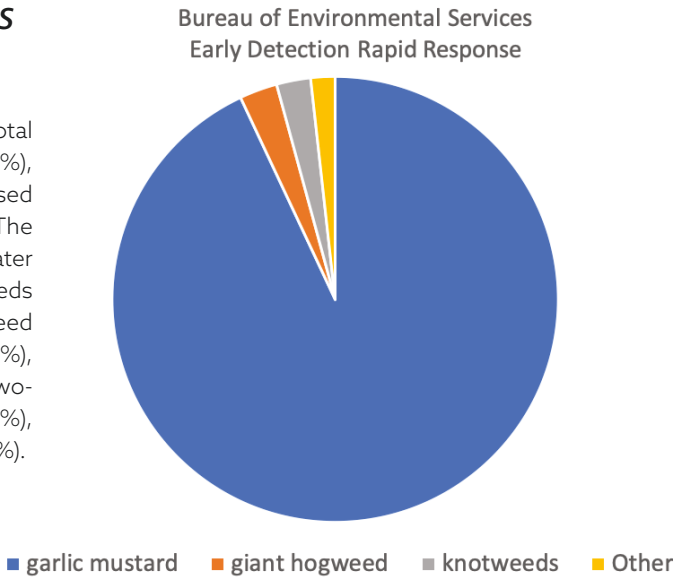
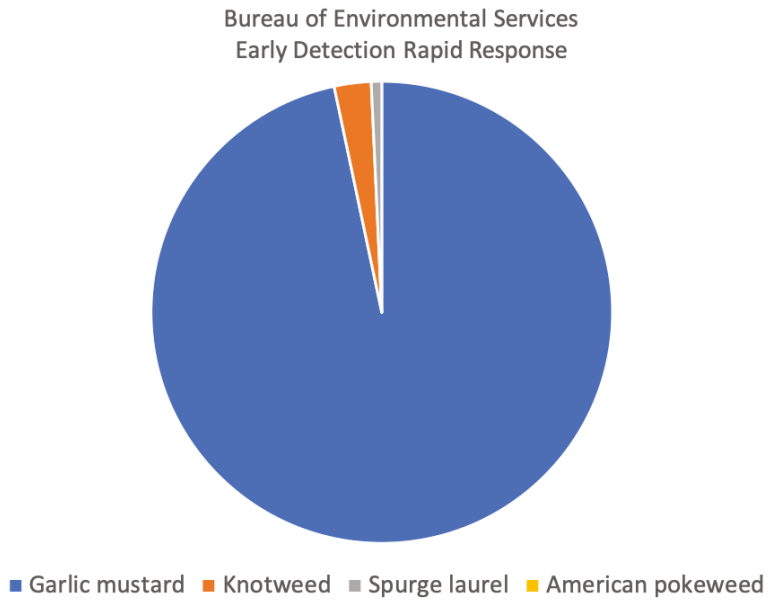



***Figure 1.*** Most common EDRR species treated, by acre from 2009–2016.

***Table 1.*** Invasive plants treated by acre from FY10–FY17 via the city's Early Detection Rapid Response Program.

| | FY10 | FY11 | FY12 | FY13 | FY14 | FY15 | FY16 | FY17 | TOTALS |
|---|---|---|---|---|---|---|---|---|---|
| | 2009–2010 | 2010–2011 | 2011–2012 | 2012–2013 | 2013–2014 | 2014–2015 | 2015–2016 | 2016–2017 | |
| | Acres treated | | | | | | | | |
| Garlic mustard *(Alliaria petiolata)* | 262.1 | 292 | 193.7 | 189.7 | 141 | 140.8 | 158.2 | 165 | 1,542.50 |
| Knotweed *(Polygonum cuspidatum, P. sachalinense)* | 7 | 7 | 5.5 | 5.5 | 5.5 | 4 | 2 | 0.25 | 36.75 |
| Spurge laurel *(Daphne laureola)* | 2 | 2 | 0.75 | 0.75 | 0.75 | 0.61 | 0.26 | - | 7.12 |
| American pokeweed *(Phytolacca americana)* | | | 0.75 | | 0.75 | | | - | 1.5 |
| Giant hogweed *(Heracleum mantegazzianum)* | 10 | 1 | 5.5 | 5.5 | 5.5 | 6.5 | 6.5 | 6.5 | 47 |
| Slender false brome *(Brachypodium sylvaticum)* | | 0.25 | 0.4 | 0.4 | 0.4 | 0.04 | 0.23 | 0.37 | 2.09 |
| Blessed milk thistle *(Silybum marianum)* | | | 0.5 | 0.5 | 0.5 | 0.57 | 0.78 | 0.78 | 3.63 |
| Goatsrue *(Galega officinalis)* | | | 0.1 | 0.1 | 0.1 | 0.41 | 0.41 | 0.44 | 1.56 |
| Orange hawkweed *(Hieracium aurantiacum)* | | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.6 |
| Policeman's helmet *(Impatiens glandulifera)* | | | 0.1 | 0.1 | 0.1 | 0.03 | 0.1 | 0.1 | 0.53 |
| Two-colored jewelweed *(Impatiens bicolor)* | | | | | | 0.21 | 0.31 | 0.31 | 0.83 |
| Balfour's touch-me-not *(Impatiens balfourii)* | | | | | | 0.63 | 0.63 | - | 1.26 |
| Water primrose *(Ludwigia peploides ssp. montevidensis)* | | | 0.1 | 0.1 | 0.1 | 2.7 | 2.77 | 9.97 | 15.74 |
| Delta arrowhead *(Sagittaria platyphylla)* | | | | | | 0.01 | 0.01 | 0.01 | 0.03 |
| Oblong spurge *(Euphorbia oblongata)* | | | | | 0.1 | 0.01 | 0.01 | 0.03 | 0.25 |
| Sulfur cinquefoil *(Potentilla recta)* | | | | | | | 0.78 | - | 0.78 |
| Diffuse/spotted knapweed *(Centaurea diffusa/C. stoebe)* | 2 | 0.2 | | | | | | - | 2.2 |
| **TOTALS** | **283.1** | **304.25** | **207.5** | **203.5** | **154.9** | **156.62** | **173.09** | **183.87** | **1,666.83** |

***Figure 2.*** Acres of A, B, C, and No Rank species treated by the EDRR Program from 2009–2016.




| **A-Rank** | **B-Rank** | **C-Rank** | **No Rank** |
|---|---|---|---|
| American pokeweed | Garlic mustard | Sulfur cinquefoil | Two-colored jewelweed |
| Giant hogweed | Knotweeds | | Balfour's touch-me-not |
| Slender false brome | Spurge laurel | | Delta arrowhead |
| Orange hawkweed | Goatsrue | | |
| Policeman's helmet | Oblong spurge | | |
| Floating water primrose | | | |

**A**—Known to be invasive; known to occur but are not widely distributed in the region (i.e., distribution is limited to a few sites); spread rapidly; difficult to control once they become widespread.

**B**—Known to be invasive; known to occur in the region; more abundant and widely distributed than A-ranked species, however distribution is limited to patches or specific habitats; distribution is not as widespread as C-ranked plants; can spread rapidly and are difficult to control once they become widespread.

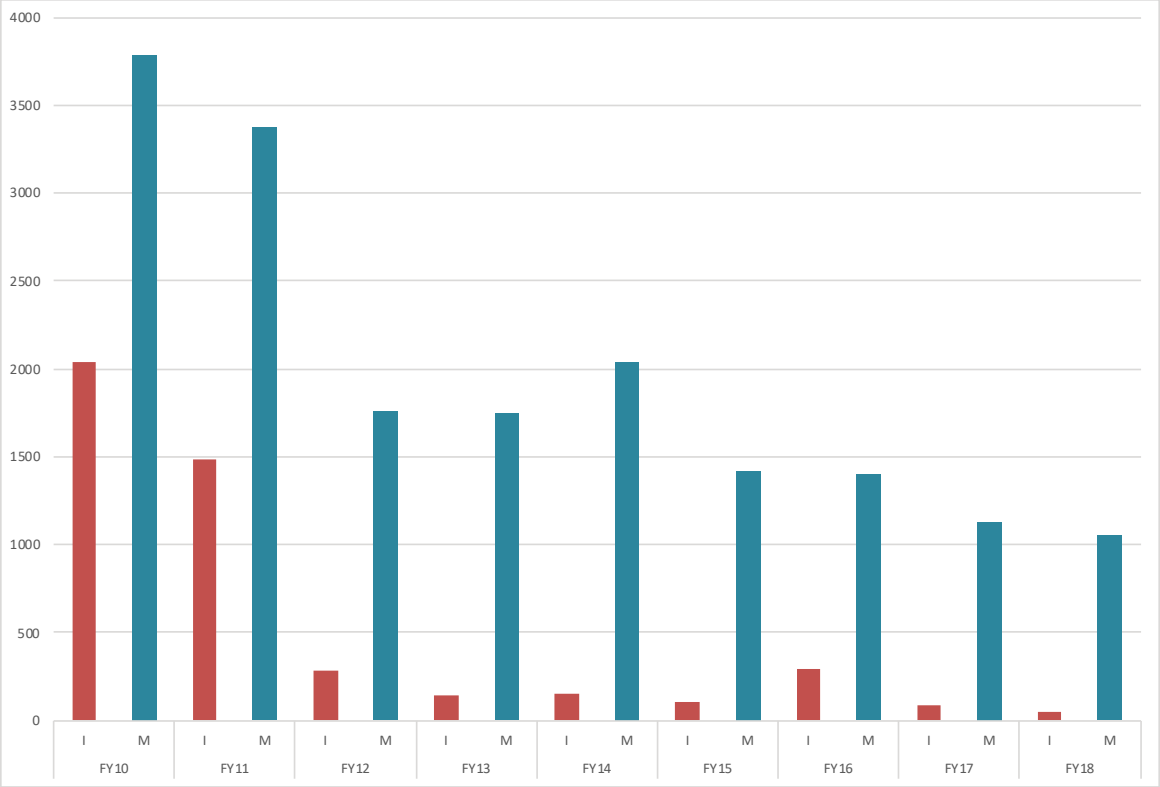
**C**—Known to be invasive; widely distributed and abundant throughout the region; distribution is very extensive throughout natural areas; difficult to control once they become widespread; considered ubiquitous.

## Watershed Revegetation

***Table 2.*** Initial and maintenance acres treated by the BES Watershed Revegetation Program from 2009–2018.

| Watersheds | FY10 | | FY11 | | FY12 | | FY13 | | FY14 | | FY15 | | FY16 | | FY17 | | FY18 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2009-2010 | | 2010-2011 | | 2011-2012 | | 2012-2013 | | 2013-2014 | | 2014-2015 | | 2015-2016 | | 2016-2017 | | 2017-2018 | |
| | Acres | | Acres | | Acres | | Acres | | Acres | | Acres | | Acres | | Acres | | Acres | |
| | I | M | I | M | I | M | I | M | I | M | I | M | I | M | I | M | I | M |
| Balch Creek | | | 61 | 61 | | 40 | | 40 | | 228 | | 78 | 210 | 210 | | 210 | | |
| Columbia Slough | 2.5 | 473.1 | 2.4 | 514 | 21.2 | 488 | 62.4 | 560 | 1 | 436.6 | 55.75 | 459.43 | 3.3 | 285.6 | | 285.3 | | 339.6 |
| Fanno Creek | 3.2 | 34.7 | 4 | 22 | 3.3 | 33 | 9.1 | 33 | 7.4 | 38.25 | | 34.98 | 0.4 | 28.1 | 6.6 | 15.2 | 1.0 | 24.9 |
| Johnson Creek | 25.7 | 478.9 | 5.6 | 452 | 107.4 | 336 | 26 | 312 | 36.8 | 361.2 | 13.83 | 230.78 | 8 | 158.1 | 7.4 | 141.7 | 43.6 | 145.5 |
| Tryon Creek | 33.9 | 53.9 | 0.2 | 58 | 0.26 | 58 | 0.6 | 56 | 0.1 | 48.95 | | 43.29 | 20.05 | 29.2 | | 25.2 | 1.8 | 30.2 |
| Water Quality Facili- | 3.05 | 135.1 | 6 | 157 | | | | | | | | | | | | | | |
| Willamette River | 0.1 | 618.6 | 68.25 | 752 | 151.7 | 793 | 46.5 | 746 | 102 | 921.8 | 36.8 | 571.8 | 53.4 | 686 | | 449.6 | 1.2 | 510.6 |
| Other | | 21 | | 21 | | 4 | | 0.8 | | | | | | | | | | |
| Forest Park FEMA | 1972 | 1972 | 1335 | 1335 | | | | | | | | | | | | | | |
| **TOTALS** | **2040** | **3787** | **1482** | **3372** | **284** | **1752** | **145** | **1748** | **147** | **2,035** | **106** | **1,418** | **296** | **1,397** | **88** | **1,127** | **48** | **1,050** |

*Figure 3.* Number of acres initiated and maintained through the BES Revegetation Program, FY08–16.




## Riparian Plants Classroom Program

| Fiscal Year | # programs | # students |
|---|---|---|
| 2007-2008 | 37 | 982 |
| 2008-2009 | 36 | 1015 |
| 2009-2010 | 34 | 903 |
| 2010-2011 | 35 | 870 |
| 2011-2012 | 27 | 701 |
| 2012-2013 | 21 | 587 |
| 2013-2014 | 10 | 238 |
| 2014-2015 | 7 | 165 |
| 2015-2016 | 17 | 426 |
| 2016-2017 | 30 | 705 |
| 2017-2018 | 35 | 784 |

## Restoration & Education Field Trips*

| Fiscal Year | # programs | # student contacts** |
|---|---|---|
| 2007-2008 | 85 | 2083 |
| 2008-2009 | 109 | 2666 |
| 2009-2010 | 84 | 2038 |
| 2010-2011 | 72 | 1767 |
| 2011-2012 | 58 | 1495 |
| 2012-2013 | 79 | 1975 |
| 2013-2014 | 65 | 1587 |
| 2014-2015 | 71 | 1528 |
| 2015-2016 | 74 | 1622 |
| 2016-2017 | 102 | 2153 |
| 2017-2018 | 76 | 1894 |

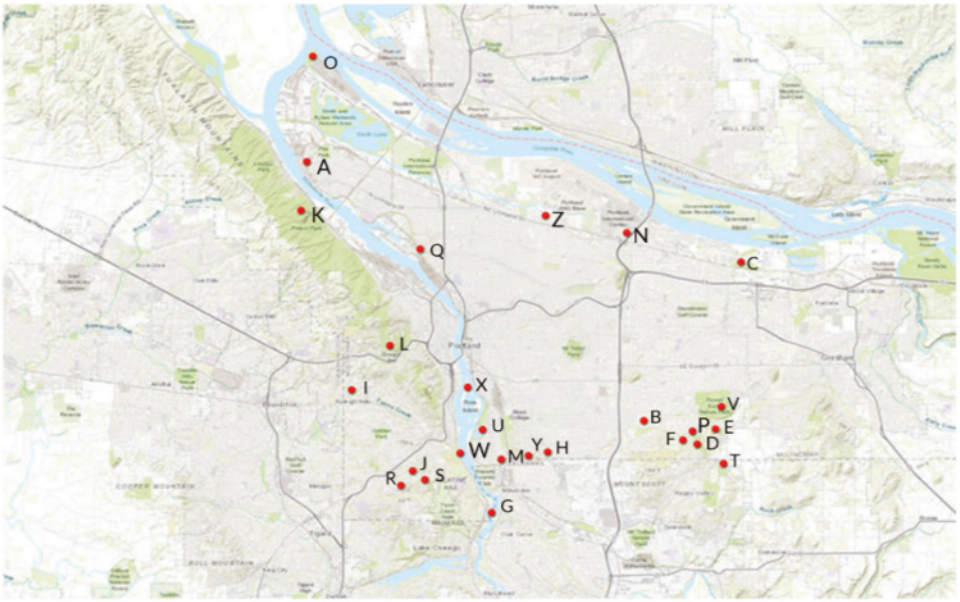
* **NOTE** Restoration/Education field trips are conducted in partnership with Portland Parks. During the field trips, students typically rotate through two activities: a field study with Clean Rivers Education (plant ID, water chemistry, macroinveretbrates, etc.) and a restoration stewardship project with PPR (invasive removal, planting projects). These numbers might also be reported by PPR in their tracking.

***Some students attend multiple (e.g. seasonal) field trips. 'Student contacts' is used instead of 'students' to indicate that students may attend multiple trips.*

*Portland Parks and Recreation*

# Portland Parks and Recreation

Protect the Best
Initital and Retreatment Sites, FY08-FY16




A. BALTIMORE WOODS CONNECTIVITY CORRIDOR
B. BEGGAR"S TICK WILDLIFE REFUGE BIG FOUR CORNERS NATURAL AREA
C. BIG FOUR CORNERS NATURAL AREA
D. BUTTES NATURAL AREA
E. CLATSOP BUTTE PARK
F. DEARDORFF CREEK NATURAL AREA
G. ELK ROCK ISLAND
H. ERROL HEIGHTS COMMUNITY GARDEN
I. FANNO CREEK NATURAL AREA
J. FOLEY-BALMER NATURAL AREA
K. FOREST PARK
L. HOYT ARBORETUM
M. JOHNSON CREEK PARK
N. JOHNSON LAKE
O. KELLEY POINT PARK
P. KINGSLEY BUNDY NATURAL AREA
Q. MADRONA PARK
R. MARICARA PARK
S. MARSHALL PARK
T. MITCHELL CREEK NATURAL AREA
U. OAKS BOTTOM WILDLIFE REFUGE
V. POWELL BUTTE NATURE PARK
W. POWER'S MARINE PARK
X. ROSS ISLAND NATURAL AREA
Y. TIDEMAN JOHNSON NATURAL AREA
Z. WHITAKER PONDS NATURE PARK

***Table 3.*** Initial and retreated acres in the Protect the Best Program from FY2007–FY2017.

| | FY08 | | FY09 | | FY10 | | FY11 | | FY12 | | FY13 | | FY14 | | FY15 | | FY16 | | FY17 | | FY18 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2007-2008 | | 2008-2009 | | 2009-2010 | | 2010-2011 | | 2011-2012 | | 2012-2013 | | 2013-2014 | | 2014-2015 | | 2015-2016 | | 2016-2017* | | 2017–2018 | |
| | I | R | I | R | I | R | I | R | I | R | I | R | I | R | I | R | I | R | P | T | P | T |
| Baltimore Woods | | | | | | | | | | | | | | | | | 2 | | 0 | 0.38 | | |
| Beggar's Tick | | | | | | | | | | | | | | | | | 2 | | 0 | 0 | | |
| Big 4 Corners NA | | | | | | | | | 22 | | 64 | 86 | 7 | 86 | | 70 | | 29 | 20 | 0 | 20 | 0 |
| Bundy NA | | | | | 4 | | | 4 | | | | | | | | | | | | | | |
| Buttes NA | | | 9 | | 2 | | 113 | 9 | | | | 124 | | 3 | | | | 9 | 12 | 12 | 12 | 0.5 |
| Clatsop Butte Park | | | 27 | | | | | 18 | | | | | | | | | | | | | 0 | 2.77 |
| Deardorf Creek Natural Area | | | | | | | | | | | 3 | | | | | | | | | | | |
| Elk Rock Island | 5 | | 2 | | 3 | 4 | | 6 | | | | 5 | | 2 | | | | | | | 0 | 1.65 |
| Errol Heights NA | | | | | | | | | 7 | | | 10 | | | | | | 10 | 0 | 0.37 | | |
| Fanno Creek | | | | | | | | | | | | | | | | | 4 | | 0 | 0 | | |
| Foley-Balmer NA | | | | | | | | | | | | | | | 5 | | | | | | 0 | 0.48 |
| Forest Park | 823 | | 588 | 435 | 499 | 387 | 351 | 559 | 484 | 513 | 264 | 500 | 93 | 493 | 202 | 364 | 102 | 144 | 294 | 294 | 352.9 | 368.15 |
| George Himes | | | | | | | | | | | | | | | | | | | | | 33.35 | 3.2 |
| Hoyt Arboretum | | | | | | | | | | | | | | | | | 2 | | 0 | 0 | | |
| Jensen | | | | | | | | | | | | | | | | | | | | | 2.25 | 0 |
| Johnson Creek Park | | | | | | | | | | | | | | | | | 5 | | 0 | 0 | | |
| Johnson Lake | | | | | | | | | | | | | | | | | 1 | | 0 | 0 | | |
| Kelley Point Park | | | | | | | | | | | | | | | | | | 2 | 0 | 0.79 | | |
| Madrona Park | | | | | | | | | | | | | | | | | 1 | | 0 | 0 | | |
| Maricara Park | 17 | | | | | 17 | | | | | | | | 2 | | 9 | | 11 | 10 | 11.5 | 10 | 3.5 |
| Marshall Park Comp. | | | | | 4 | | | | | | | | | | | | 11 | | 14 | 8.94 | 14 | 5.9 |
| Mitchell Creek NA | 71 | | | | | 67 | | | | | | 4 | | 2 | | 70 | | | | | 0 | 7.16 |
| Mt. Tabor | | | | | | | | | | | | | | | | | | | | | 0 | 11 |
| Oaks Bottom | | | | | | | | | | | 15 | | 61 | 14 | | 47 | | 27 | 17 | 54.5 | 17 | 60.77 |
| Oaks Crossing | | | | | | | | | | | | | | | | | | | 4 | 1.4 | 4 | 4.34 |
| Powell Butte NP | | | 171 | | 72 | | 69 | 171 | 13 | 83 | 4 | 8 | | 18 | | | | 52 | 24 | 28.7 | 24 | 120.15 |
| Power's Marine | | | | | | | | | | | | | | | | | 3 | | 0 | 0 | 0 | 6.8 |
| Ross Island | | | | | | | | | | | | | | | | | 10 | | 9.6 | 29 | 10 | 38.66 |
| Tideman Johnson NA | | | | | | | | | 8 | | | 8 | | | | | 2 | | 0 | 0 | | |
| Wahoo Creek | | | | | | | | | | | | | | | | | | | 0 | 15.52 | 25 | 15.2 |
| Whitaker Ponds | | | 3 | | | | | | | | 2 | | | | | | | | 0 | 0.48 | | |
| Wilkes Creek Headw. | | | | | | | | | | | | | | | | | | | 0 | 0.25 | 10 | 4.46 |
| TOTALS | 916 | 0 | 800 | 435 | 584 | 475 | 533 | 767 | 534 | 596 | 352 | 745 | 161 | 620 | 207 | 560 | 147 | 258 | 413.6 | 495.43 | 534.5 | 656.69 |

**The Protect the Best Program no longer records initial versus repeat treatments, as it did not accurately reflect on-the-ground restoration actions.*

# Appendix A-3. City of Portland Risk Assessment

Name: Scientific Name:

Family:

Date:

Findings of This Review and Assessment:

_____ , was evaluated and determined to be a category "_____ " nuisance plant as defined by the City of Portland Nuisance Plant Risk Assessment. This determination is based on a literature review and analysis using the quantitative risk assessment, below. Using the City of Portland Nuisance Plant Risk Assessment, v. 1.0, the above species scored _____ . This score indicates a "_____" rank.

**IMAGE HERE**

Introduction:

Growth Habits, Reproduction, and Spread:

Reproductive Traits:

Establishment and Competitive Ability:

Probability of Detection:

Hardiness Zones:

Native Range:

Native Range Map: Probability of Detection:

Hardiness Zones:

Native Range:

Native Range map:

Distribution in Oregon and/or Washington or, if not present, North America:

USDA map here

Economic Impacts:

Ecological Impacts:

Hydrologic Impacts:

Control:

**City of Portland**
**Nuisance Plant Risk Assessment v. 1.0**
**Reviewer Evaluation Form**

Species:

Assessor info:

Name:

Affiliation:

Mailing Address:

Phone:

Email:

Date assessed:

Signature: _____

**City of Portland**
**Nuisance Plant Risk Assessment v. 1.0**

Common Name:

Scientific Name:

Family:

For use with plant species that occur or may occur in Portland to determine their potential to become, or status as, nuisance plants. For each of the following categories, select the number that best applies. Numerical values are weighted to increase the value of important factors over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: Risk Category:

## GEOGRAPHIC INFORMATION

### 1. Invasive in other areas

| | | |
|---|---|---|
| 0 | Low | Not known to be invasive elsewhere. |
| 2 | Medium | Known to be invasive in climates dissimilar to Portland's current climate. |
| 6 | High | Known to be invasive in the region or geographically similar areas. |

*Comments:*

### 2. Habitat availability: Are there susceptible habitats for this species and how common or widespread are they in Portland?

| | | |
|---|---|---|
| 1 | Low | Habitat is very limited or seemingly non-existent. |
| 3 | Medium | Habitat encompasses is relatively uncommon in Portland (i.e., gravel bars). |
| 6 | High | Habitat covers large regions, or is limited to a few locations of high economic or ecological value (e.g., rare species habitat such as Elk Rock Island). |

*Comments*:

### 3. Proximity to Portland: What is the current distribution of the species?

| | | |
|---|---|---|
| 0 | Present | Occurs within Portland. |
| 1 | Distant | Occurs only in distant US regions or foreign countries. |
| 3 | Regional | Occurs in Western regions of US but not adjacent to the Coast Range, Willamette Valley, or Cascade Mountain ecoregions. |
| 5 | Adjacent | Weedy populations occur adjacent (<50 miles) to Portland border. |

*Comments:*

### 4. Current distribution: What is the current distribution of escaped populations in Oregon?

| | | |
|---|---|---|
| 0 | Not present | Not known to occur in Coast Range, Willamette Valley, or Cascade Mountain ecoregions. |
| 1 | Widespread | Throughout much of above ecoregions (e.g., herb robert). |
| 5 | Regional | Abundant in parts of above ecoregions (e.g., shiny geranium) |
| 10 | Limited | Limited to one or a few infestations in above ecoregions (e.g., goats rue). |

*Comments*:

## BIOLOGICAL INFORMATION

### 5. Environmental factors: do abiotic (non-living) factors in the environment affect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).

| | | |
|---|---|---|
| 1 | Low | Severely confined by abiotic factors (e.g., common reed). |
| 2 | Medium | Moderately confined by environmental factors (e.g., herb Robert, Scots broom). |
| 4 | High | Highly adapted to a variety of environmental conditions (e.g., slender false brome). |

*Comments:*

### 6. Reproductive traits: how does this species reproduce? Traits that may allow rapid population increase or complicate management and control.

| | | |
|---|---|---|
| 0 | Negligible | Not self-fertile, or is dioecious and opposite sex not present. |
| 1 | Low | Reproduction is only by seed, produces few seeds, or seed viability and longevity are low. |
| 3 | Medium | Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons). |
| 3 | Medium | Produces many seeds but seeds of short longevity (<5 years). |
| 5 | High | Produces many seeds and seeds moderately long-lived (>5 years) (e.g., garlic mustard). |
| 6 | Very high | Have two or more reproductive traits (e.g., seeds are long-lived [>10 years] and spreads by rhizomes). |

*Comments:*

### 7. Biological factors: do biotic (living) factors restrict establishment and spread of the species? [What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?]

| | | |
|---|---|---|
| 1 | High | Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agents on tansy ragwort). |
| 2 | Medium | Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived (e.g., biological agents on Canadian thistle). |
| 4 | Low | Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential (e.g., reed canar grass). |

*Comments:*

### 8. Reproductive potential and spread after establishment—non-human factors: how well can the species spread by natural means?

| | | |
|---|---|---|
| 0 | Negligible | Insignificant potential for natural spread in Portland (e.g., ornamental plants outside of climate zone). |
| 2 | Low | Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., mole plant). |
| 3 | Medium | Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g.,weeping sedge). |
| 5 | High | Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., orange hawkweed). |

*Comments:*

### 9. Potential of species to be spread by humans: what human activities contribute to spread of species? Examples include: recreation; interstate or international commerce; contaminated commodities; packing materials or products; vehicles, boats, or equipment movement; rights-of-way and parks maintenance; or intentional introductions of ornamental and horticultural species.

| | | |
|---|---|---|
| 1 | Low | Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in commodities, mulch, gravel,seed mixes or other commercial products). |
| 3 | Medium | Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., Canada thistle). |
| 5 | High | Potential to be introduced or moved within the region high (e.g., species widely propagated and sold; propagules common contaminant of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recre-ational activities) (e.g., spotted knapweed, water primrose spp). |

*Comments:*

## IMPACT INFORMATION

### 10. Economic impact: What impact does/could the species have on Portland's infrastructure and economy?

| | | |
|---|---|---|
| 0 | Negligible | Causes few, if any, economic and/or infrastructure impacts. |
| 2 | Low | Potential to, or causes low economic impact to urban or natural areas (e.g., common vetch, creeping bent grass). |
| 5 | Medium | Potential to, or causes moderate impacts to urban areas, rights-of-way maintenance, property values, recreational activities; increases costs and risks to a moderate extent (e.g., English/Irish ivy, Himalayan blackberry). |
| 8 | High | Potential to, or causes high impacts and risks in urban areas and natural areas, (e.g., kudzu, giant hogweed). |

*Comments:*

11. Environmental Impact: what risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired/rare species at risk.

| | | |
|---|---|---|
| 0 | Negligible | None of the above impacts probable. |
| 2 | Low | Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats (e.g., roadsides, vacant lots, etc.). |
| 5 | Medium | Species can or does cause moderate impacts in less critical habitats (e.g., urban parks, Environmental Zone private properties, etc.). |
| 8 | High | Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to priority habitats (e.g., aquatic, riparian corridors, Oregon white oak stands, species of concern sites, etc.). |

Comments:

12. Impact on Health: What is the impact of this species on human and animal health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles.

| | | |
|---|---|---|
| 0 | Negligible | Has no impact on human or animal health. |
| 2 | Low | May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge). |
| 4 | Medium | May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury (e.g.,giant hogweed, gorse). |
| 7 | High | Causes death from ingestion of small amounts, acute toxicity (e.g., poison hemlock). |

Comments:

## CONTROL INFORMATION

13. Probability of detection at point of introduction: How likely is detection of species after introduction and naturalization?

| | | |
|---|---|---|
| 1 | High | Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted. |
| 5 | Medium | Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., gorse). |
| 10 | Low | Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, plant resembles common species (e.g., weedy grasses, yellow-flowered hawkweeds). |

Comments:

14. Control efficacy: What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?

| | | |
|---|---|---|
| 1 | High | Easily controlled by common, non-chemical control measures (e.g., mowing, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort). |
| 2 | Medium | Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control). |
| 4 | Low | Treatment options marginally effective or costly. Mechanical control efforts can increase plant density (e.g., rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol agents ineffective or unknown. |
| 6 | Negligible | No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment or complete control is not achievable. |

Comments:

## CATEGORY SCORES

Geographic score (Add scores from 1 – 4)
Biological score (Add scores 5 – 9)
Impact score (Add scores 10 – 12)
Control score (Add scores 13 – 14)
Total Score for species (Scores 1 – 14)

## RISK CATEGORIES

**A—Scores of 70-90**
**B—Scores of 50-70**
**C—Scores of 40-50**
**D—Scores of 30-40**

This Risk Assessment was modified by the City of Portland from the USDA-APHIS Risk Assessment for the Introduction of New Plant species and the Oregon Department of Agriculture's Noxious Qualitative Weed Risk Assessment v. 3.6 using An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity. NatureServe, Arlington, Virginia by Morse, Randall, Benton, Hiebert, and Lu. City of Portland version 1.0 7/25/13

# Appendix A-4. Pathways of Introduction

**Air transportation/cargo**—Organisms can become lodged in or attached to pieces of airplanes, such as landing gear (Columbia University 2013). The Japanese beetle *(Popillia japonica),* a voracious pest with a particular fondness for roses and turf (it is considered the single more important turfgrass pest in the United States), has been introduced to the City of Portland via air cargo carriers at Portland International Airport annually since 2000 (Oregon Department of Agriculture 2016a). The largest infestation of Japanese beetles found in Oregon was detected in 2016 in Cedar Mall and Bethany, in Washington County. It is estimated it will take five years to eradicate this population.

**Water transportation—**Ballast, hull fouling, stowaways, structures above the water line, dredge spoil material, and anglers have contributed to the introduction and spread of invasive species.

**Ballast**—More than 70% of aquatic invasive species, including quagga and zebra mussels (Dreissena spp.) have been introduced and spread via ballast water discharge and attachment to vessels (Beyer et al. 2011). Purple loosestrife *(Lythrum salicaria)* has been transported via ship ballast and ship transport (Thompson et al. 1987).

**Hull fouling**—International shipping transports about 90% of globally traded goods and represents the single largest pathway for transport and introduction of invasive species globally (Hewitt, Gollasch, and Minchin 2009). Species that become encrusted on exposed vessel surfaces can dislodge and reproduce in ports-of-call (Coutts and Taylor 2004, Ruiz and Smith 2005, Sylvester and MacIsaac 2010). It is estimated that hull fouling is responsible for 55–69% of currently established coastal and estuarine nonindigenous species worldwide (Scianni et al. 2017), including 58% of established nonindigenous marine invertebrates and algae in Puget Sound (Davidson et al. 2014). The blue mussel *(Mytilus galloprovincialis)* may have contributed to the exclusion of the native *M. trossulus* from its southern range on the Pacific Coast (Geller 1999).

**Stowaways**—As of 2014, a total of 232 species of exotic ants have been intercepted as stowaways in global trade (Miravete et al. 2014).

**Structures above water line**—The Asian gypsy moth (*Lymantria dispar* spp.) was detected in Portland in 2015 and followed by large-scale public outreach and eradication efforts. It was likely introduced on cargo and vessels originating from Asia (Oregon Department of Agriculture 2016b).

**Dredge spoil material**—Movement of soil, sand and gravel is a pathway of introduction for invasive species; plants and plant parts, nematodes, and soil-borne pathogens (Campbell and Kriesch 2003).

**Anglers**—Anglers and boaters can spread invasive species, such as New Zealand mudsnail (*Potamopyrgus antipodarum*) among aquatic ecosystems via felt-soled wader boots, or unclean gear (Oregon Sea Grant 2010).

**Land Transportation**—Although the movement of invasive species stowaways is poorly documented for terrestrial transportation systems (Ascensao and Capinha 2017), it is well documented that transportation corridors have a higher frequency of nonnative species than control sites (Hansen and Clevenger 2005). The following have been identified as terrestrial transportation pathways of introduction: cars and trucks, all-terrain vehicles, boat trailers, trains, equipment, recreationists, working animals, and pets, are land transportation-based pathways for introductions of invasive species.

**Cars and trucks, all-terrain vehicles, equipment**—Cars and trucks can transport invasive seeds in the soil that is attached to wheels and other parts of the vehicle (Hodkinson and Thompson 1997). Weeds and plant parts are commonly transported when soil attaches to vehicles.

**Boat trailers**—Trailered boats are responsible for the spread of aquatic invasive species, such as quagga and zebra mussels (Dreissena spp.) as well as numerous aquatic invasive plants (Rothlisberger et al. 2011).

**Trains**—Spotted knapweed (*Centaurea stoebe*) is an example of an invasive species dispersed by trains (Broennimann et al. 2014), often attaching itself to the undercarriage of trains (Sheley et al. 1998).

**Recreationists**—Abundance and richness of non-native species is significantly greater in sites where tourist and outdoor recreation activities occur than in control sites (Anderson et al. 2015). Human activity serves as a form of disturbance, which can alter plant/animal biomass and change niche opportunities for species within habitats (Byers 2002; Jauni, Gripenberg, and Ramula 2014).

**Working animals**—Working animals, such as horses, transport invasive species through feed, manure, and hoof debris, however establishment of invasive species is minimal along horse trails, likely because of the harsh environmental site-specific conditions, i.e., lack of adequate water and light that adversely affect plant germination and establishment (Gower 2008).

**Pets**—The escape or release of former pets is a pathway for the introduction of invasive species (Pet Industry Joint Advisory Council). Examples of species that were introduced to natural environments and subsequently became invasive include red-eared slider turtles (*Trachemys scripta elegans*), American bullfrogs (*Lithobates catesbeianus*), Monk parakeets (*Myiopsitta monachus*), Lionfish (*Pterois volitans*), and feral domestic cats (*Felis domesticus*). Four of these species exist as invasive species in the Portland metropolitan area. In Alaska, the red-legged frog was introduced to Chichagof Island by a teacher who believed her act compassionate (Alaska Department of Fish and Game). In addition, house pets, such as dogs, can transport invasive species via their coats and feces.

**Items used in shipping**—Port containers and crates, wood packing material, and seaweed are items used in shipping capable of transporting invasive species.

**Port containers/crates**—Shipping containers and crates can contain stowaways inside and hitchhikers outside. For example, in 2008, inspectors at the Port of Portland detected a live toad (unidentified species) in a shipping container from Asia (DeBruyckere 2009).

**Wood packing material**—Wood packing material used in trade, such as wooden pallets, crating, and dunnage harbors invasive species that use the wood as host material, feed upon it, or hitch a ride on it (USDA-APHIS 2003). Wood packing material has been found to have infection rates ranging from 22-24% (Batabyal 2006). Asian longhorned beetle *(Anoplophora glabripennis)*, pine shoot beetle *(Tomicus piniperda)*, and emerald ash borer *(Agrilus planipennis)* introductions have been traced to the use of solid wood packing material.

**Seaweed**—Seaweed is a live packing material that is often used to accompany shipments of seafood saltwater bait. Live Atlantic organisms were found in seaweed *(Ascophyllum nodosum)* used to pack live lobsters shipped to California (Miller 1969) and Atlantic periwinkle *(Littorina littorea)* was introduced to San Francisco Bay via this mode of transport (Carlton 1979); three non-native species have become established in California, likely the result of seaweed packing from the East Coast (Cohen and Carlton 1995); seaweed packing in three New England lobster shipments that arrived in Washington state contained a total of 11 different organisms (Olson 1999).

**Travel tourism/relocation**—This pathway includes people traveling to or moving to the Portland metropolitan area as well as those arriving with baggage and gear, or smuggling products into Portland.

**Travel/relocation**—An infestation of gypsy moths in Bend, Oregon was traced to vintage car parts purchased on eBay and shipped to Bend from Connecticut in 2005. Older egg masses were found on the car parts after gypsy moths were caught in traps in 2005 and 2006. Three aerial applications on 533 acres with *Bacillus thuringiensis* eradicated the infestation.

**Baggage/gear**—Foreign agricultural items, such as fruits, vegetables, and plant parts can carry invasives species, such as insects, snails, slugs, mites and diseases.

**Smuggling**—The illegal wildlife trade is responsible for the transport and establishment of invasive species worldwide (Garcia-Diaz et al. 2016). An individual moving to California smuggled northern pike *(Esox lucius)* into Lake Davis two decades ago to create fishing opportunities for this species in California. The state implemented a $5.6 million Northern Pike Eradication Project, using rotenone to eliminate all fish from the lake and its tributaries. The lake was subsequently restocked with trout.

**Plant pathways-plant trade**—Most of the woody invasive plants in the United States were introduced for horticultural purposes (Reichard 1997). Purple loosestrife *(Lythrum salicaria)*, Japanese honeysuckle *(Lonicera japonica)*, Japanese barberry *(Berberis thunbergii)*, Norway maple *(Acer platanoides)*, English ivy *(Hedera helix)*, and Kudzu *(Pueraria montana var. lobata)* are examples of plants introduced for horticultural purposes that have become invasive, causing significant economic and environmental damage to ecosystems throughout North America. The recent proliferation of difficult to regulate online-marketplaces for plants and plant propagules has exacerbated this pathway.

**Food pathways**—Accidental escape from holding tanks, intentional discarding, or intentional release of live food have resulted in the introduction and establishment of invasive species, although the risk of future invasion is relatively low because most live seafood imported is eaten; product that is not eaten generally does not exist in quantities large enough to establish reproducing populations (Cohen 2012).

**Non-food animal pathways**—Invasive species have been introduced via the bait industry, pet/aquarium trade, and aquaculture industries.

**Bait industry**—Invasive species are introduced via the live bait (both fresh and salt water) pathway through the bait itself, packaging materials, or hitchhikers on bait or packing materials, including parasites/microbes (Park and Fowler 2013). Pileworms *(Alitta virens)* and bloodworms *(Glycera dibranchiata)* from Maine can transport up to 24 other species (Cohen et al. 2001), 13 macroalgae species, two harmful microalgae, and 23 invertebrates (Haska et al. 2011), and four microbial species three seaweed species, and 30 invertebrate species (Cohen 2012). Examples of invasive species that have been transferred via live bait to salt water systems include nuclear worms *(Namalycastic rhodochorde)* from Vietnam to the mid-Atlantic (Mulladay et al. 2010) and ghost shrimp *(Neotrypaea californiensis)* from Washington and Oregon to California, which resulted in the transport of bopyrid isopod lone cornuta (Pernet et al. 2008; Passarelli 2010). Live bait has been responsible for the introduction of 47 species in mid-Atlantic drainages (Kilian et al. 2012).

**Pet/aquarium trade**—The moderate climate of the Pacific Northwest and sizeable human population create opportunities for the introduction and establishment of invasive species via the aquarium trade (Strecker et al. 2011). An estimated 58% of the fish that pet stores import monthly pose an ecological threat to native PNW ecosystems (Strecker et al. 2011). Thousands of African clawed frogs were detected in 2015 in the College Regional Stormwater Facility in Lacey, Washington, likely an introduction from a pet/aquarium owner.

**Aquaculture industries**—Fish, shellfish, and aquatic plant farming is the leading vector of aquatic invasive

species worldwide, leading to the introduction of non-native seaweeds, fish, invertebrates, parasites, and pathogens (Naylor, Williams, and Strong 2001). Since their introduction for food culture and biological control in the 1970s, Asian carp are now established in Mississippi River basins, causing economic and environmental damage (Chick and Pegg 2001). Cooke Aquaculture Pacific, an Atlantic salmon fish far off Cypress Island in Washington state, had a net-pen spill which resulted in the release of 263,000 Atlantic Salmon; three months later, Atlantic salmon were being netted 42 miles upstream in the Skagit River.

**Minimally processed products** (e.g., firewood)—Firewood is a key pathway for the introduction of invasive pests, including the emerald ash borer. In a research study in the upper Midwest, a total of 1,045 pieces of firewood representing 21 tree species, of which the most common were maple, oak, ash, and elm, live boring insects were found in 23% of the pieces, and 41% had evidence of previous borer infestation (Haack, Petrice, and Wiedenhoeft 2008, 2010).

**Natural spread of populations**—Includes the spread of invasive species by natural vectors, such as wind, connectivity between ecosystems, birds, and wildlife.

***Table 1.*** Pathways of invasive species introduction, including pathway specifics, organisms transported, and examples of invasive species associated with pathways.

| Pathway | Pathway Specifics | Organisms Transported | Examples of invasive species associated with pathways |
|---|---|---|---|
| TRANSPORTATION – ALL PATHWAYS RELATING TO THE TRANSPORTATION OF PEOPLE AND GOODS | | | |
| MODES OF TRANSPORTATION | | | |
| Air | A. Planes, helicopters | V, IN, INV, PS, PDP | Japanese beetle (*Popillia japonica*) |
| Water/Aquatic | B. Ship ballast | AI, AP, MBV | Spiny water flea (*Bythotrephes longimanus*), Fishhook waterflea (*Cercopagis pengoi*) |
| | C. Hull/surface fouling or recreational vessels | HFO | Quagga and zebra mussels (*Dreissena* spp.) |
| | D. Stowaways in baitboxes, holds, cabins | V, INV, PS, PDP | Rusty crayfish (*Orconectes rusticus*) |
| | E. Structures above water line | INV | Gypsy moth (*Lymantria dispar dispar*) |
| | F. Dredge spoil material | AI, AP, ADP, PDP | Asian clam (*Corbicula fluminea*) |
| | G. Anglers | PS, IN, V, ADP, PDP | New Zealand mudsnails (*Potamopyrgus antipodarum*) |
| Land/Terrestrial | H. Cars, buses, trucks, ATVs, recreational boat trailers | PS, IN, V, ADP, PDP | Hydrilla (*Hydrilla verticillata*) |
| | I. Trains, subways, metros, monorails | | Orange hawkweed (*Hieracium aurantiacum*) |
| | J. Construction, utility and other heavy equipment/vehicles | | Scots thistle (*Onopordum acanthium*) |
| | K. Hikers, hunters, horses, pets | | Russian knapweed (*Acroptilon repens*) |
| ITEMS USED IN SHIPPING PROCESS | | | |
| Containers | L. Port containers, crates | IN, INV, V | Asian long-horned beetle (*Anoplophora glabripennis*), Asian gypsy moth (*Lymantria dispar asiatica, Lymantria dispar japonica, Lymantria albescens, Lymantria umbrosa, Lymantria postalba*), Asian frogs, reptiles |
| Packing materials | M. Wood packing materials | PS, IN, PDP | Oak ambrosia beetle (*Monarthrum scutellare*) |
| | N. Seaweed | AI, ADP, PDP | Diatoms, algae, snails, isopods, amphipods, crabs |
| | O. Other plant materials | PS, IN, V, ADP | Common reed (*Phragmites australis* ssp. *australis*) |
| MAIL/INTERNET/OVERNIGHT SHIPPING: IN, INV, PS | | | |
| TRAVEL TOURISM/RELOCATION | | PS, IN | |
| | P. Travel/relocation | | Japanese beetle (*Popillia japonica*), Asian gypsy moth (*Lymantria dispar*) |
| | Q. Baggage/Gear (carry-on and checked items) | | Mediterranean fruit fly (*Ceratitis capitata*) |
| | R. Pets/plants and animals transported Smuggling | | |
| | S. Service industries | | |

## *Legend*

**AI** = AQUATIC INVERTEBRATES (AND LARVAL STAGES)

**ADP** = ANIMAL DISEASE PATHOGENS AND PARASITES

**AP** = AQUATIC PLANTS

**HFO** = HULL FOULING ORGANISMS

**IN** = INSECTS

**INV** = TERRESTRIAL NON-INSECT INVERTEBRATES

**MBV** = MICROBES, BACTERIA AND VIRUSES

**PDP** = PLANT DISEASE PATHOGENS

**PS** = TERRESTRIAL PLANTS AND SEEDS

**V** = VERTEBRATES

| LIVING INDUSTRY – ALL PATHWAYS ASSOCIATED WITH LIVING PLANTS AND ANIMALS OR THEIR BYPRODUCTS | | | |
|---|---|---|---|
| Plant Pathways | | | |
| Plant trade – aquatic and terrestrial | T. Plant parts (above and below-ground), seeds and the seed trade, aquatic propagules | PS, PDP, IN, V, AI, ADP | Water primrose (*Ludwigia peploides* ssp. *montevidensis*, *L. hexapetala*) |
| | U. Whole plants | | Light brown apple moth (*Epiphyas postvittana*) |
| | V. Plant organism, intentionally released or escaped | | |
| | W. Hitchhikers on or with plant or plant part, or in water, growing medium, or packing material | | Viburnum leaf beetle (*Pyrrhalta viburni*) |
| | | | Chameleon plant (*Houttuynia cordata*) |
| FOOD PATHWAYS (includes food and hitchhikers) | | | |
| | X. Live seafood market | AI, AP, ADP, PDP | Snakehead (*Channa argus*) |
| | Y. Other live food animals (livestock, game birds) | ADP, IN, MBV, V | |
| | Z. Plants and plant parts as food, medicine (fruits, vegetables, nuts, roots, seed, edible flowers) | PS, PDP, IN, INV, V | Goatsrue (*Galega officinalis*) |
| NON-food animal pathways | | | |
| | AA. Bait industry (fishing) | AI, AP, ADP, PDP | New Zealand mudsnails (*Potamopyrgus antipodarum*) |
| | BB. Pet/aquarium trade, including organisms and facilities | Any taxa | Ringed crayfish (*Orconectes neglectus*) |
| | CC. Aquaculture (where organisms are raised, the raising of organisms, their movement) | Fish, shellfish, shrimp, and other invertebrates | Atlantic salmon (*Salmo salar*) |
| | DD. Non-pet animals for non-food livestock (hunt clubs, breeding, racing, work animals), research, ranches, rodeos, lab facilities, e.g.) | ADP, IN, MBV, V | Chinese mystery snails (*Bellamya chinensis*) |
| MISCELLANEOUS (INCLUDES SUBCATEGORIES THAT DO NOT FIT UNDER THE FIRST THREE CATEGORIES) | | | |
| Other animal and plant-related pathways: ADP, IN, INV | | | |
| | EE. Minimally processed plant products (logs, firewood, mulch, straw, baskets, potting soils) | IN, INV, PS, PDP, V | Emerald ash borer (*Agrilus planipennis*) |
| OTHER AQUATIC PATHWAYS | | | |
| | FF. Interconnected waterways (canals) | AI, AP, ADP, PDP | Parrotfeather (*Myriophyllum aquaticum*) |
| | GG. Interbasin transfers | | |
| Natural spread of established populations | | | |
| | HH. Includes natural migration, movement and spread of established populations, ocean currents, wind patterns, unusual weather events, spread by migratory waterfowl and other birds | All taxa | American pokeweed (*Phytolacca americana*) |
| Ecosystem disturbance | | | |
| | II. Long-term disturbances that facilitate introduction, e.g., highway, railroad, utility ROW, land clearing, logging, development, damming, stream channelization | PS, PDP, IN, INV, V | Meadow knapweed (*Centaurea x gerstlaueri*) |
| | JJ. Short-term disturbances that facilitate introduction, e.g., habitat restoration and enhancement, forestry, post-fire treatments | PS, PDP, IN, INV, V | Exotic earthworms (many taxa) |

## *Air Pathways*

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Aviation** | Bureau of Planning | LCDC Airport Planning Rule | Portland Zoning Code | Consider applying to State Aviation Board for seaplane regulations. |
| | Port of Portland | State seaplane and invasive species laws | Portland International Airport Rules | Consider amending Portland International Airport Rules to address invasive risks. |

**State Law:**
Oregon Department of Aviation has authority over aviation services within the state. This authority includes entering into contracts, leases, and other arrangements for commercial concessions at state airports. (Or. Rev. Stat. § 836.055). Municipalities may establish and operate airports on property they own or control. (Or. Rev. Stat. § 836.200).

Oregon's Land Use Planning Act requires all cities and counties to adopt comprehensive plans. Local government comprehensive plans and associated land use regulations must include requirements for airports within their jurisdictions. To assist with local planning, the Land Conservation and Development Commission has adopted rules establishing compatibility and safety standards for uses of land near airports. (ORS § 836.619). A local government may adopt land use compatibility and safety requirements that are more stringent than the minimum required by Land Conservation and Development Commission rules. (Or. Rev. Stat. Ann. § 836.623).

Seaplanes may land, take off, or operate on Oregon waters open to motorboats unless specifically prohibited by state or federal law. (Or. Admin. R. 738-040-0016). Seaplanes must comply with all boating restrictions and regulations established for the water on which it is operating. Local governments are preempted by state law from regulating seaplane operations. (Or. Rev. Stat. § 835.201(2); Or. Admin. R. 738-040-0016(4)). However, local governments may apply to the State Aviation Board for special regulations relating to the operations of seaplanes on waters within their jurisdiction. (Or. Rev. Stat. § 835.210(1)). Such regulations may include, but are not limited to, establishment of limits on areas of operations, hours and times of operations, and the prohibition of seaplane landings and takeoffs.

A person may not launch a boat into the waters of this state if "the boat has any visible aquatic species on its exterior hull or attached to any motor, propulsion system or component, anchor or other attached apparatus outside of the hull, or on the trailer or other device used to transport the boat. (Or. Rev. Stat. § 830.560(2)(a)). State law defines "boat" to include seaplanes on the water and not in flight. (Ore. Rev. Stat. 830.005(2)). Seaplanes are exempt from Oregon State Marine Board requirements to carry an aquatic invasive species permit. (Or. Admin. Code 250-010-0650(2)(m)(F)).

**City of Portland:**
Chapter 33.209 of the Portland Zoning Code addresses aviation. The chapter contains sections address the siting of three types of facilities: aircraft landing, helicopter landing, and commercial seaplane. Portland zoning code – 33.209 aviation.

The Port of Portland has enacted the Portland International Airport Rules that govern and regulate the activities and conduct of persons and entities using the airport. The introductory text to Chapter 5 states that "All users of the Airport must comply with all applicable federal, state, and local environmental laws, and the Rules while at the Airport."

**Recommendations for Action:**
- Consider applying to the State Aviation Board for regulations relating to the operation of seaplanes on city waters.
- Add provision to Portland International Airport Rules to address invasive species risks from aviation services.
- Emphasize that airport users are required to comply with all federal, state, and City of Portland invasive species laws and regulations. Airport users are encouraged to review their

operations for invasive species risks and implement best management practices to mitigate identified risks, including:

- Visually inspecting the exterior and interior of aircraft for invasive species.
- Use bait, traps, or other barriers to prevent infestations.
- Decontaminate aircraft, cargo holds, or cargo if feasible if invasive species are present
- Require vendors or service providers to be WPM compliant.
- Train personnel to detect invasive species.

## *Water Pathways*

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Ballast Water** | Portland Fire & Rescue (Harbor Master)<br><br>Port of Portland | LCDC Airport Planning Rule<br><br>State ballast water management law (Or. Rev. Stat. Ann. §§ 783.620 – 783.640) | Portland Zoning Code<br>State statutes and regulations are silent. Local authority may be preempted due to comprehensive nature of the state law. DEQ regulations state that "DEQ or its agent is authorized to board and inspect vessel..." | Consider applying to State Aviation Board for seaplane regulations. |

**State Law:**
Oregon Department of Environmental Quality has authority over ballast water. State law prohibits the discharge of ballast water into the navigable waters of the state, except in compliance with state law. Discharge is permitted following a complete open sea or coastal exchange or Except as provided in ORS 783.635, a person may not discharge the ballast of any vessel into the navigable portions or channels of any of the bays, harbors or rivers of this state, or within the jurisdiction of this state, so as to injuriously affect such portions or channels of such bays, harbors or rivers, or to obstruct navigation thereof. (Or. Rev. Stat. Ann. § 783.620)

Owners or operators of vessels regulated by the state ballast water management law must report ballast water management information to the Department of Environmental Quality at least 24 hours prior to entering the waters of the state (for voyages greater than 24 hours in length) or prior to departing the port or place of departure (for voyages less than 24 hours in length. (Or. Rev. Stat. Ann. § 783.640).

DEQ regulations permit vessel inspections by authorized agents. "Only DEQ employees, agents or specifically authorized contractors are authorized to conduct such inspections." (Or. Admin. R. 340-143-0030(2)(a)).

**City of Portland:**
The City of Portland provides authority to the Chief of Portland Fire and Rescue to assign a person to perform the duties of a harbor master. Under PCC 19.12.010, the duties of the Harbor Master are "to inspect the harbor frequently and report any violation of this Title or any other title or any law respecting the use of wharves, docks, landings, vessels, watercraft, or harbor to the proper authorities of the City, County of Multnomah, the United States, or the State of Oregon, as the case may be to be acted upon as provided by law in cases where he/she is not empowered by this Title to act." The Harbor Master also has the authority to inspect vessels "when engaged in fire prevention, and/or harbor inspection work." (PCC 19.12.030).

PCC 19.16.025 requires notification of the arrival of ocean going vessels to the Harbor Master.

**Recommendations for Action:**

- Consider options for city officials to become authorized agents to conduct ballast water inspections.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Hull/ Surface Fouling** | Bureau of Parks and Recreation<br><br>Port of Portland | State AIS laws re: shipbreaking and watercraft inspections<br><br>State pesticide law re: marine antifouling paints | Marine Terminal Operations Ordinance 426-R<br><br>Parks and Recreational Dock and Boat Ramp Rules (PRK-1.17) | Require underwater hull cleaners to following best management practices.<br><br>Add provisions addressing invasive species risk to Parks and Recreation rules. |

**State Law:**

Under state law, shipbreaking activities (i.e., process of dismantling a ship for scrap or disposal) may only take place in dry dock. (ORS 783.400(2)(a)). Shipbreaking activities may not be conducted "in a manner that allows hazardous materials, fouling communities or fouling organisms that are in or on the ship to enter the waters of this state or the ocean shore." Fouling organisms means "native or nonnative species that attach to the hull of a ship including, but not limited to, sessile bottom-dwelling invertebrates, algae and microorganisms such as bacteria and diatoms."

With limited exception, a person may not sell, offer to sell or use in this state tributyltin-based marine antifouling paint or coating unless a method of using such paint or coating exists that does not result in the release of tributyltin or derivative or organotin into the waters of the state. (Or. Rev. Stat. § 634.505). Tributyltin-based marine antifouling paint or coating may be sold or used in this state if the paint or coating is sold by a licensed pesticide dealer and is:

- A low-leaching tributyltin antifouling paint or coating used on aluminum hulls;
- A low-leaching tributyltin antifouling paint or coating used on a ship that is more than 25 meters in length; or
- In a spray can containing 16 ounces or less of paint or coating; and commonly referred to as an outboard or lower drive unit paint. (Or. Rev. Stat. § 634.510).

Low-leaching tributyltin antifouling paint or coating may only be sold to a person who certifies in writing that the paint or coating is to be used for one of the above allowed uses. (Or. Rev. Stat. § 634.515).

A person may not launch a boat into the waters of this state if "the boat has any visible aquatic species on its exterior hull or attached to any motor, propulsion system or component, anchor or other attached apparatus outside of the hull, or on the trailer or other device used to transport the boat. (Or. Rev. Stat. § 830.560(2)(a)).

**City of Portland:**

Ordinance No. 426-R of the Port of Portland regulates the use and operation of marine terminals and their facilities with the city. The ordinance does not address hull cleaning or shipbreaking activities.

Portland Parks and Recreation had adopted administrative rules governing the use of municipal dock and boat ramp facilities. The rules do not address invasive species risks.

**Recommendations for Action:**

- Require underwater hull cleaners operating in city port facilities to follow best management practices.
- Add provisions addressing invasive species risk, such as requirements for vessels to be "Clean, Drain, and Dry" before launch, to Portland Parks and Recreation's Shore Term Boat Launch and Moorage Rules (PRK-1.17).
- Consider implementing a watercraft inspection program at city waters used for recreational boating.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Dredged Material** | Port of Portland | Removal-Fill Law<br><br>Solid and Hazardous Waste Rules | Prohibition on dredging near power mains | Consider enacting an ordinance regulating placement of dredged material.<br><br>Consider amending zoning code to provide authority to review dredging projects. |

**State Law:**

Dredging activities require both federal and state permits. Section 404 of the Clean Water Act prohibits the discharged of dredged or fill material into navigable waters without a permit from the U.S. Army Corps of Engineers (Corps). Federal permit applications are reviewed by the Oregon Department of Environmental Quality pursuant to CWA §401 (water quality certification) to ensure permitted activities do not result in violations of state water quality standards. The Portland Sediment Evaluation Team evaluates dredged material suitability for both federally permitted and civil works dredging projects.

Oregon's Removal-Fill Law requires any person who plans to remove or fill material within state waters to obtain a permit from the Department of State Lands (DSL). (Ore. Rev. Stat. § 196.810(a)). Projects involving less than 50 cubic yards of material are exempt from permitting requirements, unless located in Essential Salmonid Habitat, State Scenic Waterways, or compensatory mitigation sites. Activities conducted by or on behalf of federal agencies, such as the Corps, in connection with a federally authorized navigation channel are also exempt.

The DSL has adopted a general permit for maintenance dredging (Ore. Admin. R. 141-093-0275). This general permit authorizes maintenance dredging in accordance with the requirements of this Division, including the removal of material, transport of material to a placement site, and placement of material in an upland, flowlane or territorial sea location. (OAR 141-093-0270). Projects that qualify under the general permit must conform to a number of standards and conditions, including restrictions on placement of removed material. Unless otherwise authorized, removed materials may not be placed in any wetland, Administration designated floodway, or in an area historically subject to landslides. Removed material placed in an upland site must meet the Oregon Department of Environmental Quality's (ODEQ) definition of clean fill or the use must be specifically allowed by the ODEQ by rule, permit, or other authorization. If the project includes direct placement of material on the ocean shore, a separate Ocean Shore Permit issued the by Oregon Parks and Recreation Department is required.

Dredged material is classified as a solid waste. As such, it is also subject to regulate by the ODEQ under Oregon's solid and hazardous waste rules. The Oregon Legislature has declared that the upland placement of dredged material by a port district is a productive, or beneficial, use. (Or. Rev. Stat. § 459.061). ODEQ has issued "standing beneficial use determinations" for dredged sediment. (Or. Admin. R. 340-093-0270). A person may manage solid waste according to a standing beneficial use determination listed without contacting ODEQ for approval if the person complies with the regulatory requirements. There is a standing beneficial use determination for dredged sediment approved by ODEQ for unconfined in-water placement based on chemical screening. Pursuant to this determination, a person may use the material for the following beneficial uses: non-residential construction fill, habitat improvement, beach renourishment, other similar uses. The only condition that applies is a requirement that the person submit a report to ODEQ.

**City of Portland:**

It is unlawful for any person to drive any piling or to dredge or dig within 200' of the submerged water mains of the City of Portland in the Willamette River, without first obtaining written permission to do so from the Harbor Master. Before giving any such permission, the Harbor Master shall consult with the Engineering staff of the Portland Water Bureau. PCC 19.16.355(A).

Portland Zoning Code 33.10.030(C) states that the zoning code "does not regulate shipping, dredging, boating, and other similar uses on or in water bodies."

**Recommendations for Action:**

- Consider enacting an ordinance restricting the placement of dredge materials or requiring a risk assessment before placement.
- Consider amendment zoning code to provide authority to city to review dredging projects for invasive species risks.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Live Bait (G/AA)** | Bureau of Parks and Recreation | ODFW regulation re: nonnative wildlife; OARD regulation re: pest and disease control | State statutes and regulations silent. Cities have broad home rule authority to address local affairs. Local peace officers have authority to enforce state wildlife laws. | Add provision to PCC 20.12.150 addressing use of live bait (e.g., limited use to species on state and city approved lists). |

**State Law:**

Oregon Department of Agriculture has authority over plant pests. Permits are needed to possess or move plant pests in the state. Certain invertebrate species listed as "approved" by OARD may be possessed, sold, and released in state without a permit. OARD Approved Species list includes several earthworms used for bait. (Or. Admin. R. 603-052-1320).

**City of Portland:**

Oregon is a "home rule" state. Cities have broad authority to address local affairs. "Except as limited by express provision or necessary implication of general law, a city may take all action necessary or convenient for the government of its local affairs. Or. Rev. Stat. Ann. § 221.410(1))

Portland Bureau of Parks and Recreation manages parks and natural areas within the city. City Code has a provision for fishing and bathing in parks. Under PCC 20.12.150 "No person shall fish, wade, swim, or bathe in any Park except in the places designated by the Director for such purposes."

**Recommendations for Action:**

- Add provision to Parks and Recreation Code addressing use of live bait.
- Consider options for city enforcement of state wildlife rules regarding restricted wildlife.

## *Land Pathways*

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Land Transportation (vehicles, equipment, people, etc.)** | Bureau of Transportation<br><br>Bureau of Parks and Recreation | State noxious weed, non-native wildlife, and aquatic invasive species laws | Portland City Code Ch. 16 | Consider adopting city ordinances requiring use of BMPs when transporting vehicles and equipment.<br><br>Consider adopting a Parks and Recreation invasive species policy. |

**State Law:**

State law restricts the import, transport, and possession of listed noxious weeds ((Or. Admin. R. 603-052-1200(7)) and non-native wildlife (Or. Admin. R. Ch. 635, Div. 56).

Oregon Department of Transportation (ODOT) manages programs and administers the laws related to highways and roads, railways, public transportation services, and driver and vehicle licensing and safety. ODOT operates weigh stations at ports of entry for size and weight enforcement.

Machinery, such as threshing machinery, clover hullers, hay balers, and seed cleaning or treating machinery, must be thoroughly cleaned before being moved over a public road or from one farm to another. (Ore. Rev. Stat. § 569.445). Hay or bundle racks and all other equipment must be thoroughly swept and cleaned. Hay, straw, or other crop residue infested with noxious weeds having partially or fully formed seeds "shall not be moved from the land on which grown to other lands not infested with any of the weeds in the field from which such crop material came."

The Oregon Department of Fish and Wildlife, State Marine Board, and Department of Agriculture are authorized to require a person transporting a recreational or commercial watercraft to stop at a check station to inspect the watercraft for the presence of aquatic invasive species. (Or. Rev. Stat. § 830.589(1)). The agencies may decontaminate or recommend decontamination of any watercraft the agency inspects at a check station.

**City of Portland:**

Chapter 16 of the Portland City Code regulates traffic, parking, and related activities within the city on city owned or operated property. Section 16.70.610 prohibits any person from driving or moving a vehicle that "is so constructed or loaded so as to allow its contents to drop, sift, leak, or otherwise escape therefrom."

**Recommendations for Action:**

- Consider adopting city ordinances requiring the use of best management practices when moving mowers, backhoes, tractors, and other equipment between sites.
- Consider adopting a Parks and Recreation invasive species policy to address invasive species risks from recreational activities (firewood, hiking/fishing gear).

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Shipping containers, wooden pallets and crates, other solid wood packaging materials, spools, dunnage** | Port of Portland | Oregon Department of Agriculture (ORS 570.305); Oregon Department of Fish and Wildlife (ORS 635-056); Department of State Police (ORS 496.610) | Marine Terminal Ordinance<br><br>Portland International Airport Rules | Establish sentinel tree programs in the city<br><br>Consider amending ordinances, rules, and leases to require ISPM-15 compliance.<br><br>Consider developing incentive programs for port and air cargo operators to encourage ISPM-15 compliance. |

**State Law:**

The USDA-APHIS regulations implementing the Plant Protection Act adopt the International Standard for Phytosanitary Measures (ISPM) 15 "Regulation of wood packaging material in international trade." (7 U.S.C. §319.40). This standard describes phytosanitary measures that reduce the risk of introduction and spread of quarantine pests associated with the movement in international trade of wood packaging material made from raw wood. The Plant Protection Act expressly preempts state and local law with respect to plants and plant products moving in foreign commerce. No state or political subdivision of a state may regulate the movement in foreign commerce of any plant or plant product to control, eradicate, or prevent the introduction or spread of plant pests or noxious weeds. APHIS's adoption of ISPM-15 in Part 319 therefore preempt all state and local laws that are inconsistent with or exceed the federal regulations (7 C.F.R. § 319.1).

The Oregon Department of Agriculture (ODA) has authority to inspect imported timber products from a source outside of North America to safeguard the health of trees and plants in the state (Or. Rev. Stat. § 570.705). Timber products are defined as "any wood product, including, but not limited to, finished lumber, rough cut lumber, cants, logs, wood chips, sawdust and wood waste." (Or. Rev. Stat. § 570.700(3)). Under the ODA's regulations for the Imported Timber Products Inspection Program, importers of untreated timber products are required to notify ODA at least seven days in advance of the estimated date of arrival. (Ore. Admin. R. 603-052-1120). Within 21 days after arrival, the importer must provide the ODA with a copy of the bill of landing, and if the imported material is scaled, a copy of the scaling bureau scale certificate. Consider adopting a Parks and Recreation invasive species policy to address invasive species risks from recreational activities (firewood, hiking/fishing gear).

The ODA has primary authority to implement plant pest control laws. Ore. Rev. Stat. § 570.305 authorizes the "Director of Agriculture, and the chief of the division of plant industry, to use such methods as may be necessary to prevent the introduction into the state of dangerous insect pests and plant diseases, and to apply methods necessary to prevent the spread, and to establish control and accomplish the eradication of such pests and diseases, which may seriously endanger agricultural and horticultural interests of the state, which may be established or may be introduced, whenever in their opinion such control or eradication is possible and practicable." This statute also authorizes ODA, via it's Insect Pest Prevention and Management section, to issue permits for pesticide use to control introduced nonnatives.

The Oregon Department of Agriculture administers and has regulatory authority to implement the Pesticide Control Act and has the authority to declare any living organism to be a pest based on the definition of pesticide.

The Oregon Department of Fish and Wildlife Integrity Rules (Ore. Rev. Stat. § 635-056) regulate human actions involving non-native wildlife. Ore. Admin. R. 635-056-0050 Prohibited Species prevents the import of specified non-native species.

The Department of State Police enforces Oregon's wildlife laws (Ore. Rev. Stat. § 496.610).

**City of Portland:**

Terminal Tariff No. 8 is a federally approved tariff that establishes rates and rules of Port of Portland marine terminals. Terminal Tariff No. 8 provides guidance relative to the introduction of invasive species through the Port. Specifically, Section 1.3, Damage to Port Property and the Environment, Subsection B, Environmental Costs, states that marine terminal facility users are responsible for the cleanup of any " . . . invasive species, or hazardous materials into the air, land, groundwater, or waterways in the vicinity of Port marine terminal facilities, and/or on Port property that emanate from or are caused by its vessel, equipment, or operations."

Section 7A of Tariff No. 8 provides conditions for acceptance, retention, or delivery of cargo, and provides authority for the Port, "subject to federal, state, and city regulations . . . to process . . . invasive species . . . at marine terminal facilities." Section 7B provides authority for the Port to refuse to accept, receive, or unload cargo . . . deemed extremely offensive, perishable, hazardous, or likely to contain invasive species."

Chapter 5 of the Portland International Airport Rules states that "all users of the Airport must comply with all applicable federal, state, and local environmental laws, and the Rules while at the Airport."

**Recommendations for Action:**

- Consider amending Marine Terminal Ordinance and Portland International Airport Rules to require carriers to ensure international shipments are ISPM-15 compliant.
- Consider adding a clause to marine terminal leases and leases for air cargo operations regarding ISPM-15 compliance.
- Consider using the latest research and science to define best management practices and protocols for pallet storage to reduce the likelihood of post-treatment re-infestation.
- Consider requiring packaging materials that are not made from solid wood for international shipping.
- Consider promoting voluntary use of lower-risk alternatives to wood packaging materials, informing shippers of the benefits that include fewer inspections, cost savings on shipping lighter materials, and support by consumers for products that are both green and sustainable.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Plant parts** | Bureau of Planning and Sustainability | Weed Control Law | Portland Plant List | Restrict sale of noxious weeds and seeds in city ordinance.<br><br>Require plant sellers to notify customers about planting restrictions and state laws regarding release. |

**State Law:**

The Oregon Department of Agriculture (ODA) has authority over noxious weeds. Plants designated as noxious weeds by the Department may not enter the state or be transported, purchased, sold, or propagated in the state. (Or. Admin. R. 603-052-1200(7)).

ODA maintains lists of prohibited and restricted noxious weed seeds. (Ore. Admin. R. 603-056-0205). It is unlawful for any person to sell or transport for use in planting in the state any agricultural, flower, or vegetable seed that contains any prohibited noxious weed seeds or that contains restricted noxious weed seeds in excess of the permissible numbers per pound. (Ore. Rev. Stat. § 633.651(1)). Containers of agricultural, flower, or vegetable seed possessed, sold, or offered for sale for planting may be seized by the ODA. (Ore. Rev. Stat. § 633.670(3)).

Machinery, such as threshing machinery, clover hullers, hay balers, and seed cleaning or treating machinery, must be thoroughly cleaned before being moved over a public road or from one farm to another. (Ore. Rev. Stat. § 569.445). Hay or bundle racks and all other equipment must be thoroughly

swept and cleaned. Hay, straw, or other crop residue infested with noxious weeds having partially or fully formed seeds "shall not be moved from the land on which grown to other lands not infested with any of the weeds in the field from which such crop material came."

Responsibility for weed control lies with the Department of Agriculture and counties. (Or. Rev. Stat. § 569.355). Counties have the authority to establish weed control districts for the purpose of destroying and preventing the spread of noxious weeds. Any person, which is defined to include cities, owning or occupying land within a weed control district must destroy or prevent the seeding of noxious weeds on their land within a reasonable time using the "best means at hand." (Or. Rev. Stat. § 569-390). Municipalities are further directed to "destroy or prevent the spread or seeding of any noxious weed ... on any land owned by them or constitution the right of way" for highways, roads, irrigation ditches, or power lines. (Or. Rev. Stat. § 569.395).

**City of Portland:**

The City of Portland Bureau of Planning and Sustainability has adopted the Portland Plant List, which is comprised of two lists: Native Plants List and Nuisance Plants List. (ENN-7.01). Only those plants on the Native Plants List are allowed to be planted within the City's Environmental Overlay Zone and the Pleasant Valley Natural Resources Overlay Zone. Native plants are also encouraged to be planted in the Greenway Overlay Zone. In addition to being prohibited in above mentioned zones, species on the Nuisance Plant List cannot be installed in city required landscaping areas.

The City of Portland Bureau of Development Services and Bureau of Environmental Services administers enforcement provisions of Title 29, related the Required Eradication List of Nuisance Plants: 15 species not allowed within the city and must be eradicated when found (Title 29).

**Recommendations for Action:**

- Consider adding provisions restricting the sale of noxious weeds in city ordinances.
- Require garden centers and other stores where plants and seeds are sold to notify customers at point of sale regarding city planting restrictions and state noxious weed laws.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Live Food Animals** | Bureau of Planning<br><br>Multnomah County Health Department | ODFW Prohibited, Controlled Species List<br><br>Livestock import permits<br><br>ODFW rules re: propagation of wildlife | Portland City Code Title 13<br><br>Portland Zoning Code | Consider amending city ordinances to incorporate "Invasive Animal Lists" |

**State Law:**

The Oregon Department of Fish and Wildlife (ODFW) controls and restricts the import, transportation, possession, and propagation of certain non-native wildlife species. Non-native species listed as Prohibited my not be imported, possessed, or sold within the state. (Ore. Admin. R. 635-056-0050). Controlled species may be imported, possessed, sold, or released subject to certain conditions and approvals.

Pursuant to state disease control laws, any person transporting or moving livestock into Oregon, except for livestock being transported through the state without interruption, must obtain an import permit from the Oregon Department of Agriculture before entry (Ore. Rev. Stat. § 596.341; Ore. Admin. R. 603-011-0255). Livestock includes, but is not limited to "horses, mules, jennies, jackasses, cattle, sheep, dogs, hogs, goats, domesticated fowl, psittacines, ratites, domesticated fur-bearing animals, bison, cats, poultry, and any other vertebrate in captivity." Livestock does not include fish. No livestock may be imported that are specifically prohibited from interstate movement by the U.S. Department of Agriculture.

A Wildlife Propagation License from the Oregon Department of Fish and Wildlife to raise for sale

game birds (ducks, geese, doves, pigeons, grouse, pheasants, quail, partridge, turkeys, cranes, coots) or game mammals (antelope, black bear, cougar, mountain goat, mountain sheep, silver gray squirrel). (Or. Rev. St. § 497.228). A Cervid Propagation License is needed to breed deer and elk species for sale (Ore. Admin. R. 635-049-0010).

An ODA-issued license is required to sell meat products or to engage in custom processing or slaughtering. (Or. Rev. St. § 603.025). Poultry growers slaughtering less than 1,000 birds per year for direct retail sales are not required to obtain an ODA license. (Ore. Admin. R. 603-028-0720; 603-028-0730). Individuals slaughtering or processing meat or poultry, for personal use, are exempt from licensing.

**City of Portland:**
State law grants cities broad comprehensive and land use planning authority (Or. Rev. Stat. § 197.175). A city permit is required to operate or maintain a "specified animal facility." (PCC § 13.05.015(A)). A specific animal facility means a permitted site for the keeping of specified animals, which are defined as "bees or livestock." Livestock "means animals including, but not limited to, fowl, horses, mules, burros, asses, cattle, sheep, goats, llamas, emu, ostriches, rabbits, swine, or other farm animals excluding dogs and cats." In addition, the location and operation of businesses related to live food animals, either as agriculture (breeding and raising for sale), meat sales or processing, or a retail store, would be governed by the city's zoning code and ordinances.

**Recommendation for Action:**
- Consider amending Title 13 to prohibit possession of animals identified on City's "Invasive Animal Lists."

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Live fish** | Bureau of Planning | ODFW Fish Transport Permit<br><br>ODFW Prohibited Species List | Portland Zoning Code | Consider amending zoning code to address seafood markets.<br><br>Consider requiring educational signage at locations where live fish is sold. |

**State Law:**
All persons transporting live fish in Oregon need to have a fish transport permit issued by ODFW. (ORS 498.222; Or. Admin. Rules 635-007-0600). This requirement does not apply to fish taken in authorized commercial fisheries. Transport permits, however, are required for anyone importing live fish for sale to wholesalers, fish dealers, retail fish dealers, restaurants, or the consumer. Individuals shipping live fish within the state must provide a Fish Transport Permit to the carrier or affix the permit to the shipping container. (OAR 635-007-0610).

State law prohibits the possession of certain live fish, including walking catfish and piranha. (ORS 498.242). The Oregon Department of Fish and Wildlife (ODFW) controls and restricts the import, transportation, possession, and propagation of certain non-native fish species. Non-native fish species listed as Prohibited may not be imported, possessed, or sold within the state.

**City of Portland:**
State law grants cities broad comprehensive and land use planning authority (Or. Rev. Stat. § 197.175). Although not expressly mentioned, the location and operation of markets selling live seafood would be governed by the city's zoning code and food and sanitation ordinances.

**Recommendations for Action:**
- Consider including provisions regulating or restricting the sale of live fish in zoning code or city ordinances.

- Require educational signage at locations where live fish are sold notifying customer of invasive species risks or state laws prohibiting release.
- Increase awareness among city inspectors relative to invasive fish and fish that cannot be imported without an ODFW permit.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Pet/ Aquarium Trade** | Bureau of Planning<br><br>Multnomah County Health Department (implements Title 13 provisions) | State law prohibits release of live fish.<br><br>ODFW Prohibited, Controlled Species List | Portland City Code Title 13 (Animals)<br><br>Portland Zoning Code | Require pet and aquarium store owners to notify customers about state laws prohibiting release. |

**State Law:**

Aquaria fish are classified by ODFW as a "non-controlled species." (Or. Admin. R. 635-056-0060(5)). Noncontrolled species may be imported, possessed, sold, purchased, exchanged or transported in the state without a permit. Aquaria fish are defined in ODFW regulations as "any fish, shellfish or marine invertebrates legally acquired and sold in the pet store trade, except game fish, state or federally protected threatened and endangered species and those species listed as Prohibited or Controlled." (Or. Admin. R. 635-056-0010(2)).

State law prohibits the possession of certain live fish, including walking catfish and piranha. (ORS 498.242). The Oregon Department of Fish and Wildlife (ODFW) controls and restricts the import, transportation, possession, and propagation of certain non-native fish species. Non-native fish species listed as Prohibited my not be imported, possessed, or sold within the state. Controlled fish may be imported, possessed, sold, or released subject to certain conditions and approvals.

Live fish that are for aquaria use maybe transported in Oregon without an ODFW-issued fish transport permit. (ORS 498.222(3); Or. Admin. R. 635-007-0600(3)(a)). Aquaria is defined in ODFW regulations as "any tanks, pools, ponds, bowls or other containers intended for and capable of holding or maintaining live fish and from which there is no outfall to any waters of this state." (Or. Admin. R. 635-056-0010(1)).

An ODFW Fish Propagation License is generally required to propagate for sale and sell any live fish. (Or. Admin. R. 635-007-0650(1)). This requirement, however, does not apply to the propagation and sale of nongame aquaria species in aquaria. (Or. Admin. R. 635-007-0650(3)(a)).

State law prohibits the "release or attempt to release into any body of water any live fish that was not taken from that body of water" without first obtaining a permit from ODFW. (ORS 498.222(1)).

**City of Portland:**

State law grants cities broad comprehensive and land use planning authority (Or. Rev. Stat. § 197.175). Although not expressly mentioned, the location and operation of aquarium and pet stores would be governed by the city's zoning code and ordinances.

A city permit is required to operate or maintain a "specified animal facility." (PCC § 13.05.015(A)). A specific animal facility means a permitted site for the keeping of specified animals, which are defined as "bees or livestock."

**Recommendations for Action:**

- Consider including provisions regulating the sale of aquaria fish in city ordinances (for example, in Chapter 13:10 General Animal Regulations).
- Require pet and aquarium store owners to notify customers at point of sale about state laws prohibiting release and disposal options.
- Require educational signage at pet and aquarium stores notifying customer of invasive species risks or state laws prohibiting release.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Aquaculture** | Bureau of Planning | State Submerged Lands Leasing Program<br><br>ODFW Fish Transport Permit<br><br>ODFW Propagation License | Portland Zoning Code | Consider amending zoning code to address aquaculture. |

**State Law:**

Regulatory authority over aquaculture activities varies based on location. Aquaculture activities located on state-owned submerged lands are authorized through leases issued by the Department of States Lands. (OAR 141-082-0265). The Oregon Department of Agriculture has authority for shellfish leasing. Aquaculture activities occurring in private ponds or in land-based facilities are subject to local land use regulation.

Private fish ponds are regulated by Oregon Department of Fish and Wildlife. (Or. Admin. R. 635-056-0000). All persons transporting fish in Oregon need to have a fish transport permit issued by ODFW. ODFW allows stocking of certain species classified as low or moderate risk under certain conditions.

The Oregon Department of Fish and Wildlife (ODFW) controls and restricts the import, transportation, possession, and propagation of certain non-native fish species. Non-native fish species listed as Prohibited my not be imported, possessed, or sold within the state. The propagation of certain Controlled species is allowed if the operator obtains a propagation license from the ODFW prior to production and complies with conditions set forth by regulation. A propagation license, for example, is required to raise tilapia. (Or. Admin. R. 635-056-0075(1)(b)). Tilapia, however, may be raised indoors for personal consumption without license. Propagation outdoors "must occur in ponds or tanks covered with nets and screens adequate to prevent the capture or transport of cultured fish by predators or other animals." Barramundi may be raised with a propagation license, but propagation must occur indoors and only in closed recirculating systems. (Or. Admin. R. 635-056-0075(1)(d)).

**City of Portland:**

State law grants cities broad comprehensive and land use planning authority (Or. Rev. Stat. § 197.175). Private land uses Portland Zoning Code identifies the zones where agriculture is an allowed, conditional, and prohibited use. Section 33.920.550(A) states that "Agriculture includes activities that raise, produce or keep plants or animals." If the City interprets "animals" to include fish, aquaculture would be permitted on the local level in a manner similar to traditional aquaculture activities. However, neither the City's comprehensive plan or zoning code mentions aquaculture.

**Recommendation for Action:**

- Consider adding provisions to zoning code to address aquaculture activities, such as designation of zones where aquaculture would be an allowed, conditional, or prohibited use.

| Pathway | Responsible City Department | State Law or Regulation | Local Authority | Recommendation for Local Action |
|---|---|---|---|---|
| **Firewood, landscaping, nursery stock** | Bureau of Parks and Recreation<br><br>Bureau of Environmental Services<br><br>Bureau of Transportation<br><br>Bureau of Development Services<br><br>Bureau of Insect Control | State noxious weed and plant pest laws.<br>State laws re: firewood and feral swine<br>ODF regulation re: introduced pests;<br>ODA regulation re: plant pests;<br>ODA regulation re: firewood | Portland Tree Code<br><br>Integrated Pest Management Program | Considering adding provisions to require use of treated firewood and weed-free forage in City recreational areas. |

**State Law:**

*Forest Insect or Disease Pest*

The Oregon Department of Forestry has authority over forest insects and disease management to the state's forest resources. In the event of introduction of a new forest insect or disease pest, the State Forester shall cooperate with other responsible federal and state agencies and private forest landowners to secure prompt, effective action to prevent the spread of the damage by the new pests. State law requires the State Forester to implement an integrated pest management process on department-managed lands and encourage the process on other non-federal lands. (Or. Rev. Stat. § 527.321). Owners of forestlands or timber are required to implement prevention and suppression strategies to meet their forest resources management objectives. (Or. Rev. Code § 527.341). In the absence of action by other agencies the State Forester may employ such control measures as are approved by the State Board of Forestry policy. (Or. Admin. R. 629-051-0230).

Oregon Department of Forest regulations require the use of weed-free certified hay, straw, and other livestock forage on state forest land. (Or. Admin. R. 629-025-0040).

*Noxious Weeds*

The Oregon Department of Agriculture has authority over noxious weeds. Plants designated as noxious weeds by the Department may not enter the state or be transported, purchased, sold, or propagated in the state. (Or. Admin. R. 603-052-1200(7)).

Responsibility for weed control lies with the Department of Agriculture and counties. (Or. Rev. Stat. § 569.355). Counties have the authority to establish weed control districts for the purpose of destroying and preventing the spread of noxious weeds. Any person, which is defined to include cities, owning or occupying land within a weed control district must destroy or prevent the seeding of noxious weeds on their land within a reasonable time using the "best means at hand." (Or. Rev. Stat. § 569-390). Municipalities are further directed to "destroy or prevent the spread or seeding of any noxious weed ... on any land owned by them or constitution the right of way" for highways, roads, irrigation ditches, or power lines. (Or. Rev. Stat. § 569.395).

To prevent the establishment and spread of noxious weeds via tree seedlings used for commercial forest plantings, seedling production fields must be kept noxious weed-free. (Or. Admin. R. 603-052-1205(2)).

*Plant Pests*

The Oregon Department of Agriculture has authority over plant pests. Permits are needed to possess or move plant pests in the state. (Or. Rev. Stat. §570.215). Certain invertebrate species listed as "approved" by OARD may be possessed, sold, and released in state without a permit.

*Firewood*

State law restricts the transport of firewood into and within the state to prevent the spread of invasive species. A person may not transport firewood for personal use or sale at, or delivery to, a destination in the state unless (1) the firewood is harvested from a source located in Oregon, Idaho, or Washington or (2) the firewood has been treated in a manner prescribed by the Department of Agriculture. (Or. Rev. Stat. § 570.720; Or. Admin. R. § 603-052-1080). Similarly, firewood may not be sold unless it has been harvested from a source located in Oregon, Idaho, or Washington or (2) the firewood is label as required by the Department and the seller can

provide documentation that the firewood has been treated. Persons who transport or supply firewood in Oregon for other than personal use that is harvested from a source outside Oregon, Idaho, or Washington must maintain records, certifications, and other documents as required by the department.

*Feral Swine*

The Oregon Department of Fish and Wildlife has authority over feral swine. ODFW regulations prohibit the import of feral swine into Oregon for any purpose. (Or. Admin. R. § 603-011-0310(5)).

It is unlawful under state law for a person, or an employee of that person who acts as a land manager, to knowingly allow feral swine to roam on land owned or controlled by that person. (Or. Rev. Stat. 498.182). If a person, or an employee of that person who acts as a land manager, knows that feral swine roam on land owned or controlled by that person, they must take action to remove any feral swine. Such persons must also notify the ODFW within 10 days of discovering feral swine on their land and submit a feral swine removal plan to the ODFW for approval within 60 days. (Or. Admin. R. 635-058-0010).

**City of Portland:**

In March 1988, the Portland City Council adopted a resolution directing the Portland Parks and Recreation to adopt and implement a grounds maintenance policy following the principles of Integrated Pest Management. Portland Parks and Recreation's Integrated Pest Management Program was last updated in June 2016 and is available at https://www.portlandoregon.gov/Parks/article/116237.

The City of Portland implements its  Plan in part through a Tree Code (PCC Title 11). The Tree Code applies to all trees in the City and is implemented by the City Forester and the Director of the Bureau of Development Services. The City Forester has the authority to prune, remove, or treat (or direct others to do so) any trees on City or private property to control insects and disease if "needed to maintain the public health, safety or health of the ." (PCC 11.60.600). If the City Forester determines that a tree on private property has been affected by a pathogen or insect infestation that will likely adversely impact surrounding trees, all portions of the tree are to be removed from the site and properly disposed of at the property owner's expense. (PCC 11.60.050(B)(2)).

Permits are needed for the removal of city or street tree that is dead, dying, or dangerous. (PCC 11.40.040).

A dying tree is a "tree is in an advanced state of decline because it is diseased, infested by insects, or rotting and cannot be saved by reasonable treatment or pruning, or must be removed to prevent spread of the infestation or disease to other trees or is imminently likely to be become a danger or die." Permits to remove dying trees will be granted if the removal is exempt or allowed by Title 33 (Planning and Zoning). Chapter 33.630 exempts trees from the regulations of the chapter if the trees are dead, dying, or dangerous as determined by an arborist. The City Forester can apply a condition of approval to the permit to require specific disposal methods for infected wood.

The Bureau of Insect Control is charged with controlling all nuisances created by earwigs, elm leaf beetles, mosquitoes and all other injurious insects affecting premises, buildings, trees, or shrubs within the corporate limits of the City. The Bureau of Insect Control falls within the supervision of the City Health Officer. (PCC 8.44) This Bureau and associated actions no longer exists.

Portland prohibits the possession of live pigs or swine within city limits for more than 3 days, (PCC 13.10.020).

**Recommendation for Action:**

- Consider adding provisions to Parks and Recreation Code to place restrictions on use of firewood or livestock forage.

# Appendix A-5.
# City Employee Survey

Full name _____

Title _____

City Bureau _____

Program _____

Email _____

Office phone number _____

## Priorities

1. How do you prioritize your invasive or nuisance species/weeds work, i.e., what criteria do you use to prioritize?

2. What management plan(s) or guidance document(s) that includes invasive or nuisance species/weeds strategies/action items do you use to guide your work?

3. Considering all landscapes and habitat types, what were up to 10 invasive or nuisance species/weeds you spent time and money on in 2017?

4. If the species listed in the question above are not, from your perspective, priority species, list up to 10 species you believe your bureau/program should prioritize.

5. Please rank, from 1-8, with 1 being the most important and 8 being the least important, the following by their importance to your program in the City of Portland

___ Monitoring or surveillance ___ EDRR ___ Prevention activities ___ Management or control activities
___ Outreach and education ___ Research ___ Coordination ___ Policy work

6. If you participated in EDRR efforts in 2017, please list the species that were the focus of these EDRR efforts.

7. If there is anything you wish to add about the species you work on, or invasive species/weeds, nuisance plant priorities, please do so here.

## Regulations and Policies

8. To your knowledge, what laws/policies exist that give you the authority to engage in or guide your invasive or nuisance species/weed activities?

9. Rate the effectiveness of the laws and regulations that govern your invasive or nuisance species/weed work in the City of Portland (Excellent, Good, Fair, Poor).

10. Please describe any existing regulations pertaining to invasive species in the City of Portland, and/or State of Oregon, that you believe need to be improved—and why.

11. Is there anything else you would like to add relative to City of Portland/State of Oregon regulations and policies associated with invasive/noxious or nuisance species/weeds?

## Partnerships

12. If your organization had a formal partnership/cooperative agreement with any organizations within the past 3 years, please list those organizations below and please characterize the purpose of the agreement (O=Outreach and education, M=Monitoring/Surveillance, E=EDRR, R=Research, P=Prevention, MC=Management/Control, C=Coordination).

13. If you believe any deficiencies exist relative to communication or cross-program invasive or nuisance species/weed coordination in the City of Portland, please describe.

14. If there is anything else you would like to add relative to invasive species partnerships, please do so here.

## Funding

15. How would you describe where your budget relative to invasive or nuisance species/weeds is invested, e.g., road rights-of-way, a specific watershed? Please be as specific as possible.

16. Please estimate the total dollar amount of staff salaries and benefits for full and part-time staff that conducted invasive or nuisance species/weed work of any kind in 2017. If staff worked only a portion of time on invasive species, include that percentage of their salary and benefits.

17. If you entered a dollar amount in the previous question, please enter the estimated total percent of staff time dedicated to specific invasive species activities. The total should add up to 100.

18. Estimate the total dollar amount for operational expenditures by category for invasive or nuisance species/weeds during FY 2017.

19. Organizations receive funding from a variety of sources. Please list any funding you received in 2017 from any organization for the purpose of conducting invasive or nuisance species/weed activities. Please list the organization and total dollar amount.

20. Did your 2017 program budget include any funding that was disbursed to another organization, such as a grant program? If so, please list the recipients of these 2017 budget funds, and the total dollar amount.

21. If you would like to upload a file or spreadsheet to help explain your budget, please upload your file here.

22. If your program uses volunteers to implement invasive species/weed activities, please estimate the total number of volunteer hours contributed in 2017 and the source of those volunteer hours.

23. If there is anything else you would like to add relative to your program budget for invasive or nuisance species/weeds, please do so here.

## Evaluating Program Effectiveness

24. How do you evaluate the effectiveness of your invasive or nuisance species/weed efforts? Check all that apply:

☐ Compliance monitoring ☐ Conduct cost-benefit analysis ☐ Conduct opinion surveys
☐ Do not evaluate program effectiveness ☐ Effectiveness monitoring
☐ Met the requirements of a contract/agreement ☐ Outcome-based performance objectives ☐ Other

25. Please describe up to three strengths relative to your program and its invasive or nuisance species/ weed activities.

26. Please describe up to three weaknesses relative to your organization and its invasive or nuisance species/weed activities.

27. If there is anything you would like to add relative to evaluating your invasive or nuisance species/weed program effectiveness, please do so here.

## Challenges

28. Please rank from 1-10, with 1 being the most important and 10 being the least important, the obstacles you face in being able to effectively implement your invasive or nuisance species/weed program:

___ Coordination ___ Effective databases ___ Funding ___ Landowner involvement ___ Laws and regulations,
___ Political will ___ Public awareness ___ Scientific understanding ___ Technical expertise
___ Clear objectives

29. Are there other obstacles not included in the list above that you believe are important? If so, please describe.

30. What should your program be doing differently to address existing challenges associated with invasive or nuisance species/weeds?

31. If you could do one thing to improve how the City of Portland addresses invasive or nuisance species/ weeds, what would it be?

# Appendix A-6. External Stakeholder Survey

Full name _____

Organization _____

**What best describes the entity you represent?**
(Federal agency, tribe, state agency, local/county government, nonprofit organization, institution of higher learning, business, private landowner, other)

_____

**If you selected other in the question above, please explain.**

_____

Title _____

Address _____

Email _____

Office phone number _____

1. Please describe the geographic scope of your program/the program you work with relative to invasive species.

2. If you conducted invasive species work in 2017, please select the taxa associated with your activities:

☐ Aquatic Invertebrates ☐ Aquatic Plants ☐ Birds ☐ Fish ☐ Land Invertebrates ☐ Land Plants

☐ Mammals ☐ Micro-organisms ☐ Reptiles ☐ Other

3. How do you prioritize your invasive species work, i.e., what criteria do you use to prioritize? (Cooperative agreement, Management plan, EDRR, Noxious weed list, Level of threat and ability to control, Other)

4. Considering all landscapes and habitat types, what were the top five invasive species you spent time and money on in 2017? If you worked on fewer than five species, place a check next to those species, or add the species in the Other box

☐ Atlantic/Irish/common/English ivy ☐ Himalayan/Armenian Blackberry ☐ Garlic Mustard

☐ Lesser Celandine ☐ Common Holly ☐ Leather Flower ☐ Knotweeds ☐ Slender False Brome

☐ Canada Thistle ☐ Reed Canary Grass ☐ Other

5. Please rank, from 1-8, with 1 being the most important and 8 being the least important, the following by their importance to your program in the City of Portland

___ Monitoring or surveillance ___ EDRR ___ Prevention activities ___ Management or control activities

___ Outreach and education ___ Research ___ Coordination ___ Policy work

6. Portland's EDRR program focused on controlling invasive plant infestations while their distribution is limited and patch sizes are small. If you participated in EDRR efforts in 2017, please list the species that were the focus of these EDRR efforts

☐ Garlic Mustard ☐ Giant Hogweed ☐ Knotweed ☐ Spurge ☐ Laurel ☐ Water Primrose
☐ Blessed Milk Thistle ☐ Knapweeds ☐ Slender ☐ False Brome ☐ Other

7. Rate the effectiveness of the laws and regulations that govern your invasive or nuisance species/weed work in the City of Portland (Excellent, Good, Fair, Poor).

8. Please describe any existing regulations pertaining to invasive species that need to be improved
*(note: these can be local, state, regional, or national regulations), or any new regulations you would like to see enacted.*

9. If you believe any deficiencies exist relative to communication or cross-program invasive species coordination in and around the City of Portland, please describe.

10. How do you evaluate the effectiveness of your invasive species efforts? Check all that apply:

☐ Monitoring ☐ Consider cost versus benefits ☐ Do not evaluate program effectiveness
☐ Evaluating the success in meeting objectives ☐ Met the requirements of a contract/agreement
☐ Other

11. Please rank from 1-10, with 1 being the most important and 10 being the least important, the obstacles you face in being able to effectively implement your invasive or nuisance species/weed program:

___ Coordination ___Economic impacts ___Effective databases ___Funding ___Landowner involvement
___ Laws and regulations ___Political will ___Public awareness ___Scientific understanding
___ Technical expertise

12. How does the City's invasive species policy influence your invasive species work?

13. Do you believe the City of Portland should expand its invasive species strategy to incorporate all taxa, and not just plants? (Yes, No, I don't know)

14. If you could do one thing to improve how the City of Portland addresses invasive or nuisance species/weeds, what would it be?

# Appendix A-7. Descriptions of Natural Assets in City Management Plans

**Portland Watershed Management Plan (2005)** Charts a path forward to evaluate watershed conditions and improve watershed health, ultimately protecting natural resource assets and restoring critical ecosystem function.

The Plan describes four classes of habitat present in Portland that support fish and wildlife:

- Aquatic areas (running-water or slack-water systems);
- Riparian areas (adjacent to streams and rivers)—Ecosystem functions include organic materials, channel dynamics, water quality, water quantity, microclimate, wildlife habitat (including diversity of vegetative species and structure, unique vegetation assemblages, high edge-to-area ratios, provision of wildlife corridors and migration routes, habitats necessary for survival, e.g., water, food, cover, nesting and breeding habitat).
- Uplands (grassland, meadow, shrubs, coniferous or deciduous forests, rocky slopes)—The five upland habitat types that exist in the Portland area include Westside Lowlands Conifer-Hardwood Forest; Westside Oak and Dry Douglas-Fir Forest and Woodlands; Westside Grasslands; Agriculture, Pasture and Mixed Environs; and Urban and Mixed Environs); and
- Wetlands—Ecosystem functions include streamflow, water storage, and watershed hydrology; bank stabilization and sediment, pollution and nutrient control; channel dynamics; organic inputs, food web, and nutrient cycling; microclimate, and fish and wildlife habitat.

**Portland Plant List**

Native plant communities are further described in the Portland Plant List (2016). They include:

1. Western Hemlock-Douglas Fir Forest—the most common plant community in Portland, dominated by large conifers (Forest Park and Boring Lava Domes are examples).
2. Mixed Conifer/Deciduous Forest—along streams that periodically flood and have broad floodplains (John Creek is an example)
3. Mixed Deciduous Forest, Steep Dry Slope—a mixture of deciduous trees with scattered conifer, on exposed and well-drained south slopes (Overlook Bluff is an example)
4. Deciduous Forested Wetlands and Floodplains—large floodplains and wetlands that support a riparian community dominated by deciduous trees (habitat along the Willamette and Columbia Rivers are examples)
5. Scrub-shrub Wetlands—on lake shores or gravel bars, in poorly drained areas, with plants that tolerate seasonal variation in water levels (the edges of Smith-Bybee Lakes and Beggars-tick Marsh near Johnson Creek are examples)
6. Marsh—along the shores of rivers and sloughs, or in poorly drained, low-lying areas where the ground is wet most of the year (Beggar's Tick Marsh and around Smith-Bybee Lakes are examples)
7. Prairie—grasses on well-drained upland sites (Elk Rock Island was a city example)
8. Rocky outcrops
    - dry—rocky outcrops, cliffs, or small boulder fields where basalt lies at the surface and plants exist in rocky conditions (Rocky Butte and Mt. Tabor are examples)
    - wet—rocky outcrops, cliffs, or small boulder fields where the ground is moist or wet much of the year

**Natural Resource Inventory (2011):**

- Rivers, streams, and waterbodies—Provide critical watershed functions, including conveyance and storage of water, groundwater/surface water exchange, and nutrient cycling as well as valuable habitat for native fish and wildlife. Adjacent riparian vegetation maintains stream functions, such as water quality and temperature, organic inputs and microclimate.
- Wetlands—Provide critical watershed functions, including conveyance and storage of water, groundwater/surface water exchange, and nutrient cycling as well as valuable habitat for fish and wildlife.
- Vegetation patches larger than 0.5 acres—includes forest, woodland, shrubland, or herbaceous, and either natural, semi-natural, or cultivated. Provides numerous ecosystem functions, such as intercepting and storing rainwater, reducing and improving the quality of stormwater runoff, providing wildlife habitat and migration corridors, providing shade to cool riparian areas and maintain cooler water temperatures in streams, and providing organic material.
- Combined flood area—The combination of the FEMA 100-year floodplain and the 1996 flood inundation area. Ecosystem functions include soaking up water and reducing flood peaks during storms as well as keeping streams flowing during dry periods, the distribution of nutrients between land and water, and sustenance of a healthy stream ecosystem by allowing river and stream channels to migrate.
- Steep slopes—Includes areas with a slope equal to or greater than 25 percent. Ecosystem functions include those relating to watershed hydrology and microclimate.

**Special Habitat Area (SHA)**

Habitats or landscape features that have been documented to provide especially or uniquely important fish and wildlife habitat values and function. Special Habitat Areas contain or support special status fish or wildlife species, sensitive/unique plant populations, wetlands, native oak, bottomland hardwood forests, riverine islands, river delta, migratory stopover habitat, connectivity corridors, grasslands, and other unique natural features.

*Portland's Special Habitat Areas:*

- Columbia Slough watershed—28 species habitat areas (Smith and Bybee wetlands, Big Four Corners, Rocky Butte, Grotto, Wilkes Creek headwaters)
- Fanno Creek—32 acres of Special Habitat Areas, primarily in Woods Memorial Park.
- Johnson Creek—13 Special Habitat Areas (Powell Butte, Tideman Johnson Park, Springwater Wetlands Complex, Kelley Creek Refuge, and Johnson Creek)
- Tryon Creek—479 acres of Special Habitat Areas, including Tryon Creek State Park.
- Willamette—23 designed Special Habitat Areas totaling 9,616 acres (Willamette River mainstem, Oaks Bottom Wildlife Refuge, Ross Island complex, bottomland forest and mudflats along river, Forest Park, upland oak bluffs that parallel east side of river, Forest Park)

Other watersheds include portions of the Columbia River, Multnomah Channel and Tualatin River watersheds, which are outside the city limits but within the Urban Service Boundary. Special Habitat Areas include the Columbia River and land adjacent to Forest Park.

# Appendix A-8. Portland Plans

- Renew Forest Park is a 20-year initiative that seeks to restore, rebuild, and reconnect the park with a focus on ecology, infrastructure, and access, ensuring the area is vibrant well into the future. The restoration portion of the initiative seeks to transform the ecological health of "Portland's greatest asset" via the removal of invasive plants and the planting of native vegetation.

- Chapter 7 of the 2035 Comprehensive Plan focuses on environment and watershed health and identifies city policies associated with environment and watershed health to "prevent incremental environmental degradation, including the spread of invasive species, loss of habitat, and adverse impacts of additional impervious surfaces. Chapter 7 includes goals focused on climate, healthy watersheds and environment, resilience, environmental equity, and community stewardship.

- The city's Climate Change Preparation Strategy (2014) includes a 2030 objective to increase the resilience of natural systems to respond to increased temperatures and drier summers by addressing invasive species, connecting habitats, and supporting birds, amphibians, and other species that will need to alter their range as a result of climate change stressors.

- The Portland Plan (2012) describes a healthy connected city that includes connections for people, places, water, and wildlife.

- The Portland Watershed Management Plan (2005) includes four watershed health goals relating to hydrology, physical habitat, water quality, and biological communities, and emphasizes seven ecological principles foundational to restoration.

- The Management Plan (2004) emphasizes the goal to protect, preserve, restore and expand Portland's , promote stewardship of the , and provide equitable  benefits for all city residents. The Bull Run Watershed Management Unit Invasive Species Management Plan (2016) notes the ability of the city to deliver clean water depends on effective stewardship of the habitat in and around the unit.

- The Bureau of Planning and Sustainability Strategic Plan (2014–2016) references greenways, natural area protection, resource conservation and rivers as well as an emphasis on healthy, connected and resilient neighborhoods.

- The city's Natural Resource Inventory (2010 and amended in 2012), which identifies effects of urbanization on ecosystem services.

- Portland Parks & Recreation Natural Areas Restoration Plan (2010) establishes goals and strategies, management priorities, and implementation actions for the city's natural areas.

*Project funded by the City of Portland*
*Bureau of Environmental Services*