

**CITY OF WILSONVILLE
INTEGRATED PEST MANAGEMENT PLAN**

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**Prepared By
City of Wilsonville**

**With Support From
EnviroLogic Resources, Inc.
Northwest Center for Alternatives to Pesticides**

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EXECUTIVE SUMMARY

Within the array of public facilities, grounds and infrastructure City staff are responsible for operating and maintaining, pests can be a troublesome and persistent problem. Choosing the appropriate response to these pests requires careful planning and implementation to ensure a successful result. Whether the targeted pest is a plant, insect, or animal, the City's response should take into account public safety, environmental health and available resources.

Integrated Pest Management (IPM) offers a broad-based approach that relies on a combination of common-sense practices. An IPM Plan identifies management areas and key pests of concern and outlines approaches mindful of pest biology and the resources of the responsible organization while minimizing the risk associated with pest management.

In developing the City's IPM Plan, Staff reviewed current pest management practices, identified a list of pests, and developed additional practices to address the pests of concern. The objective of IPM is to maximize the use of natural practices to control pests. Broadly, practices fall within four categories: cultural, mechanical, biological, and chemical treatments.

Preventing pest problems through early detection and a rapid response is accomplished through inspection and monitoring. The success of the IPM Plan is dependent on staff practicing routine prevention strategies that keep pests from establishing and spreading.

[Reference to City IPM Coordination and Leadership Team]

Goals of the IPM Plan

The goals for selecting treatment principles and developing pest management strategies include:

- Preservation of the natural system, including pollinator habitat
- Emphasize practices to minimize risk to human health
- Reduce and eliminate, where possible, chemical pest control treatments
- Ensure cost-effectiveness in the short and long term, and
- Evaluate the efficacy of the integrated pest management

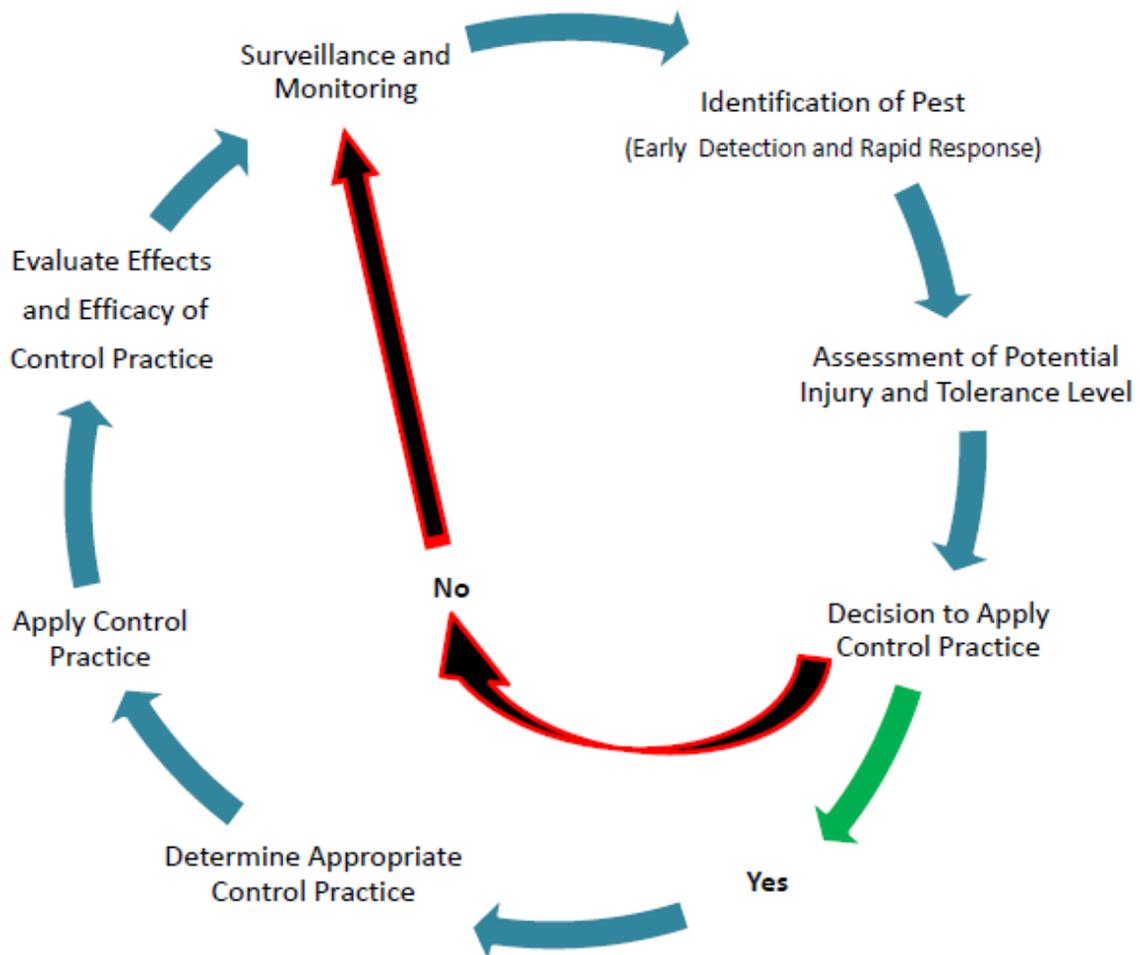
Key Components of the IPM Plan

The IPM Plan relies on the following steps in addressing pests of concern:

- Define areas requiring management and the relative maintenance intensity associated with each area.
- Maintain vigorous plant health through maintenance practices to optimize pest tolerance.
- Identify pests likely to be encountered.
- Determine the pest's life cycle and know which life stage to target.
- Establish action threshold levels for each pest that when exceeded, trigger the use of a chemical treatment.
- Scout and monitor for the presence of pests.
- Implement sequential corrective action when pest populations have been observed.
 - Adjust cultural practice.
 - Utilize mechanical and biological controls when appropriate.

- Initiate appropriate chemical treatments when action thresholds have been exceeded and additional cultural practices, or mechanical or biological controls are expected to be ineffective.
- Determine if chemical control intervention is necessary or appropriate and apply minimum amounts of selective chemical control products in a highly targeted fashion. Chemical control products will be selected based on minimal toxicity and optimal efficacy.
- Document scouting and monitoring observations, treatments, and treatment results.
- Determine if the "corrective actions" actually reduced or prevented pest populations, were economical, and minimized risks.

IPM Flow Chart



1.0 INTRODUCTION

The City of Wilsonville recognizes the importance of sound environmental stewardship and is committed to optimizing management practices to protect the people and the environment within and surrounding City facilities, parks, and infrastructure. Integrated Pest Management (IPM) considers pest management strategies within the context of public safety, environmental health, and available resources, including funds. An IPM plan identifies management areas and key pests of concern and outlines management approaches mindful of pest biology and the resources of the managing organization while minimizing the risk associated with pest management.

The City of Wilsonville will consider all Integrated Pest Management (IPM) strategies to protect the environment and maximize the quality of facilities and grounds by using a combination of tactics to control pests, with an emphasis on including cultural, biological, and mechanical controls. Pests are monitored until pre-determined thresholds are reached before chemical control measures are employed. Chemical control actions will be taken when the threshold for a specific pest has been exceeded or as needed in the case of preventative applications. This City of Wilsonville IPM Plan provides a sound working framework for selection and implementation of the most environmentally sound solutions to pest problems.

This IPM Plan describes detailed and specific practices of land and facility maintenance and serves as an operational reference directing management practice. The City is dedicated to the philosophy and practicality of IPM and remains vigilant to incorporate emerging and useful management practices into the IPM Plan. This document is viewed to be a functional document, which will evolve over time and will be revised to incorporate industry developments to bolster and optimize the effectiveness of the plan.

2.0 INTEGRATED PEST MANAGEMENT DEFINITION

Integrated Pest Management (IPM) is a management system which utilizes systematic, disciplined, and documented cultural practices as a first line of defense for pest control. Cultural practices, including proper fertility and irrigation, contribute to plant health. Biological control options are considered and utilized whenever feasible. If action thresholds are exceeded, and when cultural practices are not fully effective at controlling pests, the use of chemical control products to manage pest damage may be necessary.

Oregon Department of Agriculture (ODA) refers to IPM as 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 agency pest management objectives". IPM includes optimizing the physical condition of the site features through cultural practices to enhance natural plant resistance to pest infestation, optimizing habitats for beneficial species, and minimizing plant or facility damage resulting from routine operations.

Additionally, according to Oregon Revised Statutes (ORS 634.650), integrated pest management means a science-based decision-making process which:

- a) Identifies and reduces risks from pests and from pest management-related strategies;
- b) Coordinates the use of pest biology, environmental information and comprehensive technology to prevent unacceptable levels of pest damage by economical means and poses the least possible risk to people, property, resources and the environment; and
- c) Uses a pest management approach that focuses on the prevention of pests through a combination of techniques that may include, but need not be limited to:
 - (A) Surveillance and monitoring
 - (B) Early detection and rapid response
 - (C) Mechanical control
 - (D) Cultural practices
 - (E) Modified land management
 - (F) Biological controls
 - (G) Selective use of chemical control products
 - (H) Evaluation of the effects and efficacy of pest treatments
 - (I) Control practices selected and applied to achieve desired pest management objectives in a manner that minimizes risks to human health, nontarget organisms, native fish and wildlife habitat, watersheds and the environment.

3.0 IPM GOALS

A committee of City staff, including the Public Works Director, Natural Resources Program Manager, Parks Supervisor, and key field staff developed the following goals and policies relevant to integrated pest management for the City's IPM program:

Select optimal integrated pest management strategies that balance social, environmental, and economic factors. The goals for selecting treatment principles and developing pest management strategies include:

- *Preservation of the natural system, including pollinator health*
- *Emphasize practices to minimize risk to human health*
- *Reduce and eliminate, where possible, chemical pest control treatments*
- *Ensure cost-effectiveness in the short and long term, and*
- *Evaluate the efficacy of the integrated pest management*

3.1 Related City Policies and Plans

Resolution 2650 Designating the City as A Bee City USA: This resolution, (adopted August 7, 2017) notes ideal pollinator-friendly habitat “is pesticide-free or has pesticide use carried out with least ill effects on pollinators” and committed the City to creating an IPM plan.

Bee Stewards Wilsonville Program: This program, connected to the Bee City USA designation, includes a variety of components to enhance and protect pollinators and educate the residents of the City on pollinator functions, conservation, and protection.

4.0 IPM OBJECTIVES

The broad objective of IPM is to maximize the use of natural methods to control pests through optimized, disciplined, and documented management practices. To meet this objective, sites are often divided into management areas. Zone Management allow for more effective IPM application. Different management areas are likely to have different pests of concern; methods to monitor pest populations; pest action threshold levels that when exceeded require action; and the actions to be taken once threshold levels have been reached.

The management practices listed under the Oregon Revised Statutes are briefly explained below.

Prevention: In IPM, prevention is the foundation for management. Maintaining healthy landscapes and facilities through attention to normal maintenance needs and conducting maintenance on routine intervals as needed are key to integrated pest management. Examples of routine prevention strategies to avoid pest establishment and spread include, but are not limited to:

- Using plant stock known to be resistant to diseases and tolerant of drought.
- Using mulches between ornamentals to reduce the potential for weed establishment and to promote water retention and healthy soil.
- Mowing turfgrass at the proper height, frequency, and with a sharp blade to maintain healthy plants.
- Adhering to maintenance schedules for facilities to avoid situations which could result in loss of structural integrity.
- Training City staff to practice sanitation in any areas where food is stored or consumed.

Weed management prevention principles are critical to protect sites from weed invasion. Examples of best management practices include: keeping sites covered and mulched, retaining topsoil during construction, preventing erosion, planting densely, avoiding soil disturbance, selecting native plants, and maintaining diverse plantings.

Surveillance and monitoring: Staying ahead of pest issues requires regular inspection. Effective surveillance and monitoring requires knowing how to identify pests (or their sign) and how to assess the severity of the problem, so appropriate action may be taken.

Early detection and rapid response (EDRR): Not all pests are invasive but those which are can be a major issue. If left unchecked, invasives can rapidly expand their range resulting in control efforts which are expensive, ineffective, or both. The principle of EDRR aims to stay ahead of the invasives by ensuring any new invasive establishments are rapidly identified and appropriate early control measures are implemented.

Cultural practices: Cultural practices are methods to improve the desired condition (e.g. healthy turfgrass, sound pest-free facilities, and attractive, healthy ornamental beds) and reduce the site's vulnerability to pests. Cultural practices can reduce pest establishment, reproduction, dispersal, and survival. For example, carefully regulating irrigation may reduce the likelihood of root disease and weeds while increasing the vigor of a plant. Pest impacts can often be reduced to acceptable levels through improved cultural practices.

Mechanical (and physical) controls: Mechanical and physical controls kill pests, suppress their reproductive capacity, or block them out. Examples include: mowing dandelions prior to seed formation; trapping for rodents, screening building openings to keep birds and insects out, pressure washing roofs or pathways, mowing blackberry, and hand-pulling, string-trimming, steaming, or flame-weeding weeds.

Selective use of chemical control products: In IPM, chemical control products or “pesticides” are an available tool. However, since one of the primary goals of IPM is to reduce the risk to humans and the environment, chemical control product use should follow other remedies that have been tried and found either not fully effective or too costly. Typically, control products are utilized in combination with other approaches. Under an IPM paradigm, reducing the use of chemical control products is encouraged. Products utilized should be applied in a selective manner, should be the most selective available, and should be the safest efficacious choice for people, other organisms and for air, soil, and water quality. Examples of selective uses of control products under an IPM approach include using control products in bait stations rather than sprays and spot-spraying weeds instead of an entire area.

Modified land management: Modified land management can be any practice which changes the conditions upon which pests thrive. For example, planting a cover crop can be a useful practice prior to establishing a new ornamental area.

Biological controls: Biological control is the practice of promoting “natural enemies” of the pest species for control, such as insect or disease parasitoids, predators, and microbial products. This can involve deliberate release of biocontrol agents, a practice regulated by ODA. Biocontrol can also be enhanced by establishing or maintaining habitats conducive to native predators and parasitoids, a practice known as “conservation biocontrol.” For example, aphid midges prey on aphids and are available in hanging vials or larger trays for release on ornamental or tree plantings.

Minimizing risks to human health and the environment: Protecting human and environmental health is an important component of IPM. Practices to minimize risks in the City of Wilsonville include; using an established list for product selection; applying chemical control products according to the law (label); adhering to sound practices for storage, transport, and application, and continued training.

Evaluation of the effects and efficacy of pest treatments: Assessing efficacy in a real-world situation demands pragmatism. Side by side-controlled treatment comparisons are unlikely to occur as City staff address pest management. The most practical way for the City to evaluate the effectiveness of treatments is for field personnel to keep good records on monitoring abundance of pests, before and after treatment.

5.0 IPM STRUCTURE

The structure of the IPM Plan is based on the selective targeting of plant pathogens, weeds, and insects which threaten structural integrity of facilities or agronomic and/or human health. In addition, the IPM Plan includes provisions to optimize the quality of natural areas. The structure of the IPM program is as follows:

- Define areas requiring management and the relative maintenance intensity associated with each area.
- Maintain vigorous plant health through maintenance practices to optimize pest tolerance.
- Identify pests likely to be encountered.
- Determine the pest's life cycle and know which life stage to target.
- Establish action threshold levels for each pest that when exceeded, trigger the use of a chemical treatment.
- Scout and monitor for the presence of pests.
- Implement sequential corrective action when pest populations have been observed.
 - Adjust cultural practice.
 - Utilize mechanical and biological controls when appropriate.
 - Initiate appropriate chemical treatments when action thresholds have been exceeded and additional cultural practices, or mechanical or biological controls are expected to be ineffective.
 - Determine if chemical control intervention is necessary or appropriate and apply minimum amounts of selective chemical control products in a highly targeted fashion. Chemical control products will be selected based on minimal toxicity and optimal efficacy.
- Document scouting and monitoring observations, treatments, and treatment results.
- Determine if the "corrective actions" actually reduced or prevented pest populations, were economical, and minimized risks.

5.1 City IPM Coordination and Leadership Team

The IPM Leadership team will meet quarterly or as needed and is comprised of the following staff members or their designees:

- Natural Resources Program Manager
- Public Works Director
- Parks Supervisor

The team will have the following roles and functions:

- Coordinate across departments to ensure a consistent, City-wide approach
- Provide oversight of the City IPM program and ensure the Plan is followed
- Ensure the City is compliant with the state Hazard Communication Standard
- Oversee applicator staff training
- Oversee non-applicator staff training on IPM concepts, prevention strategies, and reporting
- Review and approve or deny any proposed chemical control product chemical pest control products not on the approved list
- Communicate on any new or invasive species
- Compile annual reports of chemical control product applications and keep trend analysis
- Discuss efficacy concerns and conduct efficacy reviews
- Update and revise the City Integrated Pest Management Plan as needed
- Prepare annual report on IPM metrics

Pest complaints from other staff or the public: Other City staff, City residents and visitors to City properties can assist in identification and reporting of pests on City property. The City encourages residents to notify City staff of pest problems via its online “Ask The City” tool, especially for pests which pose human health or invasive concerns.

5.2 Zone Management

Zone management is a concept employed by many municipalities to distinguish between areas where level of service expectations are high and areas where level of service expectations are lower. This allows staff to allocate resources accordingly, spending a greater amount of effort and resources in areas where the level of service expectation is higher.

The City manages a range of properties. Level of service expectations are perceived to be high in some areas, such as at City Hall, the Korean War Memorial, athletic fields, highly trafficked park areas, and street medians. Pests, especially undesirable plants or pests posing a public health risk, are less tolerated where human activity is more concentrated and where expectations for safety, functionality, and aesthetics are higher. Conversely, in natural areas, tolerance is often higher (except for invasives of limited extent).

Using the zone management concept, property types managed by the City are classified into zones to reflect the following Levels of Service:

- **Level of Service 1.** Heavily used areas or highly visible areas. Zero tolerance for pests which pose human health threats on heavily used areas. Low tolerance of human health pests on areas not directly used but are highly visible. Zero tolerance for structural pests. Low to moderate tolerance for cosmetic/nuisance pests. Zero tolerance for invasives except those already established in natural areas.
- **Level of Service 2.** Moderately used by people, some visibility. Low tolerance of human health pests. 15-50% tolerance of cosmetic and nuisance pests. Zero tolerance for invasives. Structural pests not applicable to this class.
- **Level of Service 3.** Lightly used. Low to moderate tolerance of human health pests. Moderate tolerance of most established invasives (i.e., ODA B-designated invasives). Low tolerance for emerging invasives and A-listed and T-listed noxious weeds. Cosmetic/nuisance pests tolerated at 50% or not managed.
- **Level of Service 4.** Mostly wild habitats. Human health pests are not managed with few exceptions. Cosmetic and nuisance pests are not managed. Moderate tolerance of most established invasives (i.e., ODA B-designated invasives such as ivy and blackberry). Low tolerance for emerging invasives and A-listed and T-listed noxious weeds.

The level of service and associated action thresholds for the various zone management areas of the City are shown in [APPENDIX C](#).

5.3 Management Areas

The managed areas of the City of Wilsonville include turfgrass areas (athletic fields and general use areas), non-turfgrass areas (natural areas, playgrounds, ornamentals, community garden, dog park, stormwater management sites), City owned and maintained structures/facilities, and aquatic areas (creeks, riverfront, dock, and wetlands).

6.0 CULTURAL AND MECHANICAL PRACTICES

As indicated above cultural practices are methods to improve the desired condition and reduce the site's vulnerability to pests and can reduce pest establishment, reproduction, dispersal, and survival. Pest impacts can often be reduced to acceptable levels through improved cultural practices. Below are brief descriptions of cultural practices pertaining to management areas within the City.

6.1 Cultural Practices for Minimizing Pest Issues-Buildings and Structures

Buildings and structures are important and expensive assets which must be protected from pests which may threaten the structure's integrity. Human health pests are other important pests requiring management.

Key practices to protect facilities from these pests include:

6.1.1 Sanitation

Regular and thorough cleaning and refuse removal reduce the attractiveness of the structure to many pests.

6.1.2 Exclusion

Ensure the building envelope is sound, without holes or openings, which may be penetrated by rodents, wasps, or squirrels. Screens and metal guards are an important part of termite, housefly, and rodent control.

6.1.3 Clean-up of Building Site

Ensure tree stumps and lumber scraps are removed from construction sites, as these are prime food sources for termites.

6.1.4 Protect Structures from Water and Soil Contact

Carpenter ants and termites are more likely to attack structures regularly moist or in contact with soil.

6.2 Cultural Practices for Minimizing Pest Issues-Shrubs, Trees, and Ornamental Beds

Shrubs, trees, and ornamental beds provide habitat, beauty and shade to the City's parks, building exteriors and streetscapes. Sparsely planted, lightly shaded and unmulched shrub and ornamental beds are open to undesirable plant invasion.

6.2.1 Plan for Planting Diversity

Where possible, a mixed, dense planting which includes a variety of co-evolved native plants providing a dense canopy, can inhibit weed pressure.

6.2.2 Establish Healthy Starts

Inspect all plants procured and check to ensure roots are not circled, girdled, or kinked. Assess for vigor and health. Check for damage, disease, and poor pruning. In Wilsonville's climate, planting is best in fall. Keep roots moist if planting is delayed; excessively long roots may be shortened. Position plant so the shoot-root interface is at or slightly above the planting surface. If needed, fertilize according to species and time of year and irrigate if rainfall is not imminent. Stake plants only if necessary; stakes should be loose and low (bottom 1/3 of plant) and removed after one growing season. If necessary, use tree shelters or other barriers to keep out herbivores.

6.2.3 Avoid Bare Soil

Ensure soil is either shaded or covered with desirable plants and leaves and allow fallen leaves to accumulate where applicable.

6.2.4 Minimize Soil Disturbance

Avoid compaction and other soil disturbances as much as possible. Surface disruption can be the opening for undesirable plants to emerge. Therefore extreme care must be taken when mechanically removing pests. If not performed in a sensitive manner, manual weed abatement may result in an increase in undesirable plant pressure.

6.2.5 Minimize Irrigation

Irrigate newly planted shrubs and trees during the first two growing seasons, otherwise avoid irrigation on shrubs, trees and ornamentals.

6.2.6 Use Coarse Wood Chip Mulches

Finer-textured bark mulches break down more rapidly than coarse mulches and eventually provide a suitable substrate for weed establishment. It is recommended to use coarse organic mulches for ornamental beds, especially wood chipped from local operations. Providing a mulch layer three to six inches thick of coarse wood chips helps suppress undesirable plant growth. Place mulch away from trunks/stems of trees and shrubs, taper the mulch down to nearly nothing close to the trunk therefore protecting the soil as well as above-ground plant tissues.

6.3 Cultural Practices for Minimizing Pest Issues-Stormwater Facilities

Low Impact Development (LID) practices are increasingly being used in the City of Wilsonville to address water quality and quantity issues related to stormwater runoff. Such facilities are frequently found in new developments, along newer roadways, and in parking lots and may include:

- Green streets - Streets designed to capture, absorb and filter runoff using rain gardens, planters, swales, porous pavement, tree canopy and other methods.
- Swales: Long, planted, open channel that carries, slows and absorbs stormwater and filters out pollutants.
- Porous pavements:
- Rain gardens: Planted, bowl-shaped area designed to collect and absorb runoff and filter out pollutants.

Maintenance of such facilities is different from maintenance of conventional streetscapes. Plant and soil management and pest control in these sites must consider effects on the stormwater facility purpose, in addition to aesthetic criteria.

Practices which may contribute to weed prevention in stormwater facilities include the following.

6.3.1 Follow Establishment Guidelines When Plants Are Young

Like plants in conventional ornamental beds, plants installed in stormwater facilities need proper care, possibly including irrigation when young.

6.3.2 Mulch Around Plantings Above the Wet Zone

Two to four inches of mulch is recommended above the high-water mark to minimize weed invasion. Keep mulch out of the wet zone to prevent it from washing out of the facility and clogging outlets.

6.3.3 Regularly Remove Sediment

Sediment buildup can prevent runoff from entering a facility or increase the amount of time it takes the water to soak into the soil. Most jurisdictions in our region require facilities to drain within 24- 48 hours. Sediment may also create a prime establishment site for undesirable plants.

6.4 Cultural Practices for Minimizing Pest Issues-Hardscapes

Hardscapes include paved or gravel walkways and sidewalks, curbs, parking lots, patios, etc. Such areas commonly develop weed issues in cracks and crevices.

6.4.1 Practices for Minimizing Weed Issues in Hardscapes Include:

- Periodically blow or pressure wash hardscapes to remove dirt buildup and organic material.
- Repair unwanted cracks and crevices.
- Mechanically remove unwanted plant material.

6.5 Cultural Practices for Minimizing Pest Issues-Natural Areas

Native Douglas-fir forests, streams, ponds, and frontage along the Willamette River are examples of “natural areas” found within Wilsonville.

6.5.1 Minimize Soil Disturbance

Avoid compaction and other soil and surface disturbances as much as possible. This minimizes potential for undesirable seed germination while encouraging a healthy rootzone.

6.5.2 Maintain Vegetative Cover

Maintain native plants appropriate to the site thus discouraging competition from undesirable plant material.

6.6 Cultural and Mechanical Practices for Minimizing Pest Issues-Turfgrass

Turfgrass maintenance can be the most labor-intensive element of the IPM program, requiring the greatest percentage of resource allocation. As stated throughout this document, the intent of the IPM program is to optimize plant vigor utilizing sound cultural practices as a means of preventing and/or minimizing pest infestation. The primary practices of turfgrass maintenance include mowing, irrigation, and fertilization. Cultural practices can include aeration, topdressing, thatch removal, rolling, and over-seeding to promote a healthy turfgrass environment. Although chemical control product application is part of IPM, the City of Wilsonville strives to minimize the use of these products.

6.6.1 Mowing

Mowing will be performed on an as-needed basis and mowing frequency is area dependent. Lightweight mowing equipment is used as often as practical to minimize compaction. Mowing heights are adjusted for individual areas to assure maximized plant health.

A very integral component to the IPM program is quality of cut. We strictly adhere to a 1/3rd rule. The objective of this rule is to minimize clipping yield to no more than 1/3rd of above ground leaf tissue. The majority of the older less photosynthetically viable cells are located in the upper 1/3rd of the leaf tip. The turfgrass plant is genetically programmed to thrive when this area is consistently removed. If more than 1/3rd of the tissue is removed the turfgrass plant loses the more active and important juvenile cells. These cells are critical for carbohydrate production and plant survival.

Routinely removing 1/3rd or less of the plant tissue at every mowing ensures optimum cellular availability for root growth along with water and nutrient uptake. Mowing operations should be able to be performed within reason at any given time without leaving abundant clippings following mowing operations.

Clippings are routinely returned to the surface. Through returning clippings when mowing, roughly one pound of nitrogen per 1,000 square feet is returned to the soil, ultimately becoming available to the turfgrass plant as a food source.

While adhering to the 1/3rd rule is important, just as critical is quality of cut. All mower blades are routinely sharpened and replaced. A precision, scalpel like cut also ensures minimized energy at the plant's expense for recuperation from mowing activities. Minimizing leaf tip shredding ensures less energy is needed to repair less surface area. This is more energy for the plant, as well as reduced vertical yield. Less repair area at the leaf tip leads to less forced vertical growth. The combination of all of the above minimizes yield and creates a stronger, denser stand of resilient turfgrass plants.

6.6.2 Aeration

Aeration is the practice of using solid tines or removing soil cores from turfgrass and is performed to minimize compaction. This practice enhances the movement of air, water, and nutrients in the soil and is a useful technique to manage thatch layers.

The aeration frequency will be adjusted as appropriate for turfgrass location and conditions. Aeration frequency is greatest for athletic fields and to a lesser extent for general use areas. Aeration is typically performed during periods of active turfgrass growth in the early spring, early summer, and fall; although selective aeration may occur at the discretion of the site supervisor.

6.6.3 Thatch Management

Thatch is a layer of organic debris and the roots, crowns, and stems of grass that exists between the soil and the turfgrass canopy. Thatch accumulation can be problematic if the production of this material occurs at a faster rate than microbial activity can digest. In the absence of cultural management or in conjunction with irresponsible irrigation and fertility inputs, this layer becomes thicker over time, resulting in sub-optimal turfgrass growth. Management of thatch is particularly important on athletic fields and consists primarily of aeration and topdressing practices. The thatch layer is maintained at a thickness of approximately ½ to 1½ inch depending on the management area.

6.6.4 Topdressing

The practice of topdressing consists of the application of a layer of sand, compost, peat, loam, etc. to turfgrass and is used to assist in thatch layer management and, where necessary, to provide a smooth and firm surface. Topdressing applications typically follow the aeration or verticutting of turfgrass and are also made in the absence of aeration (light topdressing). Following the application of topdressing, the material may be lightly brushed into the turfgrass surface. The City uses USGA specification topdressing sand as its only topdressing material.

6.6.5 Overseeding

Overseeding is the selective application of turfgrass seed to improve areas of turfgrass depletion and to bolster turfgrass density. Over-seeding is performed in the late fall, spring, or early summer, as well as on an as needed basis in heavily used areas.

6.6.6 Rolling

Athletic fields may be rolled to provide a smoother, firmer, playing surface following heavy use and to discourage a lip on the infield to outfield transition.

7.0 PLANT NUTRITION

The goal of the nutrient management program is to improve plant quality, protect water resources, and reduce fertilizer costs. The application of fertilizer is essential for development of turfgrass vigor. Management of turfgrass fertility involves the understanding of soil composition, fertility management history, and the use of soil test information. The objective of the fertilizer program is to provide maximum nutrient availability to the plants while simultaneously avoiding the application of excess nutrients to avoid weed infestation, disease development, and nutrient runoff. The nutrient management program described below is a guide for managing the amount, sources, placement, form, and timing of the application or nutrients and other soil amendments.

7.1 Soil Nutrient Testing

Soil testing for nutrient concentration provides valuable information which allows for the development of a strategic fertilizer plan and also provides insight into the effects of preceding management practices. Soil testing is performed on areas selected by City staff to generate information important to the development of the fertilizer program.

Nutrient management has a significant impact on plant health, soils, and the environment over time. The nutrient application rate, nutrient form, nutrient application method, and nutrient application timing will be closely monitored.

7.2 Turfgrass Nutrient Requirements

The major nutrients required for turfgrass health are nitrogen (N), phosphorus (P), and potassium (K). Calcium, magnesium, and sulfur also contribute significantly to turfgrass health. Micronutrients include iron, boron, copper, manganese, and zinc. The availability of nutrients to turfgrass is influenced markedly by the pH of the soil. Consequently, management of the appropriate pH is an important component of the fertilizer program. Controlled release fertilizers will be used whenever possible, with adjustments being made for special needs and conditions.

- Nitrogen
 - The management of nitrogen levels is critical to the high turfgrass demand for this nutrient and the potential for excess nitrogen to enter into surface water and groundwater. As a result, the amount of nitrogen delivered to turfgrass will be the minimum amount necessary to promote turfgrass vigor. The athletic fields are one of the few turfgrass zones at the park that are fertilized. In general, nitrogen will be applied based on known rates to be effective for this area. In certain instances when turfgrass and/or climate conditions dictate, rates of application will be adjusted (either higher or lower) at the discretion of the site supervisor. The contribution of nitrogen from other nitrogen sources, such as clippings, recycling, or microorganism release will be considered. Soil factors, weather, and climate are also important considerations.
 - Nitrogen formulations consist of water insoluble (slow release), water soluble (quick release), and stabilized types. Slow release nitrogen sources include methylene urea, sulfur-coated urea, IBDU, polymer coated fertilizers, and organic preparations such as activated sewage sludge. Examples of quick release nitrogen sources include ammonium sulfate, ammonium nitrate, potassium nitrate, and urea. Stabilized nitrogen fertilizers work by delaying the conversion of nitrogen (N) to forms that can be more readily lost to the environment through leaching, denitrification and volatilization. This delay allows time for rainfall or irrigation to move the N into the soil where it is less prone to volatilization, and/or retains N in the plant/soil system longer. There are two main categories: urease inhibitors and nitrification inhibitors. To maximize plant uptake and

minimize nitrogen runoff (e.g., nitrate), slow release organic nitrogen sources, stabilized nitrogen, and/or light applications of soluble nitrogen ("spoon-feeding") are consistently used.

- Phosphorus
 - Turfgrass requirements for phosphorus are relatively low and phosphorus does not generally leach from soil quickly. As a result, application rates tend to be correspondingly low to none, which minimizes the possibility of stormwater runoff carrying residual phosphorus into water systems. However, phosphorous is persistent and excess phosphorous in aquatic systems can promote algae growth and subsequent consumption of oxygen upon degradation. Therefore, phosphorus is managed diligently and efficiently.
- Potassium
 - Potassium is an essential component needed in plant growth. Turfgrass requirements for potassium are intermediate in relation to nitrogen and phosphorus levels. Although applied to maximize efficiency of uptake, potassium does not pose the extent of environmental risk that excess nitrogen and phosphorus levels represent. Proper levels of potassium are an important component of plant disease resistance and contribute to the ability of turfgrass to withstand wear and traffic.
- Additional Nutrients
 - In general, turfgrass requirements for sulfur, calcium, iron, and micronutrients, are lower than for nitrogen, phosphorus and potassium. These nutrients are available in a variety of formulations, and application of these nutrients will be at the discretion of the grounds manager. Application of these nutrients is based on results from soil nutrient tests.
- pH
 - Maintenance of the proper soil pH is essential in optimizing the availability of nutrients, and also is important in minimizing overall turfgrass stress. When the soil pH requires adjustment (based on the results of soil testing) to a more alkaline pH, lime will be added until the targeted pH is obtained. When soil requires adjustment to a more acidic pH, ammonium sulfate may be added until the targeted pH is obtained. Ferrous sulfate may also be used to adjust pH and provide iron to turfgrass.

7.3 Fertilizer Treatment Areas

The rate and frequency of fertilizer application is area and situation dependent. Fertilizer is only applied routinely to athletic fields and other high use areas. Fertilizers may be used in establishment of new plantings, especially ornamentals.

7.4 Fertilizer Storage

Fertilizers will be maintained in a dedicated moisture free, well-ventilated storage area and not stored directly on the floor or ground.

7.5 Fertilizer Documentation

Records of fertilizer purchases will be maintained in a fertilizer logbook. Fertilizer applications will be documented on a fertilizer application form. Information recorded will include date of application, location of application, type of fertilizer(s) applied, rate of application, irrigation following application, and the identity of the applicator(s).

7.6 Buffer Zones

Fertilizer application is limited to athletic fields and other high traffic areas and is consistent with the practice of not applying fertilizers in buffer zones.

8.0 IRRIGATION

Turfgrass is irrigated to maintain plant health and optimize conditions of the grounds. Landscape areas are also irrigated to maintain plant health and optimize aesthetic conditions when needed. Water sources, irrigation system, irrigation water quality, and water conservation measures are described in this section.

8.1 Irrigation System

City irrigation systems are an automated system controlled through stand-alone electronic controllers and Rain Bird IQ software operated based on evapotranspiration (ET). The hardware consists of mostly Rain Bird rotor and spray heads ranging in age from one to 15 years old.

8.2 Water Conservation

Irrigation is limited to prevent over-application of water as a means of optimizing plant vigor, plant health, and water conservation. An integrated weather station and a forecasted ET (RainBird IQ) is utilized to assist in determining irrigation needs. In addition to other methods, a means of determining turfgrass irrigation requirements is the use of soil moisture meters and daily observations of City staff.

8.3 Hydrophobicity or Water Repellency

Hydrophobic soils are soils that repel water as opposed to wetting easily under irrigation or rainfall conditions. Soil hydrophobicity commonly referred to as soil water repellency, is generally caused by a coating of long-chained hydrophobic organic molecules that accumulates on individual soil particles. Nonionic soil water repellency can lead to run off, non-uniform wetting of soils, poor delivery of fertilizers and control products, plant stress and reduced quality, increased need for irrigation and water use, and increased risk of environmental contamination. Soil surfactants or soil wetting agents, can be used to counteract hydrophobicity in soil. Wetting agents are substances that reduce the surface tension of water and in many cases restore the wettability of the soil. When applied to water-repellent (hydrophobic) soils at rates recommended by manufactures, surfactants can improve the ability of the water and solutes to penetrate the soil surface and more uniformly wet the entire root zone. Before using a wetting agent, checks are made to ensure slow infiltration is being caused by water repellency and not some other factor. Soil wetting agents will improve infiltration rates and water distribution only in soils that have some level of water-repellency present, regardless of their texture, tilth, and aggregation.

City staff uses soil amendments (“non-ionic wetting agents”) on athletic fields to assist in soil wettability and thus conserve water and promote improved plant health. Additionally, the use of penetrant type wetting agents is encouraged throughout the fall to aid in water penetration on soccer fields and increase playability.

8.4 Plant Growth Regulators

Plant growth regulators (PGRs) are chemicals that regulate plant growth. The objective of plant growth regulators is to increase plant quality, reduce maintenance costs and water use. Plant growth regulators are not typically used throughout the City.

9.0 TREE MANAGEMENT

General tree planting, management, and removal practices are described below.

9.1 Tree Selection

Trees considered for planting are selected based on ultimate size and type of growth appropriate for the planting location, compatibility with soil conditions and climate, and pest resistance properties. As a standard practice native species are preferred. Native species are better able to thrive, require less water, and are less susceptible to disease. If non-native tree species are selected they are trees which are not invasive in nature.

9.2 Planting Locations

Tree planting locations are carefully evaluated prior to planting to anticipate the effect of mature trees on surrounding areas. Water requirements, shading, and influence on air circulation are the primary determinants of planting locations.

9.3 Tree Planting

Trees are planted in planting holes appropriate for the root ball/root mass, and planting holes are backfilled with native material, except in certain situations where the existing soil is determined to not be suitable (i.e. rubble or rocks). The planting area is mulched and receives irrigation as required through the first three growing seasons. Whenever possible, planting occurs during the fall.

9.4 Tree Maintenance

Trees are routinely monitored for overall health, influence on the characteristics of the grounds, the presence of insects and diseases, influence on surrounding turfgrass and ornamentals, and hazard potential. In general, insect and disease pests are tolerated. High-value specimen trees may require more consideration for IPM strategies. Established trees do not require supplemental irrigation except in situations of extreme drought. Trees will be pruned to optimize tree health and public safety, allow passage of light and wind, minimize hazard, and manage pests.

9.5 Tree Removal

Tree removal may be required because of disease, age, wind or lightning damage, and hazard potential. At other times, trees may be removed to increase sunlight and air circulation to specific turfgrass or buildings. Impacts to wildlife habitat and shading properties are considered before trees are removed. The appropriate Supervisor will be responsible for determining if tree removal is necessary and will consult with other professional arborists regarding tree removal beyond the scope of routine management practices.

Trees considered for removal will be evaluated for their potential to provide wildlife habitat or forage. Snags are typically left in place if they are compatible with the area uses and are not a hazard to people.

10.0 ORGANIC MATERIALS MANAGEMENT

Sustainability practices conducted throughout the City of Wilsonville include composting and recycling of organic materials from managed sites.

10.1 Leaves

When it is not conducive for leaves to be left on site, leaf blowers and sweepers are used to remove leaves from landscape and hard surface areas. In non-turfgrass areas leaves and other debris are removed in certain areas to limit clogging of stormwater facilities and minimize threats to public safety, such as flooded roadways. The collected leaves are deposited in a designated composting area or sent to an organics recycler. During heavy leaf drop in the fall, rotary mowers are used to mulch leaves in the landscape when ground conditions are firm enough. This is important because some harmful insects and diseases can survive the winter in this debris and the soil mulched leaves are beneficial to soil and turf health.

10.2 Woody Brush

When practical, a wood chipper is used to process tree limbs and other woody material. The wood chips are used as mulch for application to areas such as planting beds, steep slopes, or naturalized areas under trees. Tree stumps are mechanically removed with an excavator or with a stump grinder and the chips are deposited in ornamental plant beds, tree wells, and natural areas. Small debris from trees and landscape maintenance is collected and composted appropriately.

10.3 Logs, Stumps, and Large Woody Debris

Logs, stumps, and woody debris will be stockpiled in suitable storage locations and offered to residents of Wilsonville as firewood.

10.4 Other Management Practices

If a shrub or tree dies, what caused it to die is determined and the plant is removed. If the cause of death is related to disease the dead plant is not composted. In many cases, the dead plant is not replaced with the same type of plant, as it is likely whatever condition caused the first plant to die may reoccur.

Most landscape and stormwater shrubs can benefit from having dead blossoms removed as the plant's energy that would have gone into seed production is redirected into producing new healthy growth. As shrubs and trees reach maturity over-crowding may become an issue. Plants need adequate space to allow for airflow through the canopy and to reduce shading. Plants are thinned/pruned or replaced to relieve overcrowding. Pruning is an effective tool to maintain plant health. Pruning can be used to remove dead, diseased, or damaged wood. If pruning is used to remove diseased parts, tools are disinfected to avoid spreading the disease. Diseased clippings are not composted. For large-scale pruning and removal operations or pruning for special projects an outside professional arborist may be hired.

11.0 PEST POPULATION DEFINITION

Pest identification and monitoring are the two key components to knowing the pest population. Field staff knows most facility pests. If a new pest appears it is first identified. The City of Wilsonville has a wealth of knowledge in its professional field staff that are readily available for pest identification and control measures techniques. University Extension and the Master Gardener programs are another good source for pest identification.

12.0 PEST MONITORING AND PEST CONTROL

The pest control strategy is sequential and consists of using cultural practices as the first line of defense, followed by biological/chemical control where appropriate. The decision to implement chemical pest control measures beyond cultural, biological, or mechanical practices is based on the review of relevant safety, scientific, economic, and environmental information. Products used for pest control are those approved for use by the United States Environmental Protection Agency (USEPA), ODA, and Oregon State University's Low-Impact Pesticides List.

12.1 Pest Scouting

City Maintenance staff is trained to routinely scout the facility and monitor for evidence of pest infestation appropriate for their individual job descriptions. The intensity and frequency of monitoring will be adjusted based on the likelihood of pest infestation (i.e., seasonal) or in situational/site-specific instances. Monitoring observations of potential pest infestation will be reported directly to the site supervisor on the same day of the observation, and will be documented on an inspection form. Recorded observations will include the area observed and a description of the pest(s). Chemical control action will be taken when the threshold for a specific pest has been exceeded or as needed in the case of preventative applications. If the threshold for a given pest is exceeded, the resulting corrective action and the corresponding results will also be recorded.

12.2 Pest Control

The pest control strategy will be developed on a case-by-case basis with all potential control options given consideration. The criteria for choosing any method of pest control include evaluating potential negative impact to environmental systems and human health.

The following is a review of means by which pests can be controlled:

- Cultural Control:
 - The use of sound agronomic and horticultural practices to optimize plant health and to suppress insects, disease, and weed growth. Other cultural controls include site-appropriate design and the use of disease or drought-resistant plants.
- Mechanical Control:
 - The use of a variety of tools and equipment for the purpose of eliminating pests.
- Biological Control:
 - The use of biological control agents that act as predators or parasites of pest species. The use of other beneficial organisms that improve plant health by enhancing soil quality.
- Chemical Control:
 - The application of various turf and ornamental plant protectant products such as herbicides, insecticides, or fungicides or other chemical compounds to a target pest as a means of control. This can include the application of horticultural oils or other chemicals that act as chemical control products but are not required to be registered as pesticides with USEPA or ODA.

13.0 ACTION LEVEL THRESHOLDS

Action threshold level is the number of pests detected within a specified area that leads to corrective action to reduce the density of the specific pest below the action threshold level. The action threshold levels for specific pest types are listed in [APPENDIX A](#).

14.0 CHEMICAL CONTROL PRODUCT SPECIFICATIONS

After cultural, mechanical, and biological options have been utilized, when thresholds have been exceeded or as needed in the case of preventative applications, chemical control products or “pesticides” will be used as described in this section.

A chemical control product is a substance used to control pests including insects (insecticides), undesirable plants (herbicides), and fungi (fungicides). The mechanism of most control products is to eliminate the pest by suppressing, weakening, or eradicating the target pest.

14.1 Chemical Control Product Use Determination

The ideal control product is highly potent (requires minimal application), is target-specific (is safe for non-targeted species) and is compatible with the environment. These properties are ideal and pursued by product manufacturers; the degree of cross-toxicity and environmental compatibility in control products approved for use by the USEPA can vary considerably. As a result, if avoidable, control products will not be used. In the event chemical control product application is necessary, products will be applied according to the label.

The primary strategy for pest management as defined in this IPM Plan is to optimize plant vigor through maintenance practices, to optimize plant resistance to, or tolerance of pests. In the event cultural, mechanical, and biological options do not maintain pest populations below damage thresholds, the use of chemical controls will be evaluated. Products applied to control pests will be selected by the IPM Leadership Team based on their safety, efficacy, economic impact, toxicology, and environmental compatibility. In addition, the IPM Leadership Team will monitor developments in chemical control product research and development; and incorporate the use of newly developed, tested, and improved products approved by USEPA where appropriate.

14.2 Current Practice

The City of Wilsonville uses the Low Impact Pesticide List provided by Oregon State University for use in the Oregon School IPM program, which includes synthetic and organic options. The list is updated annually and is vetted based on USEPA cancer data and only allows products with the signal word of CAUTION. (See [APPENDIX K](#) for detailed list)

14.3 Chemical Control Product Storage

Products are stored in a separate, locked, and signed restricted access storage building. Only authorized personnel have access to the chemical storage building.

14.4 Chemical Control Product Formulation

Chemical control product mixing is performed by a licensed applicator per label instructions in a dedicated mixing area. Local weather is considered prior to product formulation and application. Care is used to mix only the amount of product needed to minimize waste.

14.5 Chemical Control Product Application

The State of Oregon requires Pesticide Licensing when applying chemical control products as a public employee using machine-powered equipment and/or applying restricted use pesticides.

The full requirements are available at:

<http://www.oregon.gov/oda/programs/pesticides/licensing/pages/pesticidelicensing.aspx>

Applicators will wear personal protective equipment (PPE) appropriate for the product being applied. Application equipment will be properly calibrated prior to addition of the product to the equipment and application to the grounds. Mobile spill response equipment and safety equipment will accompany applicators during the application process.

The area requiring chemical application will be specifically defined by the site supervisor. Whenever possible, applications will be selective and limited to localized, targeted areas to minimize the amount of product being applied.

14.6 Chemical Control Product Cleanup and Disposal

Chemical control product cleanup and disposal is consistent with requirements described on container labels and regulations. Typically, containers are triple rinsed as soon as they are empty. If possible rinsate is mixed into a batch for application according to label directions. Visible residues in the rinsed container will be removed prior to disposal and visually confirmed.

After cleaning, containers are disposed of according to the label. If there is any question about the contents of a container, it is set aside for proper disposal.

14.7 Chemical Control Product Tracking

Tracking of product purchases and usage is achieved by using an electronic and a hard copy chemical control product logbook. Chemical control product purchases, usage, and disposal is recorded as a means of monitoring inventory control. Product application information recorded will include date of application, location of application, type of chemical control product applied, rate of application, weather conditions, and the identity of the applicator. In addition, current product labels and Safety Data Sheets (SDS) will be compiled and maintained in a location accessible to all employees. Chemical control product purchases documentation will be in accordance with federal and state regulations.

15.0 REFERENCES

- 4-County Cooperative Weed Management (Clackamas, Clark, Multnomah, Washington Counties), [https://4countycwma.org/Bug Guide](https://4countycwma.org/Bug%20Guide), <https://bugguide.net/node/view/15740>
- Clackamas River Basin Invasive Species Management Plan, <https://drive.google.com/file/d/0B-kvFFv8IYynbXU1aUpvYXdUODQ/view>
- Clackamas Soil and Water Conservation District Weed Wise, <https://weedwise.conservationdistrict.org/>
- Clackamas Soil and Water Conservation District, web site, invasive weed information is available at <https://conservationdistrict.org/programs/weedwise>
- EnviroLogic Resources, Inc., Environmental Stewardship Consulting Services.
- eXtension Self-Guided Education Module: School IPM Teaching Kit, <http://articles.extension.org/pages/64932/school-integrated-pest-management>
- Field Guide to Weeds of the Willamette Valley, <http://appliedeco.org/wp-content/uploads/WV-weed-guide.pdf>
- Hortsense, <http://hortsense.cahnrs.wsu.edu/Home/HortsenseHome.aspx>
- Ken Gray Insect Collection, <http://ipmnet.org/kgphoto>
- Metro Integrated Pest Management Policy, <https://www.oregonmetro.gov/integrated-pest-management-plan-and-field-guide>
- North Carolina Extension Service, Horticulture Information Leaflet 529, Best Management Practice for Plant Growth Regulators Used in Floriculture.
- ODA Noxious Weeds (Profiles and Risk Assessments), <http://www.oregon.gov/ODA/programs/Weeds/OregonNoxiousWeeds/Pages/AboutOregonWeeds.aspx>
- Oregon Invasive Species Council, <https://www.oregoninvasivespeciescouncil.org/>
- Oregon Parks and Recreation Association - Natural Resources Page, <http://www.orpa.org/?page=NRS>
- Oregon, Department of Agriculture, website, <http://www.oregon.gov/oda/programs/weeds/oregonnoxiousweeds/pages/aboutoregonweeds.aspx>,
- Oregon, Department of Agriculture, website, <http://www.oregon.gov/oda/programs/pesticides/licensing/pages/pesticidelicensing.aspx>
- OregonImapInvasives, <https://sites.google.com/site/orimapresources/>
- OSU Department of Horticulture Weed Identification Module, <http://horticulture.oregonstate.edu/content/welcome-pnw-weed-identification-module>
- OSU Extension Catalog, <https://catalog.extension.oregonstate.edu/>
- OSU Pacific Northwest Nursery IPM, <http://oregonstate.edu/dept/nurspest/>
- OSU Plant Clinic, <http://plant-clinic.bpp.oregonstate.edu/>
- Pacific Northwest Extension Publication, undated, Pacific Northwest Weed Management Handbook, <http://pnwhandbooks.org/weed/control-problem-weeds>.
- Pacific Northwest Weed ID Image Collection, <http://uspest.org/pnw/weedimages?weeds/id/index.html>
- PBI Gordon Corporation, undated, WeedAlert.com, <http://www.weedalert.com/>
- PNPNW Insect Management Handbook, <https://pnwhandbooks.org/insect>
- PNW Disease Management Handbook, <https://pnwhandbooks.org/plantdisease>
- PNW Weed Management Handbook, <https://pnwhandbooks.org/weed>
- Rainy Side Gardens, Pacific Northwest Pest Watch Database, http://rainyside.com/features/pest_watch/Pest_Clematis.html
- Salmon Safe, Inc., Salmon-Safe Certification Standards for Corporate & University Campuses.
- State of Victoria, Department of Sustainability and Environment, Armillaria Root Rot: A Disease of Native and Introduced Trees
- State of Washington Noxious Weed Board, Noxious Weed Search, <http://www.nwcb.wa.gov/>
- UC IPM Weed Photo Gallery, http://ipm.ucanr.edu/PMG/weeds_all.html#C
- University of California Home, garden, turf, and landscape pests, <http://ipm.ucanr.edu/PMG/menu.homegarden.html>
- Urban IPM Twitter, <https://twitter.com/URBANIPMtweets>
- Washington State Noxious Weed Control Board, <https://www.nwcb.wa.gov/weeds/>
- Washington State University Pest Leaflet Series, <https://pyvallup.wsu.edu/plantclinic/pls/>
- Weed biological control planning guide, <http://www.oregon.gov/ODA/programs/Weeds/Pages/BiologicalControl.aspx>
- Weed Images, <https://www.weedimages.org/>
- Weed Science Society of America, <http://wssa.net/wssa/weed/weed-identification/>
- Weedmapper, spatial information on the distribution of noxious weeds listed by the Oregon Department of Agriculture (ODA).
- WSU Extension Pesticide Recertification Courses, <https://ecommerce.cahnrs.wsu.edu/PesticideRecertification/shop/category.aspx?catid=13>

APPENDIX A-PEST CLASSIFICATION AND ACTION THRESHOLDS

Overview of Action Thresholds

Undesirable species are common challenges in managed landscapes and in some unmanaged landscapes. The intent of IPM is not to eliminate every pest in every location at all times. Rather, the goal is to utilize a thoughtful process that allocates resources effectively among pests, protect management areas against disruption or degradation, and avoids actions which may worsen the problem or harm public or environmental health.

Monitoring for pest presence (estimating abundance, density or level of damage) and comparing observations with action thresholds is a standard component of IPM. The action threshold defines (usually quantitatively) the abundance or level of pest pressure or damage tolerated before requiring action. Preventative, biological, cultural practices and chemical control can be practiced at any level of infestation. In fact, pest management is most effective if preventative measures are regularly practiced so pest or damage levels do not rise to the level of the action threshold.¹

An important consideration in setting action thresholds is distinguishing pests: a) those which pose potential human health or public health risk; b) pests which substantially threaten resources of concern (including natural resources and built resources); and c) those pests which do not pose substantial risks and may be tolerated.

In this plan, pests are classified by the following terms, which are described in more detail below.

- Pests of Medical or Public Health Concern (Human Health Pests)
- Invasive Pests,
- Structural Integrity Pests, and
- Cosmetic/Nuisance Pests

For the City of Wilsonville, action thresholds vary according to the pest classification and the Level of Service associated with the site. Action thresholds are defined as:

- Zero
- Low
- Moderate, or
- Not Managed

Pests below action thresholds are managed through the use of cultural, mechanical or biological controls appropriate to the site and the pest. Above action thresholds or as needed for preventative control, chemical treatments are allowed, but not required. The quantitative or qualitative levels associated with these terms are described in [APPENDIX-C](#).

¹Extension.org. 2018. What is an action threshold? <http://articles.extension.org/pages/43474/what-is-an-action-threshold-and-how-is-it-used-in-pest-management>

APPENDIX B-PESTS OF MEDICAL OR PUBLIC HEALTH CONCERN AND ACTION THRESHOLD DEFINITIONS

Rats, mice, yellow jackets, cockroaches, and hornets are examples of pests that pose a risk to human health and safety. While most public health pests are not present or only occasionally a concern in the City of Wilsonville, some may, on occasion, pose a risk.

Protecting people from human health pests is imperative, particularly in areas where human activity is high. In other areas, control measures may not make sense. For example, it is not feasible to manage intensively against rats in natural areas.

Accordingly, action thresholds (also called tolerances) for detection of pests involving a risk to public health are zero for sites with a high level of human activity including: buildings, athletic fields and courts, park structures, streetscapes, and stormwater facilities.

This does not imply chemical control products will be used as a first resort on all human health pests, nor that routine control product applications will be conducted. It does mean the City of Wilsonville will engage in heightened surveillance for these pests; will adhere to strict preventative measures (for example building integrity and sanitation are both critical methods for avoiding rodent issues) and will, when necessary, employ control products chemical control products even when pests are at low densities. Being strategic and smart is important with these pests. Understanding biology and life cycle for all pests is crucial. For example, trapping or killing yellow jacket queens in early spring may help prevent nest establishments and subsequent problems.

Under certain circumstances, a pest not normally classified as a human health pest may be considered a safety risk in some City areas. For example, gophers represent a human health risk when they occur on athletic fields due to injury potential for users.

The only known weed currently present on City property that poses human health risk is poison oak. This is a native that will be left undisturbed in natural areas. Along paths and trails, poison oak is managed by mowing and sprayed with a chemical control product immediately where people are likely to come in contact with it.

Action Threshold Definitions for Human Health Pests:

- **Zero:** Regular monitoring will occur. Detections will result in an intensive effort to eradicate the pest from the site.
- **Low:** Staff will aim to reduce suitable habitat and if a complaint is received, efforts will be made to minimize the pest.
- **Moderate:** Staff will aim to reduce suitable habitat.
- **Not managed:** No particular efforts will be made to monitor or manage the pest.

APPENDIX C- PESTS AND ACTION THRESHOLD DEFINITIONS

Invasive species are defined by Oregon statute as “non-native organisms that cause economic or environmental harm and are capable of spreading to new areas of the state.”

Some invasive plants are categorized as “noxious weeds,” defined by ODA as ‘any plant designated by the Oregon State Weed Board that is injurious to public health, agriculture, recreation, wildlife or any public or private property.’ The ODA further classifies noxious weeds as either A, B, or T weeds, depending on their perceived importance and the reasonable ability of local and state government to provide control.

- A-listed weeds: ODA recommends eradication or intensive control.
- B-listed weeds: ODA recommends “limited to intensive control at the state, county or regional level as determined on a site specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method.”
- T-listed weeds: T-listed plants are selected by the Noxious Weed Control Program from the A and B lists. These species are considered priority for treatment. ODA is responsible for preparing a statewide management plan for each T-listed weed.

The Oregon Department of Agriculture considers A-listed and T-listed species on its noxious weeds list the primary targets for EDRR efforts.

The Clackamas County Soil and Water Conservation District’s WeedWise Program also maintains and annually updates a list of priority Clackamas County EDRR plant species. Weedwise classifies invasives into two groups:

- **Priority** -These weeds are the highest priority that are actively being targeted for eradication by the WeedWise Program. Landowners are encouraged to notify the WeedWise program for assistance with these weeds and to actively control them on their property.
- **Maintenance** - These weeds are damaging and widespread. The WeedWise Program encourages control by landowners and can assist with development of a plan to control these weeds.

A. Action Threshold Definitions for Invasive Pests

In order to prevent the additional spread of invasive species, in sites outside of natural areas, passive areas, detention ponds, outfalls and ditches, invasives will be managed at thresholds of 0%.

In these areas, the threshold will be variable, depending on the species. In many of the City’s natural areas, invasive weeds such as blackberry, English ivy, and holly are widespread and control efforts must be targeted and realistic. In natural areas and passive areas:

- T-listed and A-listed State-classified noxious weeds will be managed at threshold of 0%.
- B-listed State-classified noxious weeds will be managed for 15% thresholds.
- Weeds identified on the priority EDRR list maintained by Clackamas County Soil and Water Conservation District’s WeedWise Program and not on the State noxious weed list shall be managed at 15% thresholds.
- The action level threshold for other invasive species in natural and passive areas will be 25%, though preventative actions will occur as a matter of course.

Invasive insects that detected in the region recently (but not in the City of Wilsonville) include Japanese beetle and gypsy moth. The City will cooperate with ODA and other partners to ensure invasive insects detected on City property are eradicated in cooperation with ODA measures.

B. Action Threshold Definitions for Structural Pests

Wood-destroying organisms such as termites and carpenter ants are examples of pests that threaten structural integrity. Moss is also in this category as it can degrade the life of roofs and hard surface pathways. Thresholds for these pests are pest-specific:

- Wood-destroying organisms: 0%
- Moss: 15%

C. Action Threshold Definitions for Cosmetic/Nuisance Pests

Cosmetic or nuisance pests are the most prevalent kinds of pests present on City property. They are unsightly to some people or undesirable, and may be a source of allergens or attractants to stinging pests but otherwise do not present a major hazard to human health, or environmental and structural integrity.

Examples of cosmetic or nuisance weeds include crabgrass, dandelion, clover, common plantain, and horsetail. Cosmetic weeds may be native or introduced and while they can spread through seed or other plant propagules, they do not pose a substantial invasive risk. Nuisance insects include “sugar” ants (odorous house ant) and azalea lacebug. Nuisance diseases include: powdery mildew on roses or Monilinia on native huckleberry species (*Vaccinium* spp.).

Undesirable plants (weeds) - The City will manage against cosmetic/ nuisance weeds, but action threshold levels are not as strict as for other pests. In addition, prevention as well as cultural, mechanical/physical, and/or biological methods are emphasized. Thresholds are defined as follows.

- **Low** - 15% cover by the weed
- **Moderate** - 50% cover by the weed
- **Not managed** - No particular efforts will be made to monitor or manage the weed

Insects and Vertebrates - Except for ants in buildings, insects and vertebrates are not regular issues and are to be dealt with on a case by case basis. City

Disease – Disease occasionally occurs in ornamental plantings, turfgrass or City trees. The City strives to manage disease in ornamental plants and trees by removing diseased parts or the full plant as needed, and may modify the soil before replanting.

Zone	Desired Conditions	Level of Service	Action Thresholds			
			Human Health/ Safety Pests	Invasive Pests	Structural Pests	Cosmetic and Nuisance Pests (Weeds)
PARKS						
Athletic Fields and Courts	Healthy turf, safe playing conditions, neat, attractive	1	>0%	>0%	n/a	50%
Playgrounds	Safe	1	>0%	>0%	0 – 15%	15%
Passive Areas (trails, disc golf area, off leash dog area)	Safe recreation and passage, accessibility	2	Low	>0%	n/a	50%
Park Buildings and Structures	Healthy for people, neat, attractive	1	>0%	>0%	0 – 15%	15%
Ornamental beds	Healthy, neat, attractive	2	Low	>0%	n/a	15%
General use park sites not in other park categories	Healthy vegetative cover	3	Moderate	5%	n/a	50%
Natural Areas - Non-aquatic	Healthy native vegetation, forests and creeks	4	Not managed	0-25%	n/a	Not managed
Natural Areas - Aquatic	Healthy aquatic conditions	4	Not managed	0-25%	n/a	Not managed

Zone	Desired Conditions	Level of Service	Action Thresholds			
			Human Health/ Safety Pests	Invasive Pests	Structural Pests	Cosmetic and Nuisance Pests (Weeds)
STORMWATER FACILITIES						
Bioswales/green infrastructure	Filtration and passage of stormwater, neat, attractive	1	Low	>0%	n/a	15%
Detention Ponds, Outfalls, and Ditches	Stormwater flow and filtration, maintain needed access	2	Low	0-25%	n/a	Not managed
ROADS						
Streetscapes, rights-of-way, median strips	Sight distance for vehicles, low fire hazard, neat	1	Low	>0%	n/a	15%
CITY FACILITIES (NON-PARK)						
Buildings	Structural integrity, healthy for people, neat, attractive	1	>0%	>0%	0 – 15%	15%
Turfgrass	Neat, attractive	1	Low	>0%	n/a	15%
Ornamental beds	Healthy, neat, attractive	1	Low	>0%	n/a	15%

APPENDIX D-STAFF LICENSING AND TRAINING

Applicators: Employees applying Restricted Use Pesticides (or applying general-use chemical pest control products with machine-powered equipment) must be licensed as Public Pesticide Applicators under state rules.¹ The City's policy is to ensure its field staff applicators are licensed prior to permitting chemical control productchemical control applications.

Staff who apply chemical control products shall have the appropriate endorsements on their licenses. For example, parks staff shall at minimum obtain Ornamental and Turf endorsements; facilities staff likely should obtain these as well as Industrial, Institutional, Health, and Structural (IIHS) endorsements. Staff applying chemical control products within the right-of-way should obtain the Right-of-Way endorsement. Staff treating noxious weeds should consider the Regulatory Weed Control endorsement.

Supervisors shall verify license status before allowing staff to apply chemical control products, shall keep a copy of the current license on file, and shall reverify license status at annual intervals thereafter.

Certified Public Pesticide Applicators must accumulate 40 credit hours of continuing education during a 5-year period in order to renew the certification. A wide variety of continuing education courses are available. The City provides funds for applicator continuing education training, especially trainings that promote enhanced skill in cultural, mechanical, and biological methods for managing pests; effective monitoring; chemical control product safety and low-risk products and application methods; and invasive awareness.

City staff who are not applicators: City staff, including office staff, play an important role in reporting pest outbreaks or pest-conducive conditions such as leaks, and in maintaining sanitary conditions. City staff will be notified of the IPM plan, and trained in prevention, sanitation and reporting protocols from the IPM Leadership Team.

Volunteers: With proper training and a sincere interest in proper technique, volunteers can play an important role in assisting with pulling and digging weeds, spreading mulch and conducting other low-risk practices. No volunteers shall apply or handle chemical control productschemical control products on City property.

¹ ODA. Pesticide Licensing in Oregon.

<http://www.oregon.gov/ODA/shared/Documents/Publications/PesticidesPARC/LicenseGuide.pdf>

APPENDIX E-CONTRACTED PEST CONTROL

The City contracts much of its facility pest control to licensed pest control companies. Contract oversight is the responsibility of the employing department.

Licensing: Under state rules, contractors applying any chemical control products chemical control products (including 25(b) minimum –risk pesticides) on City property must also have a state-issued Commercial Operator License and the appropriate state-issued Commercial Applicator or Trainee License for each applicator. Contractor endorsements shall correspond to the work being performed. Contractor operator license (and endorsements) will be verified by the contract manager prior to the signing of the contract. Applicator licenses and endorsement shall be verified prior to each application. For ongoing contracts, qualifications should be verified semi-annually.

Contract Specifications and Procedures: IPM practitioners who regularly work with contract pest control companies recommend that contract language for pest control be as specific as possible. Ideally, contract language shall specify date ranges appropriate for monitoring and conducting the pest management; devices and equipment preferred for monitoring; locations to be monitored; allowable chemical control products or baits; reporting requirements, etc. Such specificity provides clear expectations and allows potential bidders to more accurately prepare bids.

The City will adhere to the following procedures before chemical application by a commercial contractor.

- Verify the license of the operator.
- Inform the contractor of the exact location and description of area to be treated and the approximate dates and time frames desired.
- Require the operator to check in with a designated member of the Department.
- Notify the contractor that only chemical control products on the City’s approved list shall be applied; provide the contractor with the City’s approved chemical control product list and associated restrictions or mitigations.
- Require the applicator to provide information necessary to meet the City’s record-keeping requirement immediately after application. Application records should be turned into the contract manager.
- Indicate the desired pre-treatment and post-treatment monitoring requirements and methods (i.e. recommended monitoring forms as available)
- Specify particular safety requirements.
- Specify notification and posting requirements.

Contractor Notification: Under Oregon-OSHA, the City also has certain obligations to contractors (example, electricians) who may be asked to work in a recently treated areas or in chemical control product storage areas. Such contractors should be informed of chemical control product applications, which have occurred within two months on the sites they are working on, and should be supplied with the chemical control product label and SDS sheets.

APPENDIX F-COEXISTENCE AND LIMITING OFF-TARGET EXPOSURE TO HUMANS, WATER, AND WILDLIFE

City facilities, roads and parks are embedded in neighborhoods, near heavily used commercial facilities and adjacent to agricultural lands. Safe chemical control product usage includes practicing behavior respectful of neighbors, city workers, and city residents. Applicators of chemical control products on city property and in city facilities shall take steps to minimize off-target exposure through proactive communication; minimizing drift; minimizing potential for aquatic contamination; and minimizing potential for effects to bees and other wildlife.

A. Communications and Awareness: City staff will:

- Make efforts to initiate open communication with nearby neighbors, agricultural producers, and beekeepers.
- Consider surroundings prior to product selection and timing of applications, especially near people, sensitive crops or plants, and pollinators.
- Consider application potential to affect plants considered culturally significant by Oregon's tribal groups.

B. Minimizing Drift: Applicators should make an effort to minimize drift of chemical control products. The following measures include a variety of methods known to minimize drift.

- Volatility measures the evaporation potential of a chemical control product. Applicators should choose low- or non-volatile formulations. Low-volatile products have vapor pressures less than 0.01 mm Hg. Vapor pressures are indicated on the SDS sheet.
- Applicators will avoid chemical control product applications when temperatures during or after application will exceed 70 degrees F and/or relative humidity will fall below 40%.¹
- Applicators should not apply when wind, temperature, or dry air favor drift. Applicators should only apply chemical control products when wind speeds are between 2-9 mph and only when winds are blowing away from sensitive sites. Winds below 2 mph may indicate inversion conditions, which are highly susceptible to drift.
- Applicators should use nozzles that produce larger droplets, choose nozzles designed to reduce drift, place nozzles with the air stream, not across it, and use the lowest pressure that still does the job.
- Applicators should apply as close to the target as possible.
- Applicators should use a drift-control additive as needed.
- Indoor applications: Applicators will use only non-volatile formulations and will ensure chemical control products do not move to other parts of the building by ventilation, heating and cooling systems.

C. Minimizing Runoff and Leaching: Applicators should make efforts to minimize runoff and leaching. The following measures are recognized methods to reduce runoff and leaching.

- Chemical control products will not be applied when significant rainfall or runoff-generating rainfall is expected. Precipitation may drive products toward streams, especially if soils are saturated, bare, or extremely dry. The EPA recommends avoiding application of products if heavy rain is anticipated within 48 hours.²
- Chemical control product applications to impervious (hardened), saturated surfaces, or frozen ground will be avoided unless the site is on the label for intended use.
- Unused product or rinsate will not be disposed of in a sink, toilet, floor drain, or storm drain.
- Following granular product application, sweep or blow any granules from hard surfaces onto the treatment area.

- Except where invasive treatment is necessary, chemical control products shall not be applied within 50 feet of waterways.
- Chemical control product storage sites shall be located away from wells, cisterns, springs, and other water sources. Mixing and loading shall occur a minimum of 50 feet from wells, streams, rivers, lakes, ponds, sinkholes and storm drains.
- Know the water table depth and if water can leach from the surface into the groundwater. Consult soil maps to determine the potential for leachability into groundwater. Choose products which do not easily leach into groundwater.
- Use a sealed permanent or portable mixing and loading pad to avoid seepage into soil.

D. Minimizing Risk to Bees: Bees, other insect pollinators, and beneficial insects may be exposed to chemical control products through different routes, including: direct contact during foliar applications; contact with residues on plant surfaces after applications, drift from the application into the nest site or hive; and ingestion of residues in nectar, pollen, or guttation water (dew) when the product is applied as a seed treatment, soil or tree injection, or foliar application.

- a. **To avoid acute harm to bees and beneficial insects, the City will:**
- Attempt to avoid outdoor use of insecticides.
 - Choose the least hazardous active ingredient, formulation (dusts and microencapsulated insecticides are particularly hazardous; granular formulations are generally safest for bees), and application method.
 - Insecticides will not be applied to (or allowed to drift to) plants in bloom.
 - If used, insecticides will be applied in the evening or at night when bees are not foraging.

E. Permitting: Municipalities who apply chemical control products in or near streams must adhere to Clean Water Act rules for point sources. The National Pollution Discharge Elimination System (NPDES) is the mechanism by which point source discharges to waters are regulated. Approved in 2011, the Oregon NPDES Pesticide General Permit (PGP -2300-A) regulates pesticide applications which may result in discharges of pesticides into Waters of the State. The permit provides coverage for chemical control product applications in or within three feet of water to control pests such as insects, terrestrial and aquatic weeds, algae, and nuisance animals.

If chemical control products are applied in ways that meet the PGP, municipalities must apply for the PGP. They are not required to apply for a separate individual permit for those activities. The requirements under the PGP are the same for all entities covered by the permit. The information related to all aspects of the PGP can be found at:

<https://www.oregon.gov/deq/wq/wqpermits/Pages/Pesticide.aspx>

¹ Oregon State University Integrated Plant Protection Center. 2007. Pesticide Drift Management. http://ipmnet.org/Pesticide_Drift_Artwork/Spray_Drift_lo_res_print.pdf

² US EPA. 2017. Tips for Reducing Pesticide Impacts on Wildlife. <https://www.epa.gov/safepestcontrol/tips-reducing-pesticide-impacts-wildlife>

APPENDIX G-CHEMICAL CONTROL PRODUCT INVENTORY, STORAGE, MIXING, DISPOSAL, AND TRANSPORT

Inventory and Storage: Annually, an inventory of chemical control products will be made and checked against state registration. Only chemical pest control products currently registered with the Oregon Department of Agriculture will be stored or used on City property. Products not currently registered must be disposed of.

Some chemical control products do not need federal registration; they are exempt from registration under FIFRA section 25(b). However, products sold or distributed in Oregon must be registered annually with ODA. Use of these materials is allowable but must be documented like use of any other chemical control product.

Under FIFRA, it is illegal to store or dispose of chemical control products or containers in a manner other than directed by regulations. Products shall be kept in secure, safe, signed locations, locked up, and if possible, in an area protected from freezing, vaporizing, photodecomposition, or excess moisture. Chemical pest control products should be stored in original, labeled containers. Older product should be used prior to newer product as long as registrations are still valid for use. Any unlabeled product will be disposed of.

Chemical control products used by City staff shall be stored in the chemical storage unit, off-limits to the general public. Staff will regularly inspect chemical storage areas for leaking containers, unlabeled product or other unsafe conditions. Leaking containers and unlabeled product will be promptly and safely disposed of.

Inventory in quantities greater than the “reportable quantity” threshold for hazardous chemicals will be reported to the Office of the State Fire Marshall. Reportable quantity thresholds apply to each chemical pest control product separately and constitutes 500 gallons of liquid, 500 pounds of solid and 500 cubic feet of gas.

For chemicals considered explosive or highly toxic, lower reportable quantity thresholds apply: quantities exceeding five gallons of liquid, ten pounds of solid and twenty cubic feet of gas must be reported.

- Explosive - a hazardous substance classified as an explosive by the U.S. Department of Transportation.
- Highly Toxic - Products registered in the State of Oregon are listed at: http://oda.state.or.us/dbs/pest_productsL2K/search.lasso. Registration updates are updated annually and are usually current by the end of March.

Hazard Communication: Current labels and SDS sheets should be kept in a binder in areas where chemical control products are stored and in mixing areas for quick reference when planning work and if spills occur. In addition, appropriate SDS sheets should be kept in City buildings for reference by staff who may be subject to exposure from chemical control products chemicals used on or adjacent to City facilities.

Spill kit materials appropriate to the task will be kept in or near the product chemical storage areas.

Mixing: Only the amount needed for the task that day should be mixed. Chemical control products used by City staff which require mixing should be mixed in a dedicated area of the maintenance yard.

Disposal: Empty chemical control product containers should be triple rinsed, and the rinsate poured into spray equipment and applied to target areas. Empty and rinsed rigid containers should be punctured and disposed of appropriately. Bags should be fully emptied, rolled up and disposed of per label.

Equipment should be rinsed at the end of the spray cycle or when changing to chemistries incompatible with those in the tank, and rinsate applied to target areas.

Surplus product, with expired labels, or banned from use will be identified during annual inventories. Unopened surplus product may be returned to the dealer, manufacturer, or formulator. Staff will follow the recommendation of the manufacturer or dealer in finding a new legal user for the product or dispose of the product at an authorized pesticide disposal site. Oregon Department of Environmental Quality hosts regular chemical pest control drop-off events for expired products or products no longer needed. Municipalities can participate in DEQ-ODA chemical control product collection events for free. Another option available to municipalities is the Metro “CEG” (conditionally exempt generator) collections at their two transfer stations, however disposals are charged a per pound fee.

Transporting: When transporting chemical control products, drivers should ensure containers and spray equipment is safely secured. Chemical control products are prohibited from being carried in the part of vehicle where people ride. A spill kit should be kept in vehicles used for transporting chemical control products.

Chemical control products should be transported in their original containers unless the original container is damaged or unless the product is mixed prior to going to the field. Persons in possession of control productschemical control products in the field should carry a copy of the label and the corresponding current Safety Data Sheet (SDS).

APPENDIX H-PERSONAL PROTECTIVE EQUIPMENT (PPE)

City staff will wear long-sleeved shirts and long-sleeved pants whenever handling chemical control products. In addition, staff will wear appropriate Personal Protective Equipment (PPE) to protect the body from contact with chemical control products or product residues. Consult the label to determine appropriate PPE.

The City will provide certain chemical-resistant PPE items to be used by staff who handle chemical control products, including:

- Chemical resistant footwear appropriate to the product being applied (consult label).
- Chemical-resistant coveralls, aprons, hoods and suits appropriate for the chemical control product(s) being applied (consult label)
- Chemical-resistant gloves appropriate to the product being applied (consult label). Gloves or glove lining made of cotton, leather, or other absorbent materials must not be worn during the handling or application of chemical control products.
- Protective eyewear, including chemical-resistant goggles; face shields or safety glasses with shields at the front, brow, and temple.
- Chemical-resistant hat
- Respirator (NIOSH-approved) appropriate for the chemical control product (consult label) that is properly fit to the applicator, cleaned, sanitized, and maintained.
- Supplies, equipment, and designated areas for cleaning, sanitizing, and storing reusable PPE.

Applicators are trained in how to be watchful for signs PPE is compromised or not chemical resistant. Applicators are also trained in prompt cleaning and storage of reusable PPE. PPE should be stored away from chemical control products.

APPENDIX I-EMERGENCIES AND SPILLS

Emergencies and spills are best avoided by ensuring applicators are properly trained, certified and licensed, and provided with properly functioning equipment and supplies.

First aid: Applicators are trained in first aid methods appropriate for chemical exposure through the skin, eyes, mouth, or airway. Should unintentional exposure occur to the skin, airway, or mouth, applicators will follow first aid recommendations on the productchemical label and call 9-1-1 and consult the Oregon Poison Center at (800) 222-1222.

Additional steps may include getting victim to fresh air, removing contaminated clothing, washing of skin and/or eyes if affected, rinsing the mouth, etc. Induce vomiting only if the label so instructs. See the National Pesticide Applicator Certification Core Manual for more information.

Control, contain and cleanup:

Chemical control product spills should be dealt with according to the instructions on chemical control product labels and SDS sheets.

The City will keep fully-supplied spill cleanup kits available at locations where chemical control products are handled or stored.

Important items in a typical spill kit may include:

- Telephone numbers for emergency assistance
- Personal protective clothing and equipment as required by the label, including:
- Chemically-resistant gloves, footwear, and apron
- Protective eyewear
- An appropriate respirator, if the products requires using a respirator during handling or for spill cleanup
- Containment "snakes" to confine the leak or spill to a small area
- Absorbent materials such as spill pillows, absorbent clay, dry peat moss, sawdust, "kitty litter," activated charcoal, vermiculite, or paper to soak up liquid spills
- Sweeping compound to keep dry spills from drifting or wafting during cleanup
- A shovel, broom, and dustpan made from non-sparking and nonreactive material (foldable brooms and shovels are handy because they can be carried easily)
- Heavy-duty detergent
- Fire extinguisher rated for all types of fires
- Other spill cleanup items specified on the labeling of products used regularly
- Sturdy plastic container which will hold the entire volume of the largest chemical control productchemical container being handled and can be tightly closed
- Highway flares (do NOT use flares near flammable material)
- Items should be stored in the sturdy plastic container and kept easily accessible, clean, and in working order.

Spill Reporting: In the event of a spill, SDS sheets should be consulted to determine whether the product contains ingredients subject to mandatory reporting requirements.

As a general rule of thumb, spills should be reported to the OERS (1-800-452-0311) when there is potential for harm to human health or the environment from the spill, or if the spill occurs in an area frequented by the public. The spill is not reportable when it does not result in chemical control product

lost to the environment, and there is no threat to air, soil, or water, such as when it occurs on a concrete floor, or in an enclosed area, and is removed by proper spill clean-up procedures.

Decontamination: The City makes available decontamination equipment including soap, running water, paper towels, and emergency eyewashes near mixing areas. Should the need arise there is a shower available in City Hall and the Public Works building.

APPENDIX J-PUBLIC SAFETY, NOTIFICATION AND POSTING

Some chemical pest control products may include a restricted entry interval (REI) following application. These are intended to prevent acute exposure to workers, though some product REIs include people and pets. Most of the REIs found on chemical control products specifically apply to products used in agricultural settings. Unless a product has a reentry interval specified in the “Non-Agricultural Use Requirements box” there is no legal requirement for requiring a prohibition on reentry immediately after application. When reentry limits on non-agricultural sites are specified, they may differ from the REI required in an agricultural setting. For example, the herbicide Tzone label restricts worker entry into treated agricultural areas for 24 hours, but for non-agricultural sites, reentry is permitted as soon as sprays are dry.

Given the public nature of the City’s properties,

- Applicators should ensure people and animals are kept out of the treatment area according to label instructions.
- Prior to treatment, notification signs are posted at the boundaries of the area treated. The notification sign should include: “CAUTION: Chemical Control Product Treated Area”, the date and time of application; the date and time when public entry restrictions (if any) will be lifted, and the telephone number of the designated City contact person.
- Anyone may request reports of specific chemical control applications through a public records request. Requests should include the dates or date ranges of interest, locations of interest, and may specify specific products of interest.

APPENDIX K- CHEMICAL PEST CONTROL PRODUCT HAZARD SCREENING AND PRODUCTS APPROVED FOR USE

The IPM team chose to adopt the Low Impact Pesticide List used in the OSU School IPM program detailed below.

Low-Impact Pesticides List from Oregon State University

- Do not apply chemical control products to interior spaces, athletic fields, or other space while occupied.
- Store control products in a cool, dry place with limited access.
- Store liquids below granules and dusts, just in case the liquid container leaks.
- *At the very least*, wear long pants, long sleeves, shoes and socks when handling or using chemical control products.
- Keep people and pets off treated areas until sprays or wetted granules have dried.
- Do not apply products in a way that will contact people, either directly or through drift.

WARNING

- *“Non-crop areas” include uncultivated agriculture, farmyards, fuel storage areas, fence rows, rights-of-way, and fallow land. That term does NOT include ornamental sites, turf, or sports fields.*

The law defines “low-impact” in specific terms. Oregon State University (OSU) has evaluated products upon request and created this list, which governing bodies are welcome to use in lieu of, or in addition to, their own low-impact lists. The list is based solely on the requirements of ORS 634.705(5) and is not intended as a recommendation or endorsement of the products listed within.

Consult with your supplier, pest management professional, or Oregon Department of Agriculture prior to chemical control product use. Always read the label and follow all directions before you apply any chemical control products. ***The Label is the Law!***

The products listed here meet the criteria under the law for use in and around Oregon schools and are registered for sale in the state of Oregon. Use the EPA Registration number to match products on the list. The same product name can be used for different products, so matching the product name(s) below to products on the shelf is not sufficient. This table is sorted by EPA Registration number (lowest to highest).

Herbicides

Product Name	EPA Reg. No.	Active Ingredient(s)	Read the label, use products only for labeled uses, and be aware of the following:
<i>TenaCity</i>	100-1267	mesotrione	This product is harmful if absorbed through skin. Prolonged or repeated skin exposure may cause allergic reactions. Avoid contact with skin, eyes, or clothing. All handlers must wear chemical-resistant gloves. Do not contaminate water. This product has a high potential for runoff for several weeks after application. Avoid application when rain is expected within 48 hours. Certain insecticides, when applied within 7 days of TenaCity, can cause turf injury.
<i>Refuge</i>	100-1362	glyphosate	In agricultural settings, this product requires a restricted-entry interval of 12 hours and chemical resistant gloves in Category A. Consider applying that same standard in your school setting. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.
<i>Cornerstone Plus - Agrisolutions</i>	1381-192	glyphosate isopropylamine salt	This product causes moderate eye irritation. Do not mix, store, or apply this product in galvanized steel or unlined steel containers; it may form a highly combustible gas mixture. Be sure to follow the directions for non-crop areas.
<i>Drexel Simazine 4L</i>	19713-60	simazine	This product is labeled for use on ornamental lawns. There are no other school sites listed (i.e. athletic fields). This product causes moderate eye irritation, and it can be harmful if absorbed through the skin. Avoid contact with eyes, skin or clothing. All handlers must wear chemical-resistant gloves. Do not apply this product to sandy soils where the water table is close to the surface. This product is toxic to aquatic organisms. Do not mix this product within 50 feet of water bodies or wells. When used in agriculture, this product requires a re-entry interval of 12 hours. Consider applying that same standard in your school setting. Do not use on alkaline soils (pH above 7.8). Do not apply over the rooting zone of trees or ornamentals that are not listed on the label.

<i>Simazine</i>	19713-252	simazine	This product is labeled for use on lawns. There are no other school sites listed (i.e. athletic fields). This product causes moderate eye irritation, and it can be harmful if absorbed through the skin. Avoid contact with eyes, skin or clothing. All handlers must wear chemical-resistant gloves. Do not apply this product to sandy soils where the water table is close to the surface. This product is toxic to aquatic organisms. Do not mix this product within 50 feet of water bodies or wells. When used in agriculture, this product requires a re-entry interval of 12 hours. Consider applying that same standard in your school setting. Do not use on alkaline soils (pH above 7.8). Do not apply over the rooting zone of trees or ornamentals that are not listed on the label.
<i>Drexel De-ester LV6</i>	19713-655	2,4-D, ethylhexyl ester	This product is moderately toxic to the eyes. Avoid contact with skin, eyes, or clothing. Prolonged or frequent repeated skin contact may cause allergic reactions. This product may be toxic to aquatic life, and it has properties associated with groundwater contamination. Application around a cistern or well may result in drinking water contamination. On ornamental turf, only two applications per year are allowed.
<i>Lilly Miller Ultra Green Phosphorus Free Weed & Feed</i>	2217-559-33116	2,4-D, mecoprop, dicamba	Harmful if swallowed or absorbed through skin. Causes moderate eye irritation. Avoid contact with eyes, skin or clothing. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. This product is toxic to fish and other aquatic life. Avoid applications when rain is predicted within 24 hours. Sweep any product that lands on a driveway, sidewalk, or street back into the treated area.

<p><i>Gordon's Agricultural Products Brushmaster Herbicide</i></p>	<p>2217-774</p>	<p>2,4-D ethylhexyl ester, 2,4-DP, dicamba</p>	<p>The only school sites on the label (under "Recommended Noncropland sites") are roadsides, fencerows, fence-lines, and areas adjacent to athletic fields. Avoid contact with eyes, skin or clothing, or inhaling spray mist. This product is harmful if absorbed through the skin or inhaled. Over time, it may cause allergic reactions in individuals who are repeatedly exposed. Applicators must wear chemical-resistant gloves. A chemical resistant apron is needed when working with the concentrate. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination. Do not apply this product to shorelines, wetlands, or ditch-banks. Do not apply this product where drift may occur to ornamentals, fruit trees, vegetables, and other susceptible broadleaf plants. Do not apply when humidity is low and temperatures are high because this product may turn to vapor and move, damaging desirable plants.</p>
<p><i>Gordon's Proform Professional Formulations Speed Zone Broadleaf Herbicide for Turf</i></p>	<p>2217-833</p>	<p>2,4-D ethylhexyl ester, mecoprop-p, dicamba, carfentrazone ethyl</p>	<p>Avoid contact with skin, eyes, or clothing. All handlers, including mixer/loaders must wear chemical resistant gloves. A chemical resistant apron is needed when working with the concentrate. This product causes moderate eye irritation. Prolonged or frequently repeated skin contact may cause allergic reactions. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination. Do not apply to wetlands or shorelines.</p>
<p><i>Gordon's Proform Professional Formulations Speed Zone</i></p>	<p>2217-835</p>	<p>2,4-D ethylhexyl ester, mecoprop-p, dicamba, carfentrazone- ethyl</p>	<p>Avoid contact with skin, eyes, or clothing. All handlers, including mixer/loaders must wear chemical resistant gloves. A chemical resistant apron is needed when working with the concentrate. When finished, users should remove PPE immediately and change into clean clothing as soon as possible. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination. Do not apply to wetlands or shorelines.</p>
<p><i>The Andersons Professional Turf Products Fertilizer with Surge 16-0-9</i></p>	<p>2217-882- 9198</p>	<p>2,4-D ethylhexyl ester</p>	<p>Avoid contact with skin, eyes, or clothing. All handlers, including mixer/loaders must wear chemical resistant gloves. This product is toxic to fish and other aquatic life. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination. Do not apply to wetlands or shorelines.</p>

<i>Gordon's ProForm Professional Formulations T Zone Broadleaf Herbicide</i>	2217-920	dicamba, 2,4-D (2-ethylhexyl ester), sulfentrazone, and triclopyr, butoxyethyl ester	Avoid contact with eyes or clothing. This product causes moderate eye irritation. Chemical resistant gloves are required for all activities. When you might be exposed to the concentrate (mixing, loading, cleaning up spills), you must wear a chemical resistant apron. Users should change clothes immediately after handling this product. Application around a cistern or well may result in contamination of drinking water. Small amounts of this product can damage sensitive plants like grapes, vegetables, and many ornamentals. Do not allow spray drift. Vapor drift is also possible after the application if temperatures rise and humidity falls.
<i>Gordon's ProForm Professional Formulations Q4 Plus Turf Herbicide for Grassy & Broadleaf Weeds</i>	2217-930	quinclorac, 2,4-D, dicamba, sulfentrazone	This product causes moderate eye irritation. All handlers must wear protective eyewear and chemical-resistant gloves. If you might be exposed to the concentrate (mixing, loading, etc.), you must wear a chemical-resistant apron. In agricultural settings, the label requires a restricted entry interval (REI) of 48 hours. Consider applying that same standard in your school setting. It may be toxic to fish and other aquatic life, and highly water-soluble. Groundwater could be contaminated if this product is applied where soils are permeable and the water table is shallow.
<i>T Zone SE</i>	2217-976	triclopyr butoxyethyl ester, sulfentrazone, 2,4-D	Prolonged or frequent exposure can cause allergic reactions. All handlers must wear chemical-resistant gloves. When handling the concentrate, a chemical-resistant apron is required. In agricultural settings, this product requires a re-entry interval of 24 hours. Consider applying that same standard in your school setting. This product is toxic to fish and other aquatic life, and it has properties associated with groundwater contamination. Use caution around cisterns or wells to prevent drinking water contamination.
<i>Razor Pro Herbicide</i>	228-366	glyphosate	This product causes moderate eye irritation. Avoid breathing vapor or spray mist. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.
<i>Razor Herbicide Primera Razor Pro</i>			

<p><i>Lesco Momentum Q Herbicide</i></p>	<p>228-531</p>	<p>2,4-D (diethylamine salt), quinclorac, dicamba</p>	<p>This product causes moderate eye irritation. Avoid contact with eyes or clothing. All handlers must wear chemical-resistant gloves, and they should be washed and removed (in that order) immediately after handling the product. In agricultural settings, the label requires a restricted entry interval (REI) of 48 hours. Consider applying that same standard in your school setting. It is toxic to fish and other aquatic life, and highly water soluble. Groundwater could be contaminated if this product is applied where soils are permeable and the water table is shallow.</p>
<p><i>Qunincept Herbicide</i></p>			
<p><i>Nufarm Prosedge</i></p>	<p>228-711</p>	<p>halosulfuron- methyl</p>	<p>Avoid contact with eyes or clothing. This product causes moderate eye irritation. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination, and groundwater flow has caused off-target plant damage. In fact, it's not allowed to be used on certain sandy/loam soil types with less than 2% organic matter.</p>
<p><i>Plateau Herbicide</i></p>	<p>241-365</p>	<p>imazapic, ammonium salt</p>	<p>Remember, "non-crop areas" do not include ornamental or turf sites. On school grounds, the only eligible locations would be fence rows and rights-of-way. Avoid breathing spray mist. Applicators must wear chemical resistant gloves. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination. This product has a high potential for runoff for several months or more after application. Do not rinse equipment on or near desirable trees or plants, or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots.</p>
<p><i>Pendulum AquaCap</i></p>	<p>241-416</p>	<p>pendimethalin</p>	<p>Avoid contact with eyes, skin, or clothing. Applicators and other handlers must wear chemical resistant gloves. Do not apply this product in greenhouses, or any enclosed structure. This product is toxic to fish. This is a pre-emergent herbicide. It keeps weed seeds from germinating through the soil surface, but only after it is "activated" by rainfall or irrigation (about a half inch).</p>

<i>Lesco Pre-M Aqua Cap Herbicide</i>	241-416-10404		
<i>Quicksilver T+O Herbicide</i>	279-3265	carfentrazone-ethyl	Avoid contact with eyes, skin, or clothing, and avoid breathing spray mist. This product causes moderate eye irritation and moderate inhalation toxicity. Applicators must wear waterproof gloves. Do not allow people or pets on the treatment area until sprays have dried. This product only works when light is present, and it can take 7-14 days for susceptible plants to die.
<i>Makaze</i>	34704-890	glyphosate, isopropylamine salt	This product is harmful if absorbed through skin, and it causes moderate eye irritation. Applicators and other handlers must wear chemical resistant gloves. When used in agriculture, this product requires a re-entry interval of 4 hours. Consider applying that same standard in your school setting. Do not mix, store, or apply this product in galvanized steel or unlined steel containers; it may form a highly combustible gas mixture. Be sure to follow the directions for non-crop areas and industrial sites. These do not include ornamental beds, or locations where children have easy access.
<i>Mad Dog Plus Kleenup Pro Four Power Plus</i>			
<i>Casoron 4G</i>	400-168	dichlobenil	Avoid contact with skin, eyes, or clothing. This product is harmful if inhaled. Chemical-resistant gloves are required for all activities. Users should change clothes immediately after handling this product.
	400-168-59807		Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination. When working around desirable plants, do not allow granules to lodge in foliage, or accumulate in contact with tree trunks. <i>Casoron comes in paper bags that are known to rip easily.</i>
<i>Gly-Star Original Agristar</i>	42750-60	glyphosate, isopropylamine salt	Avoid contact with eyes or clothing. This product causes moderate eye irritation. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.
<i>Gly Star Plus, Gly Star Pro</i>	42750-61	glyphosate, isopropylamine salt	Avoid contact with eyes, skin or clothing. This product causes moderate eye irritation. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.

<i>Gordon's Farm Pronto Big N' Tuf, Gordon's Farm Pronto BigN'Tuf2 Nonselective Herbicide</i>	42750-61-2217		
<i>Hi-Yield Super Concentrate Kill-Zall II</i>	42750-61-7401		
<i>Landmaster BW</i>	42750-62	2,4-D, isopropylamine salt, and glyphosate, isopropylamine salt	Avoid contact with eyes, skin or clothing. This product causes moderate eye irritation, and it may be harmful if absorbed through the skin. When you might be exposed to the concentrate (mixing, loading, cleaning up spills), you must wear a chemical resistant apron and gloves. Application around a cistern or well may result in contamination of drinking water. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers. Do not apply this product in the vicinity of grapes, tomatoes, or other 2,4-D sensitive plants.
<i>Specticle 20 WSP Herbicide</i>	432-1499	indaziflam	Do not open soluble packets; the envelope will dissolve in water. This product causes moderate eye irritation, and it's harmful if absorbed through the skin. Avoid contact with eyes, skin or clothing. All handlers must wear chemical-resistant gloves, and they should be washed and removed (in that order) immediately after handling the product. In agricultural settings, the product requires a re-entry interval of 12 hours. Consider applying that same standard in your school setting. It is toxic to fish and groundwater could be contaminated if this product is applied where soils are permeable and the water table is shallow.
<i>Esplande 200 SC</i>	432-1516	indaziflam	This product is registered for use at educational facilities, but it's not allowed to be used on landscape ornamentals. It can be used on established turf (not newly seeded). Follow the directions for "Warm Season Turf Release." This product is harmful if inhaled or absorbed through skin. Avoid contact with skin, eyes, or clothing. Handlers must wear waterproof gloves. This product is toxic to aquatic life. Follow directions to avoid spray drift and runoff. Avoid applications when rainfall is expected within 48 hours.

<i>Specticle Flo</i>	432-1518	indaziflam	Keep out of children's reach. In agricultural settings, the label requires a restricted entry interval (REI) of 12 hours. Consider applying that same standard in your school setting. This product is toxic to fish and other aquatic life, and it is water-soluble. Do not apply within 25 feet of surface water, including seasonal wetlands. Adjacent properties with perennial ryegrass could be significantly damaged by drift. Do not allow drift.
<i>Marengo</i>	432-1518-59807		
<i>Specticle G</i>	432-1523	indaziflam	This product has no signal word, which can indicate very low toxicity. It is a pre-emergent herbicide for annual grasses. It is toxic to fish and other aquatic life. This product has a high potential to contaminate surface water and/or groundwater. The residue found in runoff can be active against aquatic life for months. Runoff can be reduced by timing applications when rain is not expected for 48 hours.
<i>Marengo G</i>	432-1523-59807		
<i>Esplanade EZ</i>	432-1528	diquat dibromide, indaziflam, glyphosate isopropylamine salt	This product is not intended to be used on turf grass. This product is harmful if absorbed through skin, and it causes moderate eye irritation. It is also toxic to fish, and prone to groundwater contamination. To minimize risk, apply the product when rain is not expected for 24 hours.
<i>Aquamaster Herbicide</i>	524-343	glyphosate, isopropylamine salt	Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.
<i>Roundup Custom for Aquatic & Terrestrial Uses</i>			
<i>Ranger PRO Herbicide</i>	524-517	glyphosate, isopropylamine salt	Avoid contact with eyes or clothing. Mix, store and apply spray solutions of this product using only stainless steel, fiberglass, plastic or plastic-lined steel containers. Otherwise, the gas mixture could flash or explode. In agricultural settings, this product requires a restricted entry interval of 4 hours. Consider applying that same standard to your school setting.
<i>RoundUp Pro Concentrate</i>	524-529	glyphosate, isopropylamine salt	Avoid contact with eyes or clothing. This product causes moderate eye irritation. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.
<i>Quikpro Herbicide</i>	524-535	glyphosate, diquat	This product causes moderate eye irritation, and applicators must wear protective eyewear. Avoid

<i>Roundup QuikPro Herbicide</i>		dibromide	breathing dust from the granules. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers. Only protected handlers may be in the area during application. Remove PPE immediately, and change clothes as soon as possible.
<i>Roundup Promax Herbicide</i>	524-579	glyphosate, potassium salt	Avoid contact with eyes or clothing. This product causes moderate eye irritation. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.
<i>Barrage HF Low Volatile Herbicide</i>	5905-529	2,4-D ester	Harmful if absorbed through skin. This product causes moderate eye irritation. Prolonged or frequently repeated skin contact may cause allergic reactions. All handlers must wear chemical-resistant gloves. When handling the concentrate, a chemical-resistant apron is required. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination. After application, if the temperature rises over 85 degrees, vapors from this product may injure susceptible plants growing nearby, including vegetables and ornamentals. Avoid applications in the vicinity of susceptible plants. Use the directions for "ornamental and recreational turf grasses, lawns, golf courses and cemeteries" rather than the directions for "Roadsides, medians, highway, railroad, utility, and pipeline rights of way, etc."
<i>Payload Herbicide</i>	59639-120	flumioxazin	Remember, "non-crop areas" do not include ornamental or turf sites. On school grounds, the only eligible locations would be fence rows, bare ground parking areas, and rights-of-way. This product causes moderate eye irritation, and it can be harmful if inhaled or absorbed through skin. This product is toxic to aquatic organisms and plants.
<i>Broadstar Herbicide</i>	59639-128	flumioxazin	Avoid breathing dust and spray mist. This product is harmful if absorbed through the skin. Applicators and other handlers must wear chemical-resistant gloves. This product is toxic to aquatic invertebrates. Take care not to allow runoff toward desirable plants. This product is most effective as a pre-emergent herbicide. Do not apply in enclosed, greenhouse structures.
<i>Envoy Plus Herbicide</i>	59639-132	clethodim	Avoid contact with eyes, skin or clothing. This product causes moderate eye irritation. It also contains potential allergens. Applicators and other handlers must wear chemical-resistant gloves and protective eyewear. Small amounts of this product may damage grass crops such as corn, rice, small grains, sorghum, or turf. Do not allow spray drift.
<i>Select Max Herbicide with Inside Technology</i>			
<i>Select Max Herbicide</i>			

<i>Gallery 75 Dry Flowable Herbicide</i>	62719-145	isoxaben	This product causes eye irritation, and it can be harmful if inhaled. When used in agriculture, this product requires a re-entry interval of 12 hours. Consider applying that same standard in your school setting. There is 'suggestive evidence' of carcinogenicity for the active ingredient, isoxaben. It meets the lawful criteria (not a 'likely' human carcinogen), but it's close. Take steps to minimize potential exposure.
<i>Snapshot 2.5 TG, Snapshot DG</i>	62719-175	trifluralin, isoxaben	Avoid contact with skin, eyes, or clothing. Avoid breathing spray mist. This product causes moderate eye irritation and is harmful if inhaled. It also contains potential allergens. Users should change clothes immediately after handling this product.
<i>Crossbow</i>			Removed from the Low-Impact list. There was confusion about the term "non-crop areas," which do not include ornamental and turf sites. Crossbow is not registered to be used in school-type settings. (EPA Registration numbers beginning with 62719-260)
<i>Rodeo</i>	62719-324	glyphosate, isopropylamine salt	Avoid breathing spray mist. This product is harmful if inhaled. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.
<i>Accord Concentrate Aquapro Herbicide</i>	62719-324-67690		
<i>Dimension Ultra 40 WP</i>	62719-445	dithiopyr	Avoid contact with skin, eyes or clothing. Avoid breathing dust. This product is harmful if absorbed through skin, and it causes eye irritation. All handlers must wear chemical resistant gloves. Do not contaminate water with equipment rinsate or run-off. This product is formulated in water-soluble packaging. Do not open the outer package until you're ready to put the water-soluble package in water.
<i>Milestone</i>	62719-519	aminopyralid, triisopropylamine salt	This product is registered for use in 'recreational areas.' Be careful to follow label directions. In agricultural settings, this product requires a restricted-entry interval of 48 hours. Consider applying that same standard in your school setting. This product causes moderate eye irritation. Avoid contact with eyes or clothing. This product has the potential to contaminate groundwater, especially where soil is permeable and the water table is shallow. Treated grass clippings should not be added to compost.

<i>Defendor</i>	62719-560	florasulam	Harmful if absorbed through skin; avoid contact with skin, eyes, or clothing. This chemical has properties and characteristics associated with chemicals detected in groundwater. Be careful where soils are permeable (more sandy), particularly where the water table is shallow.
<i>Gallery SC Specialty Herbicide</i>	62719-658	isoxaben	This product causes eye irritation, and it can be harmful if inhaled. When used in agriculture, this product requires a re-entry interval of 12 hours. Consider applying that same standard in your school setting. There is 'suggestive evidence' of carcinogenicity for the active ingredient, isoxaben. It meets the lawful criteria (not a 'likely' human carcinogen), but it's close. Take steps to minimize potential exposure.
<i>Glyphogan Plus Herbicide Quali-Pro Glyphosate Plus</i>	66222-176	glyphosate, isopropylamine salt	Avoid contact with eyes, skin or clothing. This product causes moderate eye irritation. Do not mix, store, or apply this product in galvanized steel or unlined steel (except stainless steel) containers.
<i>Fiesta Turf Weed Killer</i>	67702-26-87865	iron HEDTA	Avoid contact with eyes. Prolonged or frequent contact may cause allergic reactions. To avoid staining of shoes or clothing, wait until treated areas dry before re-entering. Rinse any desirable structures if they are accidentally contacted.
<i>Bayer Advanced Natria Grass & Weed Killer RTU/Organic Gardening</i>	67702-7-72155	ammonium salts of fatty acids	Avoid contact with eyes or clothing. This product causes moderate eye irritation. Avoid breathing vapor. This product is not for use on roofs.
<i>Dimension 270-G Turf & Landscape Ornamental</i>	7001-375	dithiopyr	Avoid contact with eyes or clothing. When used in agriculture, this product requires a re-entry interval of 12 hours. Consider applying that same standard to your school setting. This product is toxic to fish and other aquatic organisms. Do not use clippings from treated turf for mulching around vegetables or fruit trees. Do not allow domestic animals to feed or forage on treated turf or clippings.
<i>Poa Constrictor</i>	70506-107	ethofumesate	All handlers must wear chemical-resistant gloves. Prolonged or repeated skin exposure may cause allergic reactions. When used in agricultural settings, there is a re-entry interval of 12 hours. Consider applying that same standard to your school setting. This product is toxic to fish; do not contaminate water bodies.

<i>SureGuard SC Herbicide</i>	71368-114	flumioxazin	This product is harmful if inhaled or absorbed through the skin. It causes moderate eye irritation. Avoid breathing spray mist. Avoid contact with skin, eyes, or clothing. All handlers must wear chemical-resistant gloves. This product is toxic to aquatic life and non-target plants. Do not allow the product to come in contact with any oxidizing agent, or a hazardous reaction may occur. In agricultural settings, this product requires a re-entry interval of 12 hours. Consider applying that same standard to your school setting.
<i>Image Herbicide Year-Long Vegetation Killer Image Herbicide from Lilly Miller Casoron Granules</i>	802-536-73342	dichlobenil	Harmful if absorbed through skin or inhaled. Avoid breathing dust. Do not allow people or pets to enter the treated area until granules are thoroughly watered in and the treated soil has dried. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination.
<i>Lilly-Miller Moss Out! plus Fertilizer</i>	802-543	ferrous (iron) sulfate monohydr	Harmful if swallowed, inhaled, or absorbed through skin. Avoid breathing dust. This product also causes eye irritation. Iron stains wood, pavement, driveways and clothing. Use this product only on lawns, and sweep any escaped granules back into the lawn.
<i>Sedgehammer Turf Herbicide</i>	81880-1-10163	halosulfuron-methyl	Avoid contact with eyes or clothing. This product causes moderate eye irritation. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination.
<i>Sedgehammer & Turf Herbicide</i>	81880-24-10163	halosulfuron-methyl	Avoid contact with eyes or clothing. This product causes moderate eye irritation. Application to sandy soils, particularly where the water table is shallow, could result in groundwater contamination.
<i>Moss Melt Concentrate</i>	82052-1-91094	d-Limonene	This product is combustible. All handlers must wear eye protection. This product is harmful if absorbed through skin. In agricultural settings, people are not allowed to re-enter treated areas for four hours. Consider applying that same standard in your school setting.
<i>Avenger AG Burndown Herbicide</i>	82052-4	d-Limonene	Avoid contact with skin, eyes, or clothing. This product is harmful if absorbed through skin, and it causes eye irritation. All handlers must wear chemical resistant gloves and protective eyewear. Do not use or store this product near heat or open flame. When using the product, spray weeds until thoroughly wet.
<i>Worry Free Moss & Algae Control</i>	82052-6-33116	d-Limonene (citrus)	Avoid contact with skin, eyes, or clothing. This product causes moderate eye irritation. This product is labeled for use on roofs, walkways, driveways, and fences.

<p><i>EZ-Ject Diamondback Herbicide Shells</i></p>	<p>83220-1</p>	<p>glyphosate</p>	<p>Remember, “non-crop areas” do not include ornamental or turf sites. On school grounds, the only eligible locations would be fence rows and rights-of-way. Avoid contact with eyes or clothing. This product comes in water-soluble shells for trunk/stem injection. It's a closed system with low exposure potential. It may be applied to trees/brush that are standing in water, but not below the water level.</p>
<p><i>Dicamba Max 4</i></p>	<p>83222-14</p>	<p>dicamba, dimethylamine salt</p>	<p>This product causes substantial eye injury. Do not get in eyes, on skin, or on clothing. Avoid breathing spray mist. All handlers must wear goggles or face shield and chemical resistant gloves. In agricultural settings, this product requires a re-entry interval of 24 hours. Consider applying that same standard in your school setting. Avoid mowing for 7 days after the application. This chemical is known to leach through the soil into groundwater, particularly where soils are permeable and the water table is shallow. Nearby plants may be damaged, including trees, beans, cotton, flowers, grapes, and other crop plants. Follow the label carefully.</p>
<p><i>The Andersons Professional Turf Products Dimension 0.25g With Agpro</i></p>	<p>9198-213</p>	<p>dithiopyr</p>	<p>Avoid contact with eyes or clothing. Avoid breathing dust. This product contains potential allergens. It may also damage some species of turf grass.</p>

Insecticides

Product Name	EPA Reg. No.	Active Ingredient(s)	Read the label, use products only for labeled uses, and be aware of the following:
<i>EcoEXEMPT G Granular Insecticide from Envincio/Prentiss LLC</i>	None - 25(b)	eugenol (clove oil), thyme oil (other: wintergreen oil, corn cob)	Avoid contact with eyes.
<i>Essentria IC-3 Insecticide Concentrate from Envincio/Prentiss LLC</i>	None - 25(b)	rosemary oil, geraniol, peppermint oil (Other: oil of wintergreen, white mineral oil, vanillin, polyglyceryl oleate)	May cause eye and skin irritation. Avoid contact with eyes, skin and clothing. Protective eyewear and chemical resistant gloves are recommended. Do not use or store this product near heat or open flame. When diluting with water, prepare only the amount needed for immediate use, and maintain agitation during use. Do not store spray solution overnight. When used in confined spaces, prolonged exposure to the fragrance may be objectionable to some individuals.
<i>EcoExempt D</i>	None - 25(b)	2-phenethyl propionate, eugenol (clove oil) (other: calcium silicate, sodium bicarbonate, calcium carbonate, soybean oil, wintergreen oil)	Avoid contact with eyes.
<i>NatureLine NGB Professional Grade Insecticidal Concentrate</i>	None - 25(b)	sodium chloride (salt)	This product may be toxic to fish, and it is toxic to all plants. Do not store near heat or open flame. According to the label, this product is only available to licensed pest control operators.
<i>NatureLine Plus Professional Grade Botanical Insecticide</i>	None - 25(b)	clove oil, lemongrass oil, rosemary oil, cinnamon oil	This product may cause irritation of the eyes, skin, and respiratory tract. Avoid contact and inhalation of mist. Chemical-resistant gloves and a respirator are recommended when handling this product. According to the label, this product is only available to licensed pest control operators.

<i>NatureLine PRO Power Residual Oil</i>	None - 25(b)	clove oil, lemongrass oil, rosemary oil, cinnamon oil	This product may cause irritation of the eyes, skin, and respiratory tract. Avoid contact and inhalation of mist. Chemical-resistant gloves and a respirator are recommended when handling this product. According to the label, this product is only available to licensed pest control operators. Do not store near heat or open flame.
<i>WHY Spray for Wasp, Hornet, & Yellow jacket Nests from Rescue</i>	None - 25(b)	lemmongrass oil, clove oil (eugenol), rosemary oil, geranium oil	Avoid contact with eyes and skin. Contents under pressure. Do not use or store near heat or open flame. When spraying nests, spray the opening first, and stand a safe distance from the nest.
<i>Demand CS Patrol</i>	100-1066	lambda-cyhalothrin	This product may be harmful if absorbed through skin. It may also contain potential allergens. Avoid contact with skin, eyes, or clothing. Avoid breathing spray mist of vapor. Do not use this product in or on electrical equipment due to the possibility of shock hazard. Take extreme care to ensure the product is not introduced into the air. Avoid contamination of food and food processing surfaces. Spot treatments should not exceed 20% of the treated area. Individual spot treatments should not exceed 2 square feet.
<i>Speckoz Border Insecticide</i>	100-1066-72113		
<i>Grenade ER Insecticide</i>	100-1066-773		
<i>Demand G Insecticide</i>	100-1240	lambda-cyhalothrin	This product causes moderate eye irritation. Avoid contact with eyes, or clothing.
<i>Optigard Ant Gel Bait</i>	100-1260	thiamethoxam	Do not treat food preparation surfaces. In food handling areas, only crack and crevice treatments are allowed.

<i>Optiguard Flex</i>	100-1306	thiamethoxam	This product is not sufficient alone to control subterranean termites. It is harmful if inhaled or absorbed through skin. Do not breathe vapor or spray mist. Chemical-resistant gloves are required for applicators, at least 14 mils thick. This product is highly toxic to bees exposed to residues on blooming plants or weeds. It is also toxic to wildlife and aquatic life. Do not contaminate water when cleaning equipment or disposing of equipment was water. Do not use, pour, spill or store near heat or open flame.
<i>Acelepryn</i>	100-1489	chlorantraniliprole	This product is toxic to aquatic organisms, and it's prone to runoff. It can be helpful to maintain a level vegetative buffer strip between application areas and water bodies. In agricultural settings, the product label requires a re-entry interval of 4 hours. Consider applying that same standard in your school setting.
<i>Acelepryn G</i>	100-1500	chlorantraniliprole	This product is toxic to aquatic organisms, and it's prone to runoff. It can be helpful to maintain a level vegetative buffer strip between application areas and water bodies. In agricultural settings, the product label requires a re-entry interval of 4 hours. Consider applying that same standard in your school setting.
<i>Share Corp Wasp & Hornet Killer</i>	10088-91-11547	tetramethrin, permethrin, piperonyl butoxide	This product causes moderate eye irritation. Contents under pressure. This product is toxic to fish and other aquatic life. Stay a safe distance away from nests when spraying, and do not contaminate food or food-handling equipment. Avoid spraying plants.
<i>Anvil 10+10 ULV</i>	1021-1688-8329	phenothrin, piperonyl butoxide	This product is harmful if absorbed through skin. Avoid contact with skin, eyes and clothing. All handlers must wear chemical-resistant gloves except applicators using motorized ground equipment and pilots. Pilots must use an enclosed cockpit that meets requirements under the Worker Protection Standard (40 CFR 170.240(d)(6)). This product is toxic to aquatic organisms. Do not apply over bodies of water, except when weather conditions will facilitate movement of applied material away from the water. This product is also highly toxic to bees.

<i>Onslaught FastCap Spider & Scorpion Insecticide</i>	1021-2574	esfenvalerate, prallethrin, piperonyl butoxide	This product causes moderate eye irritation. Wear protective eyewear. Do not use this product in or on electrical equipment due to the possibility of shock hazard. This product is toxic to fish and other aquatic life. Do not discharge this product or equipment rinsate into water bodies without a permit (NPDES). If swallowed, do not induce vomiting. Do not repeat applications within 14 days of one another.
<i>Terro Ant Killer II Liquid Ant Baits/Killer</i> <i>Terro Outdoor Liquid Ant Bait Stakes</i> <i>Terro Outdoor Liquid Ant Baits Pre-Filled RTU</i> <i>Terro-PCO Liquid Ant Bait</i>	149-8 149-8-64405	sodium tetraborate	Do not use in food handling areas.
<i>Grant's Kills Ants Ant Control</i> <i>Amdro Kills Ants Ant Killing Bait</i>	1663-33 1663-33-73342	hydramethylnon	Keep out of reach of children, even after application.
<i>Down and Out</i> <i>Sting-X</i>	1769-370 1769-370-66114	tetramethrin, permethrin, piperonyl butoxide	This product causes moderate eye irritation. Contents under pressure. This product is toxic to fish and other aquatic life. Stay a safe distance away from nests when spraying, and do not contaminate food or food-handling equipment. Avoid spraying plants. Product is flammable, and extremely toxic to fish. Prolonged or frequent exposure could cause allergic reactions. Stay a safe distance away from nests when spraying, and do not contaminate food or food-handling equipment. Avoid spraying plants.
<i>Azatrol EC Insecticide</i>	2217-836	azadirachtin	Avoid breathing vapor. Harmful if absorbed through skin, inhaled, and by eye contact. Applicators and handlers must wear waterproof gloves. Some individuals may be, or become allergic to this product.

<p><i>Phantom Termiticide- Insecticide</i></p>	<p>241-392</p>	<p>chlorfenapyr</p>	<p>Harmful if swallowed, inhaled or absorbed through skin. This product causes moderate eye irritation. DO NOT get in eyes, on skin, or on clothing. All handlers must wear chemical resistant gloves. For termite uses, eye protection and a mask may be needed; see the label for specific instructions. Do not apply this product around electrical equipment due to the possibility of shock hazard. Do not apply into heating and air conditioning vents. Do not treat classrooms while in use. Do not contaminate food, utensils, or handling surfaces.</p>
<p><i>Talstar Professional Insecticide</i></p> <p><i>Ortho Max Pro Lesco CrossCheck Plus Multi- Insecticide</i></p>	<p>279-3206</p> <p>279-3206-10404</p>	<p>bifenthrin</p>	<p>Harmful if swallowed, inhaled or absorbed through the skin. Avoid contact with skin, eyes or clothing. Avoid breathing spray mist. All handlers must wear chemical resistant gloves when mixing/loading, and perhaps, waterproof gloves when applying. See the label. When working in a non-ventilated space, a respirator and protective eyewear are required. Do not apply to any electrical equipment because of possible shock hazard. Do not allow spray to contact food, utensils, or handling surfaces.</p>
<p><i>CB-80</i></p>	<p>279-3393</p>	<p>pyrethrins, piperonyl butoxide</p>	<p>This product causes moderate eye irritation, and it's harmful if absorbed through skin. It's also harmful if inhaled; take care to avoid breathing in dust or mist. This product is also toxic to bees and aquatic life. If a high-pressure wand or hand-held fogger is used in an enclosed area, the applicator must wear a half-face, full-face, or hood-style respirator with organic vapor cartridge and a particulate filter (N, R, P or HE). The contents of this product are under pressure, and they are flammable. In order to follow the label, you will need to calculate the number of cubic feet in each space you plan to treat.</p>

<i>Advion Cockroach Gel Bait</i>	352-652	indoxacarb	Avoid contact with skin, eyes, or clothing. This product contains potential allergens. Do not use this product in or on electrical equipment where a possibility of shock hazard exists. In food handling areas, this product may only be applied as a crack and crevice treatment where you can be sure that food, utensils, and food handling surfaces won't become contaminated.
<i>Advion Ant Gel</i>	352-746, also found as 100-1498	indoxacarb	Avoid contact with skin, eyes, or clothing. Do not use this product in or on electrical equipment where a possibility of shock hazard exists. In food handling areas, this product may only be applied as a crack and crevice treatment where you can be sure that food, utensils, and food handling surfaces won't become contaminated.
<i>Arilon Insecticide</i>	352-776	indoxacarb	This product causes moderate eye irritation, and it's harmful if absorbed through skin. Waterproof gloves are required for handlers. It's also harmful if inhaled; take care to avoid breathing in dust or mist. This product is also toxic to aquatic life. When making applications in food-handling areas (including receiving areas), apply only to cracks and crevices using equipment designed to deliver a pin stream. Do not apply to areas that are routinely washed such as cracks and crevices on table tops.
<i>Safer Brand Wasp and Hornet Killer</i> <i>Safer Brand Flying Insect Killer</i>	36488-47	d-limonene, pyrethrins, potassium salts of fatty acids	Avoid contact with skin or clothing. Contents under pressure. Do not use near heat or open flame. Do not apply this product to conduits, motor housings, junction and switch boxes, electrical equipment, or any surface that may be damaged by water. When used indoors, leave the room after spraying and ventilate upon return.
<i>Maxforce Professional Insect Control Roach Killer Bait Gel</i>	432-1254	hydramethylnon	Harmful if swallowed or absorbed through skin. This product causes moderate eye irritation. Avoid contact with eyes, skin or clothing. Do not apply bait to areas where food, utensils, or handling surfaces may become contaminated.

<p><i>Maxforce FC Professional Insect Control Roach Killer Bait Gel</i></p> <p><i>Maxforce FC Select Professional Insect Control Roach Killer Bait Gel</i></p>	432-1259	fipronil	<p>Harmful if absorbed through skin. This product causes moderate eye irritation. Avoid contact with skin, eyes, and clothing. Do not use this product in or on electrical equipment where a possibility of shock hazard exists. In food handling areas, only crack and crevice treatments are allowed. Do not treat food preparation surfaces.</p>
<p><i>Maxforce FC Ant Killer Bait Gel</i></p> <p><i>Maxforce FC Professional Insect Control Ant Killer Bait Gel</i></p>	432-1264	fipronil	<p>May be harmful if swallowed. Avoid contact with skin and clothing. Keep exposed gel away from open foods and food contact surfaces. Do not use this product in or on electrical equipment where a possibility of shock hazard exists.</p>
<p><i>Merit 75 WSP Insecticide</i></p>	432-1318	imidacloprid	<p>Water-soluble packets provide a nearly closed system. This product is highly toxic to bees, and it not allowed for use on linden trees, basswood trees, or any Tilia species. Avoid breathing dust or vapor, and avoid contact with skin, eyes, or clothing. This product is harmful if absorbed through skin. Applicators and handlers must generally wear gloves. This product is highly toxic to bees and aquatic invertebrates. Groundwater may be contaminated if applications are made where the soil is permeable, particularly where the water table is shallow.</p>
<p><i>Tempo SC Ultra Insecticide</i></p>	432-1363	beta-cyfluthrin	<p>Avoid contact with eyes or clothing. Harmful in inhaled or absorbed through skin. This product causes moderate eye irritation. It is also extremely toxic to fish and highly toxic to bees. The label has very specific instructions about how to keep this pesticide out of water bodies. If you have to spray overhead, wear safety glasses, goggles, or face shield with a dust/mist respirator. Cover exposed food and/or food handling equipment or remove them from the area being treated. Do not apply to food handling surfaces. Allowed for use on buses.</p>

<i>Tempo 1% Dust Insecticide Ready to use</i>	432-1373	cyfluthrin	This product causes moderate eye irritation, and it can be harmful if inhaled or absorbed through skin. This product is toxic to fish. In food- handling establishments, this product is permitted in non-food- handling areas only, and it can only be used as a void or crack/crevice treatment. It is not allowed in the food-handling areas.
<i>Temprid SC Insecticide</i>	432-1483	imidacloprid, beta-cyfluthrin	Harmful if swallowed or absorbed through skin. This product causes moderate eye irritation. Avoid contact with skin, eyes or clothing. Gloves are required. Do not apply to furniture or upholstery where prolonged contact with humans will occur. Do not apply in food handling areas. Do not apply more than 5 gallons of diluted product indoors per applicator per day. When treating overhead areas, wear safety glasses, goggles, or face shield and a dust/mist respirator.
<i>Delta Dust Insecticide</i>	432-772	deltamethrin	May be harmful if absorbed through skin. Avoid contact with skin, eyes, or clothing. In living areas, make applications in such a manner as to avoid depositions on exposed surfaces or introducing the material into the air. Do not allow food, utensils, or processing surfaces to become contaminated.
<i>Drione Insecticide</i>	432-992	pyrethrins, piperonyl butoxide, silica gel	This product causes moderate eye irritation, and it can be harmful if absorbed through skin. Avoid contact with skin, eyes, or clothing. All handlers must wear chemical-resistant gloves. Do not allow anyone to enter treated areas until dusts have settled.
<i>Raid Wasp & Hornet Killer 33</i>	4822-553	cypermethrin, prallethrin	Harmful if absorbed through skin. Avoid contact with skin, eyes, or clothing. Keep the product away from fire, sparks and heated surfaces. Do not expose the container to temperatures above 130° F. The best time of day to treat the nests of flying insects is in the evening or early morning. Wait at least 24 hours before removing the nest. Do not contaminate food or utensils.

Monterey Horticultural Oil	48813-1-54705	Mineral Oil	Avoid contact with eyes, skin, or clothing. Prolonged or repeated contact with skin may cause allergic reactions. All handlers must wear chemical resistant gloves. Harmful if absorbed through skin. Do not apply during drought. In school settings, this product is only allowed for ornamental plants, including interior courtyards and greenhouse plants.
PT 545 Plus XLO Pressurized Contact Insecticide, Prescription Treatment 565 Plus XLO Formula 2	499-290	pyrethrins, piperonyl butoxide, n-octyl bicycloheptene dicarboximide	For prolonged exposure to spray mist, avoid unpleasant drying of the nose and throat by wearing a respirator with an organic vapor cartridge. See the label for more details. This product may be used on bedding, upholstered furniture, and carpeting.
Prescription Treatment Wasp Freeze Wasp & Hornet Killer	499-362	d-trans allethrin, d-phenothrin	Harmful if swallowed, inhaled, or if absorbed through the skin. Avoid breathing vapors or spray mist. Avoid contact with skin, eyes, or clothing. This product is flammable, and its contents are under pressure. Keep away from heat, sparks and open flame. May cause staining of asphalt and shingles. For outdoor use only. The best time of day to treat nests is in the evening or early morning. Stand 6-15 feet away from elevated targets, not directly underneath.
MotherEarth D Pest Control Dust	499-509	diatomaceous earth (amorphous silica)	This product causes moderate eye irritation. Avoid contact with eyes or clothing. Use adequate ventilation and avoid breathing dust. For prolonged exposure to dust, use a suitable dust mask approved by NIOSH. In living areas, make applications in such a manner as to avoid deposits on exposed surfaces or introducing the material into the air. In food handling areas, only crack, crevice, and spot treatments are allowed.

<i>ULD BP-100 Contact Insecticide II</i>	499-514	pyrethrins, piperonyl butoxide	This product is harmful if absorbed through skin, and it causes moderate eye irritation. Avoid contact with skin, eyes or clothing. Applicators must wear chemical-resistant gloves. Some individuals may be, or may become allergic to this material. This product is highly toxic to aquatic life; do not allow it to run off into storm drains, ditches, or surface water. This product is highly toxic to bees; do not apply near blooming plants. Do not use or store this product near open flame or electrical equipment.
<i>MotherEarth Granular Scatter Bait</i>	499-515	boric acid	Harmful if absorbed through skin. This product causes moderate eye irritation. Avoid contact with skin, eyes, and clothing. Applicators and handlers must wear chemical-resistant or waterproof gloves. Avoid contamination of food.
<i>Alpine D Dust Insecticide, Prescription Treatment Brand Alpine Dust</i>	499-527	dinotefuran, diatomaceous earth	This product causes moderate eye irritation. Applications in food handling areas are limited to crack & crevice, void or spot treatment only. Do not apply to bedding of any kind.
<i>PT Wasp-Freeze II</i>	499-550	prallethrin	This product causes moderate eye irritation. If swallowed, do not induce vomiting. Do not apply this product or allow it to drift on blooming plants in order to protect bees. This product is toxic to fish, as well. This product is not for our door use, except attics and crawl spaces. Do not stand directly underneath treatment areas.
<i>Cyzmic CS</i>	53883-261	lambda-cyhalothrin	This product is harmful if absorbed through skin. Avoid contact with skin, eyes, or clothing. It is also extremely toxic to aquatic life. Take care to avoid household pets, particularly fish and reptile pets. This product is also highly toxic to bees, even when they visit blooming plants with residues of this product. Do not use this product in or on electrical equipment.

<i>Taurus SC</i>	53883-279	fipronil	This product cannot be used indoors except as directed, mostly in wall voids and crawlspaces. It is harmful if inhaled or absorbed through skin. Do not breathe spray mist. Applicators must wear waterproof gloves at least 14 mils thick. When working in a crawlspace or other non-ventilated area, a respirator and protective eyewear are required. This product is toxic to birds and fish. Care must be taken to avoid runoff. The applicator is required to check for any signs of leaks into the occupied areas of the structure and clean up those leaks before allowing anyone to enter.
<i>Orange Guard</i>	61887-1	d-limonene	Avoid contact with eyes or clothing. This product causes moderate eye irritation. When using the product indoors, wait three minutes after spraying before wiping off any excess fluid.
<i>Mosquito Dunks Biological Mosquito Control Summit B.t.i. Briquets Floating Sustained-Release Larvicide</i>	6218-47	<i>Bacillus thuringiensis</i> subspecies <i>israelensis</i>	Avoid breathing dust. This product causes moderate eye irritation. Avoid contact with eyes or clothing.
<i>Conserve SC Turf & Ornamental</i>	62719-291	spinosad	To control insect pests on ornamental plants growing outside, or in greenhouses. Do not apply to edible plants. This product is toxic to bees for three hours after treatment. It is also toxic to aquatic animals. Follow specific label instructions to protect bees and streams.
<i>Revenge Granular Ant Bait NiBan Granular Bait</i>	64405-2	boric acid	This product causes moderate eye irritation, and it can be harmful if absorbed through skin. Avoid contact with skin, eyes, or clothing. Do not contaminate this product with other pesticides. Do not contaminate food.
<i>Terro Multi-Purpose Insect Bait</i>	64405-2-149		
<i>Garden Safe Brand Ant & Roach Killer</i>	64405-2-39609		

<i>EcoPCO WP-X Wettable Powder Insecticide</i>	67425-25-655	pyrethrins, 2-phenylethyl propionate, oil of thyme	Harmful if swallowed or inhaled. This product causes moderate eye irritation. Avoid breathing dust. Avoid contact with skin, eyes, or clothing. Carefully open the container by holding it near its base, avoid squeezing the container as this may cause contents to puff out. In food handling areas, only crack, crevice, and spot treatments are allowed. Exposed food should be covered or removed.
<i>Boractin Insecticide Powder</i>	73079-4	boric acid	This product causes moderate eye irritation. Avoid contact with eyes or clothing. Avoid breathing dust. In food handling areas, only crack & crevice treatments are allowed.
<i>InTice Liquid Ant Bait</i>	73079-7	sodium tetraborate decahydrate	Harmful if swallowed or absorbed through the skin. In food handling areas, only crack and crevice treatments are allowed. Any product remaining outside of cracks and crevices must be cleaned up and removed.
<i>InTice Gelamino Ant Bait</i>	73079-8	sodium tetraborate decahydrate	Harmful if swallowed. In food handling areas, only crack and crevice treatments are allowed. Any product remaining outside of cracks and crevices must be cleaned up and removed.
<i>Gourmet Liquid Ant Bait</i>	73766-2	disodium, octaborate	Applicators and other handlers must wear chemical resistant or waterproof gloves. Keep out of reach of children. Do not contaminate food.
<i>Revenge Pre-Filled Liquid Ant Baits</i>	73766-2-4	tetrahydrate, (basically boric acid)	
<i>Combat Liquid Ant Bait</i>	73766-2-64240		
<i>Bee Bopper II</i> <i>ARI Wasp and Hornet Killer</i>	7754-44	tetramethrin, d-phenothrin	Harmful if swallowed, absorbed through the skin, or inhaled. Causes moderate eye irritation. Avoid contact with skin, eyes, or clothing. Avoid breathing vapor or spray mist. Do not use in commercial areas where food is handled, stored, or served. The contents of this product are under pressure. Do not store near heat, sparks or open flame. Contains petroleum distillates.

<i>Termidor SC</i>	7969-210	fipronil	Harmful if swallowed, absorbed through skin or inhaled. Do not get in eyes, on skin or on clothing. Do not breathe spray mist. All handlers must wear chemical-resistant gloves. When working in an unventilated space, protective eyewear and a respirator are required. Do not apply indoors except for wall voids.
<i>TriStar 8.5 SL Insecticide</i>	8033-106-1001	acetamiprid	This product is harmful if absorbed through the skin or inhaled. Avoid contact with eyes, skin and clothing, and avoid breathing vapors or spray mist. All handlers must wear chemical-resistant gloves. This product is highly toxic to bees. Do not apply this product when bees are visiting the area. In agricultural settings, the label requires a restricted entry interval (REI) of 12 hours. Consider applying that same standard in your school setting. Linden and Basswood trees are highly attractive to bees, and they have some inherent toxicity to bees. Consider choosing a non-neonicotinoid insecticide for trees in this family (<i>Tilia</i> species).
<i>AzaSol</i>	81899-4-74578	azadirachtin	This product is harmful if absorbed through skin. Avoid contact with skin, eyes, or clothing. It is also toxic to fish and aquatic life. In agricultural settings, a re-entry interval of four hours is required. Consider applying that same standard in your school setting. This product may be applied (as labeled) to any food crop, including the day of harvest.
<i>Rescue! WHY Attractant</i>	84565-3-49407	heptyl butyrate, acetic acid, 2-methyl-1-butanol	This product causes moderate eye irritation. Do not allow contact with your clothing because wasps, hornets, and/or yellow jackets may become attracted to you. Outdoor use only.
<i>Rescue Yellowjacket Attractant Cartridge</i>	84565-5-49407	heptyl butyrate	This product causes moderate eye irritation. Do not allow contact with your clothing because wasps, hornets, and/or yellow jackets may become attracted to you. Outdoor use only.
<i>Andersons Professional Turf Products 8% Granular Insecticide with Carbaryl</i>	9198-146	carbaryl	This product is harmful if swallowed, inhaled, or absorbed through skin. Avoid contact with skin, eyes or clothing. This product is extremely toxic to aquatic life; do not apply near water bodies.

<i>22-0-7 Fertilizer with Acelepryn Insecticide</i>	9198-247	chlorantraniliprole	This product causes moderate eye irritation. Avoid contact with eyes or clothing. This product is toxic to some aquatic life; do not contaminate water. In agricultural settings, there is a required re-entry interval of 4 hours. Consider applying the same standard in your school setting.
<i>Spectracide Wasp & Hornet Killer 4</i>	9688-141-8845	permethrin, tetramethrin, piperonyl butoxide	This product causes moderate eye irritation. Avoid contact with eyes or clothing. This product is also extremely toxic to aquatic life and bees. Do not contaminate water or blooming plants. Keep away from heat and flame(s). Never use indoors. Never allow the product to reach a drain, during or after application.
<i>Spectracide Wasp and Hornet Killer 3</i>	9688-190-8845	prallethrin, lambda-cyhalothrin	Never use indoors. Do not apply near sewers, drains, or gutters where drainage might reach water bodies. Do not use in or on electrical equipment. Stand a safe distance from the nest, never underneath. Storage temperatures above 130° F may cause bursting.

Fungicides

Product Name	EPA Reg. No.	Active Ingredient(s)	Read the label, use products only for labeled uses, and be aware of the following:
<i>Headway (not Highway)</i>	100-1216	azoxystrobin, propiconazole	This product causes moderate eye irritation. All handlers must wear chemical-resistant gloves. In agricultural settings, the label requires a restricted entry interval (REI) of 24 hours. Consider applying that same standard in your school setting. Do not allow any of this product to come in contact with apple trees. It is toxic to fish and other aquatic life, and highly water-soluble. Groundwater could be contaminated if this product is applied where soils are permeable and the water table is shallow.
<i>Monterey Horticultural Oil</i>	48813-1-54705	mineral oil	Avoid contact with eyes, skin, or clothing. Prolonged or repeated contact with skin may cause allergic reactions. All handlers must wear chemical resistant gloves. Harmful if absorbed through skin. Do not apply during drought. In school settings, this product is only allowed for ornamental plants, including interior courtyards and greenhouse plants.

Molluscicides

Product Name	EPA Reg. No.	Active Ingredient(s)	Read the label, use products only for labeled uses, and be aware of the following:
<i>Sluggo</i>	67702-3-54705	iron phosphate	This product causes moderate eye irritation. Avoid contact with eyes or clothing. Keep out of children's reach, before and after the application. Sweep any granules off driveways and sidewalks, back into treatment areas to avoid excess runoff.

Rodenticides

Product Name	EPA Reg. No.	Active Ingredient(s)	Read the label, use products only for labeled uses, and be aware of the following:
<i>Amdro Mole & Gopher Bait</i>	12455-30-73342	zinc phosphide	This product is harmful if inhaled, and it causes moderate eye irritation. All handlers must wear gloves, including handlers of retrieved carcasses or unused bait. This product is extremely toxic to fish and birds. It may only be applied underground, according to very specific label directions.
<i>Fastrac All-Weather Blox</i>	12455-95	bromethalin	Any person who handles bait or retrieves carcasses must use gloves. This product is harmful if swallowed, and it's extremely toxic to mammals, birds, and fish. Tamper-resistant bait stations are required for certain locations; read the label. Protect bait from rain or snow.
<i>Rampage All-Weather Bait Chunx</i>	12455-95-3240		
<i>Tomcat Rat Killer II</i>	12455-140	bromethalin	Any person who handles bait or retrieves carcasses must use gloves. This product is harmful if swallowed, and it's extremely toxic to mammals, birds, and fish. Tamper-resistant bait stations are required for certain locations; read the label.
<i>Generation Mini Blocks Hombre Mini Blocks</i>	7173-218	difethialone	This product poses a significant risk to wildlife and pets that may eat sickened rodents. Be sure to employ other options, such as trapping, before using this product. This product may only be used in and around (within 100 feet) of man-made structures to control Norway rats, roof rats, and house mice. For all outdoor uses, bait stations are mandatory. If applied indoors where children pets, non-target mammals, or birds could gain access, tamper-resistant bait stations are required. Harmful if swallowed or absorbed through skin. This product causes moderate eye irritation. People who handle the product and/or rodent carcasses must wear waterproof gloves.

<i>Kaput Mouse Blocks</i>	72500-7	warfarin	All handlers must wear gloves, including handlers of retrieved carcasses or unused bait. This product is extremely toxic to mammals and birds. It may only be applied in places inaccessible to children, pets, domestic pets, and non-target wildlife, Orin tamper-resistant bait stations. Bait stations are mandatory for outdoor, above-ground use.
<i>Brigand SB Soft Bait Rodenticide</i>	87235-1	bromadiolone	This product poses a significant risk to wildlife and pets that may eat sickened rodents. Be sure to employ other options, such as trapping, before using this product. This product may only be used in and around (within 100 feet) of man-made structures to control Norway rats, roof rats, and house mice. For all outdoor uses, bait stations are mandatory. If applied indoors where children pets, non-target mammals, or birds could gain access, tamper-resistant bait stations are required.

ⁱ Oregon Revised Statutes (ORS) 634.700 – 634.750

ⁱⁱ ORS 634.705, Section 5: A governing body shall adopt a list of low-impact pesticides for use with the integrated pest management plan. The governing body may include any product on the list except products that: (a) contain a pesticide product or active ingredient that has the signal words “warning” or “danger” on the label; (b) contain a pesticide product classified as a human carcinogen or probable human carcinogen under the United States Environmental Protection Agency 1986 Guidelines; or (c) contain a pesticide product classified as carcinogenic to humans or likely to be carcinogenic to humans under the United States Environmental Protection Agency 2003 Draft Final Guidelines for Carcinogen Risk Assessment [2009 c.501 §3]

ⁱⁱⁱ Pesticide products must be registered for sale and/or distribution in the state of Oregon each year. Current product registration can be verified using this search tool from the Oregon Department of Agriculture: http://oda.state.or.us/dbs/pest_productsL2K/search.lasso.

APPENDIX L-MANAGEMENT STRATEGIES FOR SELECTED PESTS OF CONCERN

This appendix describes selected pests of concern present on City property and highlighted by City staff. This section mainly includes pests identified as invasives, pests of human health concern, or structural pests.

Pests included in this appendix are organized alphabetically by common name and include the following:

- Armenian (Himalayan) Blackberry
- Bull Thistle
- Canada Thistle
- Crabgrass
- English Holly
- English Ivy
- Garlic Mustard
- Horsetail
- House Mouse
- Italian Arum
- Lesser Celandine
- Moss
- Old Man’s Beard (Clematis)
- Poison Hemlock
- Poison Oak
- Puncturevine
- Rats
- Scotch Broom
- Spurge Laurel
- Tansy Ragwort
- Termites
- White Clover
- Yellow Nutsedge
- Yellowjackets

If so designated, the State of Oregon noxious weed category is listed, per ODA’s 2017 update of its noxious weed policy and classification.¹ In addition, the classification under the Clackamas Soil and Water Conservation District Weedwise program is included.² Interpretation of classification systems used by ODA and by Weedwise are found in Section II of this IPM plan. If the species is native, that information is noted.

General prevention and containment management strategies to follow with invasives:

- Clean weed seeds and fragments from vehicles, equipment and clothing.
- Prevent existing weeds from going to seed
- Controlling weeds along fence lines and roadways; and
- Removing weed fragments from machinery and boats.
- Periodically survey for newly invading weeds
- When controlling, start in the least infested areas first and then move into the more heavily infested areas.
- Conduct regular repeat monitoring of all sites treated with manual or chemical treatment.
- Replant treated areas when the bulk of the invasive weeds have been removed. Repopulating the area with desired plants will help prevent re-establishment of the treated pest or establishment of new invasives in the treated area.

The Invasive Species BMP Calendar³ provides excellent information on timing and best management practices for controlling common invasive weeds.

¹Oregon Department of Agriculture. 2017. Noxious Weed Policy and Classification System 2017. <https://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/NoxiousWeedPolicyClassification.pdf>

²Clackamas SWCD. Weeds. <https://weedwise.conservationsdistrict.org/weeds>

³Invasive Species Best Management Practices Calendar. Developed by Shaw, S and Brunskill, R. 2007. King County Noxious Weed Control Program. Available in draft at <http://your.kingcounty.gov/dnrp/library/archive-documents/wlr/LANDS/Weeds/pdf/weed-maintenance-calendar.pdf>. Or see Appendix 5 of Clackamas County Integrated Pest Management Plan for the Surface Water Management Agency of Clackamas County, Clackamas County Service District No. 1, and the City of Happy Valley.

**Armenian
Blackberry**

(Himalayan)

Rubus armeniacus (*R. procerus*, *R. discolor*)

ODA Noxious Weed List – **B listed**

Clackamas SWCD Weedwise – **Maintenance**

Typical habitat

Wastelands, pastures, forests (especially edges), roadsides, creek gullies, river flats, riparian areas, fence lines, and right-of-way. Usually intolerant of shade.

Identification and Characteristics

Perennial vine, producing large thickets to eight feet tall. Five-sided canes grow to 20 feet per season. Compound, serrate leaflets in groups of five. Evergreen blackberry (also known as cut-leaf blackberry) has deeply incised leaflets. White flowers bloom in summer and have five petals. Fruit is desirable. Thorns are hard, sharp, and often hooked.

Look-alikes

A smaller low-growing native blackberry known as trailing blackberry (*Rubus ursinus*) has weak, slightly bluish canes with 3 leaflets instead of 5, and small, softer thorns.

Reproduction and Spread

Wide-ranging roots up to 30 feet. Suckers are occasionally formed on the roots and may emerge from a depth of 18 inches. HBB also readily propagate from root fragments and cane cuttings. Several authors have reported dispersal of HBB seeds by birds; seeds are viable in soil for several years. Daughter plants may develop where first year canes touch the ground.

Prevention

Minimize soil disturbance. Prevent vegetative reproduction from cuttings.

Dispersed seeds remain viable in the soil for several years. Plant fast-growing shrubs or trees or shade tolerant species in disturbed areas to reduce or prevent reestablishment.

Non-chemical Management Strategies

Repeated, consistent mowing close to the ground can eventually kill the vines. Mow at least four times per year March-November. For manual removal, dig rootball when soil is moist using shovels, or claw-mattocks. Remove as much root material as possible to decrease the amount of blackberry resprouts. Resprouts and small roots may be hand-pulled from moist soil. Throw rootballs on top of the pile of canes away on a tarp or thick layer of cardboard. Canes may also be chipped and composted. Any control strategy can be considered short-lived if it does not take into consideration soil seed stocks and potential future land disturbance.

Soll (2004) contains information on manual removal rates. According to King County, cutting followed by digging up root crowns is much more effective than cutting alone.

Goats are most cost-effective when used to clear or suppress brush regrowth of one to four years old rather than to do initial clearing of dense tall, mature stands of vegetation. Care must be taken to protect any native vegetation desired. Grazing also reduces production of daughter plants, however these species will eat other plants as well.

Prescribed burning can be used to remove canes, but will not eliminate resprouting. To obtain long-term control, burning should be followed by:

- herbicide treatment of resprouted canes, in the fall following burning
- subsequent burning or cutting to exhaust the soil seed bank and underground food reserves, and/or
- revegetation with fast growing or shade tolerant native species.

Chemical Management Strategies

The PNW Handbook recommends a number of different active ingredients for control, including aminocyclopyrachlor + metsulfuron methyl; glyphosate; metsulfuron; picloram; triclopyr; or triclopyr + 2,4-D.

According to Soll (2004) foliar treatment of resprouted canes in the fall following summer clearing has proven effective in some cases. Regrowth of HBB after slashing, burning, or grazing should be at least 18 inches high before herbicide application. The effectiveness of all foliar applied herbicides will be reduced significantly if the plants are badly moisture-stressed.

Uncut blackberry can be effectively treated in late summer or fall with broadcast application of a variety of herbicides including triclopyr (i.e. Garlon 3a and 4) and/or glyphosate (i.e. Round-up and similar products) or 2-4D combined with triclopyr (i.e. Crossbow). Although effective control can be achieved by this method, the extensive, standing, dry and hard canes then need to be removed to allow access for effective restoration.

Biocontrol Availability

None currently available in Oregon.

Sources for Further Information

4-County Cooperative Weed Management Area. Himalayan and evergreen blackberry.
https://4ccwma.files.wordpress.com/2018/02/ipm_18_blackberry-web.pdf

Soll, J. 2004. Controlling Himalayan blackberry in the Pacific Northwest. <https://www.invasive.org/gist/moredocs/rubarm01.pdf>

Bull Thistle*Cirsium vulgare*ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Prefers full sun. Common in disturbed areas such as pastures, roadsides, fencelines. Occurs in riparian areas and dry meadows.

Identification and Characteristics

Biennial, sometimes an annual or “monocarpic perennial”. Rosettes up to 3 feet in diameter form first year. Leaves 3-12 in, dark green very pubescent, still prickles at tips. Flowering stems reach 2-5 feet. Flowers pink to purple, June till first frost, 1.5-2 in wide, located at the branch ends. Flower head bases are covered in spine-tipped bracts.

Look-alikes:

Canada thistle (*Cirsium arvense*) - smaller flowers, smaller statured plant

Blessed milk thistle (*Silybum marianum*) – creamy white veins visible in leaves. Purple flower heads 2-3 in in diameter.

Reproduction and Spread

Reproduces only by seed. Germination occurs in spring and fall. Seeds are short-lived and do not disperse widely. If on or near the soil surface, seeds are not viable longer than a year. Buried seeds may remain viable for up to three years.

Monitoring

Scout for rosettes in fall, winter and spring.

Prevention

- Avoid soil disturbance and site overuse to prevent seed germination.
- Establish desirable plants or cover disturbed areas to prevent establishment. Mulch over disturbed surfaces may inhibit germination.
- Prevent seed production and dispersal from existing patches.
- Prevent seeds from spreading to other uninfested areas by washing vehicles, equipment, boots and animals that have been in infested areas.
- Bull thistle may be outcompeted by vigorously growing grass or shrubs.

Non-chemical Management Strategies

- Hand-pull or dig small patches of rosettes. If disposing of plants on site, leave plants roots up and chop up with a shovel to reduce risk of plant rerooting. Plants should be left well away from waterways, shorelines, roads and uninfested areas.
- Cut or mow plants prior to flowering. Avoid mowing plants in flower. Early mowing may result in delayed flowering. A single mowing is generally insufficient.
- Carefully bag and dispose of cuttings containing flowers as these may form viable seeds even after removal.
- Sever the stem about an inch below the soil surface, leaving no leaves attached. This stops the plant from resprouting. Plants may resprout if cut at or above the soil surface.
- According to King County, cultivation will effectively control bull thistle.
- Monitor and continue treatment for several years.

- Sheep, goats, and horses will eat seedlings, rosettes, and flower heads. Cattle will not.

Chemical Management Strategies

King County recommends glyphosate, triclopyr, 2,4-D, dicamba, or aminopyralid. Apply to rosettes during active growth (springtime before stem elongation) or fall.

Biocontrol Availability

Two biological controls have been released. One is a seed head weevil (*Rhinocyllus conicus*), but use of this is not recommended because the BCA attacks native thistles and interstate shipment is prohibited.

The second is a seedhead gallfly (*Urophora stylata*), which is widely distributed and provides good control. The gallfly lays eggs on closed flower buds in June and July. Larvae burrow into the seed producing tissues, forming galls and reducing seed production. To spread the agent, ODA recommends harvesting the galls after the first killing frost, then scatter galls at release site.

Sources for Further Information

King County Noxious Weed Control Program. 2014. Bull Thistle Best Management Practices.

<http://your.kingcounty.gov/dnrp/library/water-and-land/weeds/BMPs/bull-thistle-control.pdf>

DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, Univ. of Calif. 544 pp. http://wric.ucdavis.edu/information/natural_areas/wr_C/Cirsium_vulgare.pdf

Canada Thistle*Cirsium arvense*ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Sun-loving. Roadsides, pastures, lawns, gardens, riparian areas, forest clear cuts, waste areas, and disturbed areas.

Identification and Characteristics

Perennial. Pink to purple or white bristly flowers, 0.5 in wide, occurring in clusters June-October. Plant is dioecious (male and female flowers occur on different plants). Grooved stems reach 2-5 ft tall, branch at top. Leaves with glossy foliage upper surface and wooly foliage on lower leaf surface, up to 6 in long, armed with yellowish spines. Fleshy, creeping, extensive roots grow three feet deep or more. Above-ground portions die back in winter.

Reproduction and Spread

Spreads by seed and extensive root system. Horizontal roots produce buds which develop into new plants. Root fragments as small as 0.5 in can grow into new plants. Seeds are viable in the soil for up to 20 years. According to OSU, a seedling can reproduce vegetatively within 6 weeks after germination, and a single plant can develop a lateral root system with a 20-foot spread in a single season.

Prevention

Prevent establishment by:

- Irrigating and fertilizing as needed.
- Reseeding or replant bare ground, strive for heavy cover to reduce light to soil surface
- Avoiding introduction of weed-contaminated soil.
- Cleaning tools, boots, and vehicles between sites.

Non-chemical Management Strategies

Remove seedlings when young – if pulling, try to remove root entirely. Avoid fragmenting root system. Alternatively, hand-cut, or till every three weeks for an entire growing system, to weaken the root reserves.

Mow several times during growing season to deplete root reserves and prevent flowering. Carefully bag and dispose of seed heads or root fragments.

According to 4-county CWMA, late spring burns between May and June may be effective. During the first three years of control efforts, burns should be conducted annually. Inorganic mulches, such as plastic, commercial weed barrier fabrics or other materials such as roofing paper, are effective. Cover inorganic mulches with a thin layer of soil or organic mulch.

Biocontrol Availability

Three biocontrol agents are available. Stem gall fly (*Urophora cardui*) is widely distributed; larvae burrow into sheets, triggering gall formation. ODA recommends harvesting galls after first frost and scattering galls at release site. A crown/root weevil (*Ceutorhynchus litura*) can be collected by aspirating adults in Mar-April from rosettes of plants 1-4 in tall.

The third biocontrol, the seed head weevil (*Rhinocyllus conicus*) is no longer recommended because this BCA attacks native thistles and interstate shipment is prohibited.

Mowing is not recommended in conjunction with biocontrols.

Chemical Management Strategies

Translocated herbicides are recommended. Most effective on young, actively growing plants with new leaves that lack the thickened waxy coating present on mature leaves. Cut back plant three to five weeks before applying herbicide to encourage active growth.

CWMA reports that glyphosate, triclopyr, 2,4-D amine, dicamba, a combination of 2,4-D and dicamba (e.g. Weedmaster), clopyralid, or aminopyralid (Milestone) are effective when applied during the growing season.

Sources for Further Information

Oregon Department of Agriculture. Canada Thistle Profile.

<http://www.oregon.gov/oda/shared/Documents/Publications/Weeds/CanadaThistleProfile.pdf>https://oregonstate.edu/dept/nursery-weeds/feature_articles/thistles/thistles.html

Jefferson County Washington Noxious Weed Control Board

https://www.nwcb.wa.gov/images/weeds/CanadaThistle_Jefferson.pdf

Oregon Department of Agriculture. Weed Biological Control.

<http://www.oregon.gov/ODA/programs/Weeds/Pages/BiologicalControl.aspx>

Crabgrass	Smooth crabgrass (<i>Digitaria ischaemum</i>) Hairy crabgrass (<i>Digitaria sanguinalis</i>)
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Typical Habitat

Disturbed areas, lawns, landscaped areas, roadsides.

Identification and Characteristics

Usually prostrate plant, sometimes mat-forming grass with flat leaf blades a quarter to half-inch wide and 2-5 inches long. Young plants of smooth crabgrass are light green. Flower heads have 2-6 inch spikelike branches in one or two whorls at the stem tip.

Look-alikes

Bermuda grass (*Cynodon dactylon*) looks similar but has runners or creeping stems. Crabgrass seed spikes show multiple whorls while bermudagrass just has one whorl.

Reproduction and Spread

Crabgrass is an annual that grows during late spring and summer. It spreads through seed shed in August-September. For smooth crabgrass, plants as short as ¼ inch can produce seed; however large crabgrass is less tolerant of mowing.

Prevention

In beds, mulching is the primary preventative. In lawns, healthy, dense turf helps prevent the germination and spread of crabgrass. Make sure site is planted to a turf species that is well adapted to the conditions (e.g. amount of shade, foot traffic, etc.) and is adequately aerated, fertilized and watered.

Non-chemical Management Strategies

Hoe or hand-pull crabgrass while young and before it sets seed. Seeds can remain viable for at least 3 years in soil.

In ornamental beds or disturbed site, pull or hoe young plants before they set seed. Mulches help prevent germination. Cultivation will eliminate seedlings.

If establishing new sites, consider solarization technique prior to planting to eradicate crabgrass and other susceptible weeds.

In lawns, crabgrass may indicate compaction, low fertility, or overwatering. Try aeration and fertility management. Four lb. nitrogen per 1000 square feet each year in Sept, Nov, May, and June). Keep fertility low in the fall.

Avoid frequent light irrigation, which promotes germination. Instead, water deeply to encourage deeper-rooted turf grasses.

When mowing turf with crabgrass, rinse mower afterward and avoid transferring mower to uninfested sites. Mowing high in early summer– between 2.5 and 3 inches helps prevent seeds from germinating. As fall approaches, do the opposite – mow low and collect the grass clippings and dispose. This allows seed heads that have formed to be picked up by the mower, and removed from the site.

Biocontrol Availability

None known.

Chemical Management Strategies

A variety of pre- and post- emergent products are available; some labeled for turf and some not.

Sources for Further Information

University of California IPM Program. 2010. Pest Notes: Crabgrass. UCANR Pub. 7456.

<http://ipm.ucanr.edu/PMG/PESTNOTES/pn7456.html>

Washington State University. Oh no, There's crabgrass in my lawn. <http://ext100.wsu.edu/gardentips/2014/10/16/oh-no-theres-crabgrass-in-my-lawn/>

Washington State University Extension. Hortsense Fact Sheet: Crabgrass.

<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=6&ProblemId=2015>

Typical Habitat

Woodlands, forests.

Identification and Characteristics

Evergreen, grows as shrub, or tree up to 50 ft, may be multi-stemmed. Leaves are thick, glossy, dark green and wavy, 1-3 in, with sharp spines along leaf edges. Red, yellow, or orange berries in winter. Small white flowers on females; yellow flowers on males.

Look-alikes

Holly leaves resemble those of Oregon grape (*Berberis spp.*) but the Oregon grape has yellow flowers and blue berries.

Reproduction and Spread

The species is dioecious, with separate male and female plants. Holly seeds are persistent. Birds forage on fruits, dispersing the seed. Spread. Holly can also spread vegetatively through suckers and layering.

Prevention

Maintain forest cover.

Non-chemical Management Strategies

- Shade out.
- Remove seedlings before plants reach reproductive age. Hand dig or use weed wrench, removing the entire root. Monitor for reinvasions.
- Cutting may result in resprouting.

Chemical Management Strategies

Cut-stump treatment on larger holly with glyphosate or triclopyr is more effective than foliar treatment, according to Whatcom County. For larger specimens, frilling (cutting deep cuts at 45-degree angles into the tree's bark using an axe or sharp chisel) and pouring glyphosate into the cuts immediately afterward is also effective according to King County.

Sources for Further Information

Whatcom County Noxious Weed Board. Unknown date. Control options for English holly.

https://www.nwcb.wa.gov/images/weeds/English-Holly-Control_Whatcom.pdf

King County Noxious Weed Control Program Weed Alert. English Holly. <https://your.kingcounty.gov/dnrp/library/water-and-land/weeds/Brochures/English-Holly-Fact-Sheet.pdf>

English Ivy*Hedera helix*ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Woodlands, forest edges, fields, gardens. Prefers some moisture and slightly acidic, well-drained soils.

Identification and Characteristics

Evergreen climbing vine; alternate, angular dark green 2-4" long leaves with 3-7 points or rounded with a terminal point. Stems herbaceous or woody. Greenish-white flower clumps with small black berry-like fruit. Plants bloom only when light and nutrients are optimal.

Look-alikes

Irish ivy (*H. hibernica*) and Persian ivy (*Hedera colchia*) look nearly identical to English ivy, have a similar growth habits, and are also considered invasive.

Reproduction and Spread

Ivy establishes roots at its nodes and can grow from cut or broken stems. Ivy also reproduces from seed dispersed by birds.

Prevention

Prevent from blooming as ivy seeds are spread by birds.

Non-chemical Management Strategies

Reduce climbing vines to reduce access to sunlight and slow seed production. Cut vines at chest height and at hip height from trunks of trees, creating a gap. Leave stems on trees. Clear ivy around trunks for a three-foot radius.

Ivy growing along the ground may be pulled when the soil is moist. Stems may be rolled into large piles (on tarps preferably) and left on site. If not left in large piles, stems left behind may reroot.

Ivy may also be mowed or cut close to the ground; follow with digging roots out where possible. Cover with double layer of landscape fabric, black plastic, or cardboard covered with bark or mulch.

For offsite disposal, bag and place into trash.

Biocontrol Availability

Goats and sheep will graze on ivy.

Chemical Management Strategies

A variety of active ingredients are used by local management agencies (glyphosate, triclopyr) along with surfactants. Painting the cambium of cut stems is one technique; foliar sprays are also used.

Sources for Further Information

4-County CWMA. [Date unspecified] English, Irish and Persian Ivy. <https://4countycwma.org/aweeds/best-management-practices/invasive-ivy/>

Washington State University Extension. 2016. Hortsense Fact Sheet: English Ivy. <http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=6&ProblemId=2057>

Field Bindweed*Convolvulus arvensis*ODA Noxious Weed List – **B & T listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

It is widely distributed in Oregon inhabiting roadsides; grasslands grain fields and urban landscapes. It is a common feature in home gardens.

Identification and Characteristics

Field bindweed is a deep-rooted herbaceous perennial. Its stems are prostrate, one to four feet long often climbing fences and shrubs or forming dense tangled mats. Leaves are alternate, arrowhead-shaped with lobes at the base. Flowers are bell or trumpet shaped, white to pinkish and one inch in diameter. Its fruit is a small, round capsule, usually four-seeded. It looks and grows similar to the ornamental morning glory. Considered a pest throughout the United States, bindweed is known for its ability to reduce crop yields. It competes with crops for moisture and nutrients, and is difficult to remove once established. The twining nature of the plant hampers harvesting of crops, especially in orchards and vineyards.

Look-alikes

Often confused with wild buckwheat and morning glory, which are summer annual plants.

Reproduction and Spread

It spreads by seed and through a deep, extensive horizontal root system. Field bindweed seed can persist for many years in typical garden soil.

Prevention

Prevent spreading of the plant and reduce seed spread by cleaning off equipment and clothing.

Non-chemical Management Strategies

Avoid digging or tilling the soil around mature field bindweed roots; roots and rhizome fragments left behind may resprout. Repeated hand-pulling eventually works but is highly labor-intensive. It is best to limit hand pulling and tilling to seedlings; do in early spring when the ground is wet. Smothering plants with mulch, black plastic, or geotextile fabric is another option, but the covering must be kept in place for several years. Success may be somewhat limited as field bindweed can persist without light, sending its underground roots beyond the covering's edge to start a new infestation. If using this method, be sure to cover the whole patch and monitor closely for regrowth along edges or through gaps in the covering. Mowing alone will not control this plant and is not recommended

Biocontrol Availability

A Moth and a Mite has been released in Oregon to control the spread of field bindweed.

Chemical Management Strategies

Herbicides can be painted or brushed on leaves to avoid drift onto desirable plants. Products containing glyphosate are effective when applied in the summer and fall before the leaves die back. However, glyphosate is "non-selective" and will injure any foliage that it comes in contact with, including grass. Selective broadleaf herbicides with active ingredient triclopyr or 2,4-D work well for grassy areas, as they won't harm most grasses. Repeat treatment on regrowth as needed. All of the above herbicides are absorbed by foliage and moved throughout the plant to kill roots and shoots.

Sources for Further Information

King County Noxious Weed Alert. 2018. Field Bindweed. https://your.kingcounty.gov/dnrp/library/water-and-land/weeds/Brochures/Bindweed_factsheet.pdf

Oregon Department Agriculture. 2018. Field Bindweed. <https://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/FieldBindweedProfile.pdf>

Oregon State University. 2018. Bidding Farewell to the dreaded bindweed. <https://extension.oregonstate.edu/node/81956>

Garlic mustard*Alliaria petiolata*ODA Noxious Weed List – **B listed, T-listed**Clackamas SWCD Weedwise – **Priority****Typical Habitat**

Grows in deciduous or open-canopy coniferous forests, disturbed areas, roadsides, riparian areas. Once established, garlic mustard may exude a chemical which impedes native shrub and tree establishment and hinders natural forest regeneration.

Identification and Characteristics

First-year plants form basal rosettes with round to kidney-shaped leaves with scalloped edges. White, mustard-like, 4-petaled flowers appear in the 2nd year in April, on stalks measuring 12-48” tall. Leaves on flowering stalks are triangular-shaped. Crushed leaves smell like garlic.

Look-alikes

Garlic mustard may be confused with a variety of native plants, including fringe-cup, piggy-back plant, hairy bittercress or black mustard. Check for garlic odor.

Reproduction and Spread

Biennial. First-year plants emerge from fall through early March. Spreads through seeds. Seeds can remain viable for five or more years. Roots left in the ground may regrow and set seed.

Prevention

Prevention strategies include:

- Monitor vulnerable sites annually.
- Prevent flowering plants from going to seed. Clean equipment, shoes, pets, and clothes, and tires that may have contacted seeds. Seeds are easily transported.
- Do not allow disturbed sites to persist.
- Hemlock mulch may suppress mustard species, including garlic mustard. Requirements include replenishing supply after 2 years and maintaining a mulch depth of 6 inches.

Non-chemical Management Strategies

Pull plants when soil is moist, removing roots. Second-year plants with flowering stalks should be bagged and placed in garbage – not composted (first year plants may be placed in compost) to prevent seeding after pulling. Remove in spring. Do not handle or remove plants once seed pods turn yellow and dry. Clip seedheads prior to any chemical control strategy.

Chemical Management Strategies

Glyphosate is recommended by ODA on late winter seedlings and rosettes. Spraying is not effective on flowering plants. Triclopyr of 1% is recommended on rosettes by the Pacific Northwest Garlic Mustard Working Group.

Sources for Further Information

4-County Cooperative Weed Management Area. Garlic Mustard. <https://4ccwma.files.wordpress.com/2017/09/garlic-mustard-final-web.pdf>

Oregon Department of Agriculture. 2015. Noxious Weed Pest Risk Assessment for Garlic Mustard. <http://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/GarlicMustardPlantPestRiskAssessment.pdf>

Horsetail (Field)*Equisetum arvense*

Native plant

Typical Habitat

Horsetail is a native plant that occupies aquatic sites, ditchbanks, roadsides, pastures. Prefers moist soils but will tolerate fairly dry soil.

Identification and Characteristics

Upright plant to three feet tall, with stiff leaves in whorls radiating from the central hollow stalk; resembles small conifer. Spore-bearing plants have no foliage and emerge early in the year before vegetative stalks. Their stalks are topped by a conifer cone-resembling tip.

Look-alikes

Giant horsetail (*Equisetum telmateia*) is very similar to field horsetail only taller, more robust, and produces an abundance of fertile stems. Scouring rush (*Equisetum hyemale*) is evergreen, with leafless, hollow, segmented stems with ash-colored bands. Stems grow to about 1/2 inch in diameter and reach up to five feet tall.

Reproduction and Spread

Horsetail spreads by spores or creeping rhizomes and tubers. Rhizomes can grow to six feet underground. Cultivation can spread the rhizomes.

Prevention

Prevent spread and establishment of horsetails by using only clean soil and by checking nursery stock for unwanted plants.

Non-chemical Management Strategies

- Hand pull to deplete food reserves. Complete removal of the tops about 2 weeks after each emergence for 3 to 4 years has provided effective control. Avoid cultivation which spreads the rhizomes.
- Inorganic mulches (landscape fabrics) are effective; organic mulches are not. Flaming can eliminate top growth and weaken the plant if used repeatedly.
- Maintain healthy, competitive desirable vegetation to deplete horsetail on site. Where present, densely plant areas with horsetail to shade them out and reduce spore germination.

Chemical Management Strategies

The hard waxy cuticle of horsetail resists penetration by foliar applications. Injection methods are considered more effective.

Biocontrol Availability

None known.

Sources for Further Information

Oregon State University. [date unspecified]. Horsetail. https://oregonstate.edu/dept/nursery-weeds/weedspeciespage/horsetail/Equisetum_arvense_horsetail.html

Thurston County Noxious Weeds Program. Integrated Pest Management Prescription: Horsetail-Scouring Rush. <http://www.co.thurston.wa.us/health/ehipm/pdf/horsetail.pdf>

Typical Habitat

Mouse problems can occur at any time of year but especially in the fall when outdoor temperatures begin to cool and mice invade houses for shelter and food.

Identification and Characteristics

The house mouse weighs about 1/2 ounce and is 3 to 4 inches in length with a dark tail of about the same length. Mice leave dark droppings that are pointed and about the size of a grain of rice.

Look-alikes

In many areas of the United States, *Peromyscus* spp. (deer mice and white-footed mice) commonly enter buildings and may be confused with house mice. Deer mice are the vector for hantavirus, a rare but fatal syndrome. The house mouse has an overall gray coat. The deer mouse has larger eyes and a clearly delineated white underside. Before attempting to clean up premises where hantavirus exposure is possible, refer to the Center for Disease Control at www.cdc.gov/rodents/.

Adult rats are much larger than mice.

Monitoring:

See section for rats. In addition, Mitchell and Balogh (2007) presents an excellent overview of monitoring and abundance estimation techniques.

Reproduction and Spread

A female may have 5 to 10 litters annually, each with 5-6 young.

Prevention

Sanitation and exclusion are the primary prevention methods. Techniques to prevent and minimize pressure are generally the same as that for rats (see Rats section). However, mice can squeeze dime-sized holes, so exclusion techniques need to be tailored to their smaller sizes.

Non-chemical Management Strategies

Snap traps, baited with attractive foods, is the primary non-chemical management strategy. Snap traps need to be designed for mice, not rats. See Rats section for more information.

Chemical Management Strategies

See information for rats.

Sources for Further Information

Mitchell, B. and Balogh, S. 2007. NSW Department of Primary Industries. <https://www.pestsmart.org.au/wp-content/uploads/2010/03/Monitoring-techniques-for-vertebrate-pests---mice.pdf>

UC IPM. Pest Notes: Rats. 2011. <http://ipm.ucanr.edu/PMG/PESTNOTES/pn7483.html>

Italian Arum (Lords-and Ladies)

Arum italicum

Clackamas SWCD Weedwise – **Maintenance**

Typical Habitat

Woodlands, forest margins, riparian and wetland areas, disturbed areas. Can tolerate drought once established.

Identification and Characteristics

Evergreen, herbaceous perennial. Arrow-shaped, glossy leaves, up to 12 in long, usually with pale veins or purple splotches or speckles. Grows to 12-18 in high, with equal spread. Blooms in spring; tiny yellowish odiferous flowers in finger-like structure, partly surrounded by a large, sheath-like bract (spathe). Red to orange berries in spiky clusters.

Look-alikes

Reproduction and Spread

The plant produces thick underground tubers with buds (bulblets), which can break off to produce new plants. Birds and other animals eat and spread berries.

Prevention

Do not move soil from areas where the plant is known to have grown. Do not compost affected soil.

Non-chemical Management Strategies

- Cut and bag berries in August.
- The plant is poisonous. Contact with the sap causes minor skin irritation. Wear gloves.
- If digging, bulblets must be removed to prevent resprouting. All plant parts must be sealed in plastic and disposed of in garbage.

Chemical Management Strategies

Glyphosate or imazapyr may kill the top but may not kill tubers. Glyphosate at 3% with sulfomethuron at 1.5 oz/ac resulted in no regrowth according to Whatcom County.

Sources for Further Information

Whatcom County Noxious Weed Board. Unknown date. Control options for Italian Arum. <http://co.whatcom.wa.us/DocumentCenter/Home/View/27070>

Washington State Noxious Weed Control Board. Unknown date. Italian Arum. <http://extension.wsu.edu/sanjuan/wp-content/uploads/sites/9/2014/04/Italian-Arum-brochure.pdf>

Japanese Knotweed*Polygonum cuspidatum* (also known as *Fallopia japonica*)

(False bamboo)

ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Priority****Typical Habitat**

Sunny to partially shady moist areas, including riparian areas, ditches, forest understories, edges, roadsides and waste places, gravel operations, yards and gardens

Identification and Characteristics

Deciduous perennial, dying back to roots in winter, though dead canes remain standing through winter. Grows to 10 feet tall. Large somewhat heart-shaped leaves 6-8" long, with squarish leaf bases. Stout hollow, jointed stems, greenish-red in color, with sheathing stipules at nodes. Blooms July-October, plume-like clusters or panicles of showy, white flowers emerge during late summer and fall where each leaf meets the stem at leaf axis.

Look-alikes

There are three other species of woody knotweeds, all of which are also invasive: giant (*Polygonum sachalinense*), Bohemian (*Polygonum ×bohemicum*), and Himalayan (*Polygonum polystachyum*). Giant knotweed is taller than Japanese knotweed, with leaves up to 18 inches long and greenish-white flowers. Bohemian knotweed is a hybrid of Japanese knotweed and giant knotweed and has characteristics of both parents. Himalayan knotweed grows to 6 feet tall. Stems and flowers are similar to those of other knotweed species, though flowers are occasionally pink. Leaves are slender, measuring 4-8 inches long, and the sheathing stipule is long and pointed.

Reproduction and Spread

The plant grows from deep-rooted creeping rhizomes, and propagates through stem and root fragments, which may be transported by streams or rivers or soil containing root fragments. Seed is a less important mechanism for spread.

Prevention

Prevention strategies include:

- Be cautious in accepting soil from unknown origins. Thoroughly clean equipment after use in suspected sites. Refrain from dumping contaminated soil.
- Maintain shade and desirable native vegetation along riparian areas and minimize soil disturbance in riparian and streamside areas.

Non-chemical Management Strategies

Begin control from the furthest upstream site. Some practitioners have had success suppressing smaller infestations by laying large tarps, geotextile, or carpet pieces over infestations cleared of old canes during the winter. Cover edges must be carefully overlapped and held down.

When new shoots arise in the spring, walking over the tarps helps to break the new shoots, draining the resources

Small infestations may be grubbed out but entire root system must be removed. Several authors advise against digging as stem and root fragments left behind may spread the infestation.

Cutting live stems may increase plant growth and density. However, others report that cutting or mowing at least twice a month for the first year, then monthly over three years, can kill knotweed. Cut plant material must be removed, dried, and burned if possible.

Goats are reported to eat knotweed and controlled goat grazing may be an option if sustained.

Emanuel et al. (2011) cautions against allowing cut canes, or any part of a cut cane, to come into contact with water or soil.

Monitor the site and follow up with regular treatments for many years after the initial treatment. Search at least 10 yards beyond treatment sites.

Follow-up treatments by planting desirable coniferous vegetation.

Chemical Management Strategies

According to Emanuel et al. (2011) glyphosate or imazapyr were more effective at control than triclopyr or 2,4-D. Dicamba is also recommended in the PNW Handbook.

Mowing or cutting followed by herbicides. Foliar application in fall prior to frost is recommended by Emanuel (2011) and Weedwise.

Injecting 3 to 5 ml (0.1 to 0.17 fl oz) of glyphosate in every stem at the first aboveground internode has effectively controlled patches of knotweed from June to September, but current labels greatly limit this application for large infestations. The suggested injection rates are listed under a Special Local Needs label, which the applicator must apply for and have in hand during application.

Wiping stems with 33% herbicide solutions was also found to be effective, especially after cutting tops to 3 ft.

Biocontrol Availability

A number of different biological controls are under evaluation, but none are currently approved for release. Goats are reported to eat knotweed and, in some circumstances, controlled goat grazing may be an option.

Sources for Further Information

Beaulieu, David. 2017. Eradication of Japanese Knotweed Plants. <https://www.thespruce.com/eradication-of-japanese-knotweed-plants-2131201>

Emanuel, R., A. Hulting, and R. Koepke-Hill. 2011. Biology and Management of Knotweeds in Oregon: A Guide for Gardeners and Small-Acreage Landowners. OSU Extension: EM 9031. <https://catalog.extension.oregonstate.edu/em9031>

Leininger, Samuel. 2017. September's Weed of the Month: Knotweed. Weedwise, Clackamas Soil and Water Conservation District. <https://weedwise.conservationsdistrict.org/2017/september-weed-month-knotweed.html>

Oregon Department of Agriculture. Japanese Knotweed Profile. <http://www.oregon.gov/oda/shared/Documents/Publications/Weeds/JapaneseKnotweedProfile.pdf>

Oregon State University Extension. 2008. Invasive Weeds in Forest Land: Knotweeds. EC 1597.

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PNW Weed Management Handbook. Knotweed. <https://pnwhandbooks.org/weed/problem-weeds/knotweed-bohemian-polygonum-bohemicum-japanese-polygonum-cuspidatum-giant>

Lesser Celandine*Ranunculus ficaria*ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Shaded to partially shaded sites such as deciduous woods; also found in open sunny sites with adequate soil moisture.

Identification and Characteristics

Herbaceous perennial. Plants have basal rosette of dark green, shiny, stalked leaves that are kidney to heart-shaped. Lesser celandine flowers from March to April, has 6-26 glossy, butter-yellow petals, and three (rarely four) green sepals. Pale-colored bulblets are produced along the stems of the above ground portions of the plant, but are not apparent until late in the flowering period. Forms large dense patches.

Look-alikes

There are many varieties of lesser celandine including a double-flowered form with many crowded petals and dark green leaves mottled with silvery markings. Lesser celandine resembles the native marsh marigold *Caltha palustris* (not found in the urban area). Look-alikes do not have tubers or form dense mats.

Reproduction and Spread

Reproduces by seed, plant fragments, or tubers (turions) that are produced on the roots in large numbers and easily moved in contaminated dirt or by water.

Prevention

After working in an infested area, tools and footwear should thoroughly cleaned.

Non-chemical Management Strategies

Dig small patches when soil is moist. Sift soil to obtain all bulb parts. Any surviving tubers will lead to reinfestation. Dispose of plant parts and excavated soil in a trash bag and place in trash. Monitor every few weeks and repeat.

Chemical Management Strategies

Use chemical control just before or in early flowering. According to City of Portland Bureau of Environmental Services, mid-winter treatments may be more effective than spring treatments. The 4-county CWMA recommends glyphosate at low rates (1-2%), but warns that repeat treatments may be needed.

Biocontrol availability

None available at this time.

Sources for Further Information

Oregon Department of Agriculture Noxious Weed Profile: Lesser Celandine.

<https://www.oregon.gov/oda/shared/Documents/Publications/Weeds/LesserCelandineProfile.pdf>

City of Portland Bureau of Environmental Services. 2018. Lesser Celandine. <https://www.portlandoregon.gov/bes/article/433193>

4-County Cooperative Weed Management Area. Lesser Celandine Fact Sheet.

https://4ccwma.files.wordpress.com/2018/02/ipm_18_lessercelandine-web.pdf

Moss*Bryophyte**Turf Moss**Tree Moss**Roof and sidewalk Moss***Typical Habitat**

Moss thrives in shaded, moist poorly drained soils. It can be found anywhere from sidewalks, parking lots, to roofs and in turf. It tends to prefer north facing dwellings. Moss in a turf is an indication that the turf is not growing well.

Identification and Characteristics

Moss grows in a dense carpet in many colors, mostly found in hues of greens, blues, and browns. It will be tufted and usually mounding. The stems on moss are usually no more than the size of a hair and less than an inch long. Moss can grow in small or large formations, anywhere from several feet to less than an inch.

Look-alikes

Short grasses could be mistaken as mosses.

Reproduction and Spread

Moss reproduces by spores and needs moist areas to do so.

Prevention

Moss can be prevented in a number of ways, just by using good cultural practices will reduce and eliminate most mosses.

Non-chemical Management Strategies

Composting, topdressing, aerating, regular mowing intervals, overseeding, are all cultural practices that can help reduce, eliminate and prevent mosses. You can hand scrape mosses with tools such as a hula hoe. Cleaning off roofs and applying zinc strips. Cleaning off sidewalks by power washing or power brushing. Allowing light to hit the spot, by pruning low lying limbs or bushes.

Chemical Management Strategies

Ferrous sulfate, Ammonium sulfate and Copper sulfate, Fertilizers, and Lime

Sources for Further Information

Field of Science. 2008. Moss Plants and More. <http://mossplants.fieldofscience.com/2008/05/online-guide-to-north-american-mosses.html>

iNaturalist. 2016. Identification of Bryophytes. <https://www.inaturalist.org/journal/rmedina/5768-identification-of-bryophytes-mosses-liverworts-and-hornworts>

USDA Forest Service. 2006. Guide to Common Macrolichens and Bryophytes of the Umatilla National Forest. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5405373.pdf

Old Man's Beard (Clematis, also known as Traveler's Joy)

Clematis vitalba

ODA Noxious Weed List – **B listed**

Clackamas SWCD Weedwise – **Maintenance**

Typical Habitat

Near roadways and on forest edges and in riparian areas. Disturbed areas, partial to full sun. Regionally distributed, categorized as abundant in ODA Risk Assessment.

Identification and Characteristics

Deciduous woody vining perennial; trailing stems on ground also. Longitudinal ridges on young vines. Pinnately compound, 5-7 lime-green opposite leaflets, coarsely toothed, ovate. Small flowers with thin, greenish-white sepals (no actual petals). Fluffy gray seed clusters give the plant its common name. The fuzzy seed heads remain on the vine after the leaves have fallen. Taproot can reach several yards long.

Look-alikes

Similar to native honeysuckle (*Lonicera ciliosa*) but honeysuckle flower is bright orange and trumpet shaped. Also similar to *Clematis ligusticifolia*, found on both sides of the Cascades in Oregon.

Reproduction and Spread

Can self-pollinate or be pollinated by wind or insects. Seeds, vine fragments, and rooting at nodes contribute to spread. Birds, water, wind, humans, and mammals may spread seed

Prevention

Prevent establishment and spread by:

- Protect shrub and understory vegetation in closed canopy woodlands to prevent open sites for establishment.
- Prevent seed spread on equipment and footwear.
- Do not leave holes or bare dirt areas when removing the plants (fill back in or apply mulch afterwards) to reduce germination of weed seeds left in the soil and minimize erosion.
- Seedling recruitment occurs for several years mandating yearly monitoring and treatment

Non-chemical Management Strategies

Dig out roots when soil is moist. Pile atop 2-3 layers of cardboard or compost off site. Upper vines can be left on trees. Do not leave vine fragments, which can reroot. Cut vines off trees at eye level (do not pull). Pull seedlings.

Do not leave stems and root balls on the ground because plant material can form roots and start to grow again. Remove stems with flowers and/or rootballs, contain in bags or a covered load, and remove to a landfill or to a composting facility where heat will be sustained for sufficient time and at high enough temperatures to destroy plant tissues.

Chemical Management Strategies

Herbicide application on the cut stems using concentrated product or foliar application on regrowth after cutting vines is recommended by King County. Or spray leaves and stems of actively growing plants in spring before stem elongation. King County recommends glyphosate or triclopyr (amine formulation).

Biocontrol Availability

None available at this time.

Sources for Further Information

4-County Cooperative Weed Management Area. Old Man's Beard Fact Sheet.

https://4ccwma.files.wordpress.com/2018/02/ipm_18_travelersjoy-web.pdf

Miller, G. 2015. Oregon Department of Agriculture Noxious Weed Pest Risk Assessment for Old Man's Beard Clematis vitalba

L. <http://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/OldmansBeardPlantPestRiskAssessment.pdf>

King County Noxious Weed Control Program. 2010. Old Man's Beard BMP. [https://your.kingcounty.gov/dnrp/library/water-and-](https://your.kingcounty.gov/dnrp/library/water-and-land/weeds/BMPs/Old-mans-beard-Clematis-vitalba-control.pdf)

[land/weeds/BMPs/Old-mans-beard-Clematis-vitalba-control.pdf](https://your.kingcounty.gov/dnrp/library/water-and-land/weeds/BMPs/Old-mans-beard-Clematis-vitalba-control.pdf)

Poison Hemlock*Conium maculatum*ODA Noxious Weed List – **B listed****Typical Habitat**

Found along roadsides, riparian areas, ravines, fields, ditches and un-managed yards and vacant lots. Prefers moist soil and sun, but can adapt to dryer soil and shadier conditions. Can be mistaken for a carrot when small. Widespread and found in every county in Oregon.

Identification and Characteristics

Poison hemlock is a biennial member of the carrot family, growing from 3 to 7 feet tall on a deep taproot. Hollow stems are erect with leaves that are alternate, one per node, petioled, and pinnately divided. Flowers are white in compound stemmed umbels, much like little umbrellas.

Look-alikes

Wild Carrot/ Queen Ann's Lace.

Reproduction and Spread

Poison hemlock reproduces only by seeds; dispersed by water, wind, on animal fur, human clothing, boots, and machinery. Seeds are viable up to 6 years.

Prevention

Clean shoes, clothing and tires of seeds prior to moving to other areas.

Non-chemical Management Strategies

Always wear gloves and protective clothing if handling poison hemlock as all parts of this plant are toxic. Digging up small infestations and removing the entire taproot is effective. Mowing is ineffective as plants will re-sprout, sending up new stalks in the same season mowing occurs.

Chemical Management Strategies

2,4-D, metsulfuron, triclopyr, and glyphosate are considered effective as post-emergents. Apply to actively growing plants in the spring, followed by another application in late summer.

Biocontrol Availability

A small *Agonopterix* moth frequently defoliates hemlock patches; unfortunately, its impact is sporadic from year to year.

Sources for Further Information

Oregon Department of Agriculture. [date unknown]. Poison Hemlock.

<https://www.oregon.gov/oda/shared/Documents/Publications/Weeds/PoisonHemlockProfile.pdf>

Washington State Noxious Weed Control Board. 1998. *Tribulus terrestris* Written findings.

<https://www.nwcb.wa.gov/images/weeds/Tribulus-terrestris-1998.pdf>

Typical Habitat

Poison Oak can be found at the edge of tree lines and meadows, and in disturbed sites. It prefers dry well-drained soils, and sun. It can also grow in shade and wet soils.

Identification and Characteristics

Can be either brush or climbing vines, anywhere from 3 feet tall to a 100-foot climbing vine. It is a perennial, deciduous woody plant, its leaves are glossy and turn red in the fall dropping leaves in late fall. As a vine, Pacific poison-oak climbs trees or other supports by adventitious roots and/or wedging stems within grooves or crevices of the support. The bright green leaves have three (sometimes five) round to ovate, diversely lobed or toothed leaflets that usually resemble oak leaves. It flowers in spring to early summer and produces white berries midsummer to fall.

Look-alikes

Saplings of Hawthorne and Oak can be mistaken for Poison Oak. Can also be mistaken for Blackberries which have leaves of three.

Reproduction and Spread

Seeds are spread by birds and animals through digestion or by attaching to the animal's coat or birds' feathers. Rhizomes are at or just below the soil surface, and are extensive.

Prevention

Clean shoes, clothing and tires of seeds prior to moving to other areas, and to prevent spread of urushiol oil.

Non-chemical Management Strategies

All parts of the plant are toxic to skin, even long after the plant is dead. It is recommended to wear gloves, long sleeves and full-length pants when hand pulling. Be careful not to spread oils (urushiol) from the plant from clothing and shoes. Hand pulling and digging can be done after herbicide is applied or on small plants.

Chemical Management Strategies

2,4-D, dicamba, triclopyr, glyphosate, and aminopyralid are considered effective as post-emergents. Cut stump applications are recommended while plant is actively growing. Foliar application is best done during the flowering or fruiting stage.

Sources for Further Information

Encyclopedia of Life. Pacific Poison Oak. <http://eol.org/pages/582277/details#morphology>

Pacific Poison Oak. http://bioweb.uwlax.edu/bio203/s2013/denzin_zach/adaptation.htm

USDA Natural Resources Conservation Service. Pacific Poison Oak. <https://plants.usda.gov/core/profile?symbol=todi>

Puncturevine (Goat's head, bullhead) *Tribulus terrestris*

ODA Noxious Weed List – **B listed**

Clackamas SWCD Weedwise – **Priority**

Typical Habitat

Gravel parking lots, roadsides, field edges, ditches, irrigated vegetable crops, pastures, parks, waste places, railway yards, livestock grounds. Tolerant of drought conditions and survives well in sandy or gravelly soils.

Identification and Characteristics

Annual, prostrate, matty weed with multiple stems, 4-6 feet across. Leaves are opposite, hairy, divided into 4 to 8 pairs of leaflets, each about 1/2 in long. Flowers are small, yellow, 1/2 inch wide with five petals, borne in the leaf axil. Fruits, consist of a woody bur divided into 5 sections, breaking apart when mature into tack-like structures sporting sharp, rigid spines. Simple woody taproot.

Look-alikes

None.

Reproduction and Spread

Spiny fruits attach themselves to animals, clothing, and vehicles. Spread by animals, humans, and vehicles.

Prevention

Clean shoes, clothing and tires of seeds prior to moving to other areas.

Non-chemical Management Strategies

Control plants prior to seed set in spring. Smaller populations of puncturevine can be pulled, hoed, or sprayed; especially earlier in the season before flowering and seed production occurs. Shallow tilling can also be used in the spring to control the plant prior to flower and seed development.

Chemical Management Strategies

2,4-D, dicamba, and glyphosate are considered effective as post-emergents. Several pre-emergents are also recommended.

Biocontrol Availability

Two biocontrol agents were released in Oregon in 1983. It is not known if they are present within the Wilsonville area. Puncturevine seed weevil (*Microlarinus lareynii*) larvae destroy developing seed while adults feed on stems, leaves, flowers, and fruits. *M. lareynii* should only be released where puncturevine infestations are large and eradication of the weed is not the primary objective. Puncturevine stem weevil (*Microlarinus lypriformis*) was also released in 1983 but has not been documented in Oregon since the mid-1980s and may no longer occur. Larvae feed within stems and root crowns (mining); adults feed on stems and leaves. No non-target impacts have been reported from either organism.

Sources for Further Information

Oregon Department of Agriculture. [date unknown]. Weed Biological Control.

<http://www.oregon.gov/ODA/programs/Weeds/Pages/BiologicalControl.aspx>

Washington State Noxious Weed Control Board. 1998. *Tribulus terrestris* written findings.

<https://www.nwcb.wa.gov/images/weeds/Tribulus-terrestris-1998.pdf>

Washington State University. Biological Control Agents – by Weed. <http://invasives.wsu.edu/biological/weed.htm>

Rats**Roof rat:** *Rattus rattus***Norway rat:** *Rattus norvegicus***Typical Habitat**

Roof rats prefer areas off the ground and are good climbers. In buildings, they are most often found in enclosed or elevated spaces such as attics, walls, false ceilings, and cabinets. Roof rats generally enter buildings from overhanging trees or power lines. They usually live and nest above ground in shrubs, trees, and dense vegetation such as ivy.

Norway rats are burrowers and thrive in environments where there is clutter or garbage. They burrow along foundations and under debris. They are good swimmers, are found in sewers, and may enter buildings through plumbing access points (toilets, broken drains) or through holes the size of a quarter. The home range of these rats may be as much as 50 yards.

Identification and Characteristics

Roof rats range in color from black to gray or tan with a lighter belly. Their tails are uniformly dark and longer than their combined head and body length. Roof rats have a pointed muzzle.

Norway rats are reddish brown or brownish-black rodents up to 9.5 inches long (excluding the tail). The Norway rat's 6-inch to 8-inch tail (shorter than the combined head and body length) is dark above and pale below. They have a blunt muzzle.

Rat droppings are dark, blunt, the size of a raisin ($\frac{3}{4}$ inches long and $\frac{1}{4}$ inch in diameter), smooth, rectangular in shape, and usually found in small groups.

Look-alikes

See House mouse.

Monitoring:

Regular building monitoring and inspecting offer an opportunity to identify pest-conducive conditions before an infestation occurs. Regardless of rodent evidence, inspectors should record conducive conditions that allow easy access to food, buildings and structures.

Inspectors should regularly monitor for rodent droppings, gnaw damage, burrows, runways, tracks, grease or rub marks, urine stains (using a black light), sightings of live or dead rodents, rodent sounds (listen for scratching) and rodent odors. Grease marks are dark oil stains from rats rubbing against surfaces such as along travel ways, entry points, and corners. These signs are most likely to be found along linear pathways including corners between walls and floors, along the base of foundations, and along pipes or electrical conduits, and along hard edges.

Norway rat burrows are typically found in existing cavities, softer soil, eroded areas adjacent to masonry or rocks, and where hard surfaces such as sidewalks or foundations meet soil. Entrances may be found under buildings, woodpiles, shrubbery, or rubbish. Entry holes are 2-3 inches wide (clean and smooth) and may have grease marks on any hard edge. Inactive burrows may be obscured by plant growth, spider webs, or debris.

Rats are active at night. If they are seen during the day there is likely a large population, scarcity of food, or illness within the population. They defecate wherever they go, so droppings will be spread across their foraging area. Norway rats like to hoard food so they may relocate baits.

Reproduction and Spread

The average female Norway rat has 4 to 6 litters per year and can successfully wean 20 or more offspring annually. A female roof rat averages 3 to 5 litters per year with 5 to 8 young in each litter.

Young rats reach reproductive maturity in about three months. Rats can live for up to 18 months, but most die before they are one year old.

Prevention

Techniques to prevent and minimize pressure rely heavily on eliminating food, water and shelter. Practicing sanitation, exclusion, and education are all critical.

Sanitation

- Place exterior trash cans and dumpsters away from building entrances to avoid attracting rodents to building. Use exterior trash receptacles with tight-fitting or spring-loaded lids. Use self-contained, leak-proof compactors instead of Dumpsters, or at least use Dumpsters with tight-fitting lids. Empty exterior trash receptacles daily at the end of each day. Keep trash collecting areas secure and clean.
- Trash should be collected only in sturdy rat-resistant containers.
- Clean clutter inside office space, shops, and storage areas and in cabinets.
- Store items off the floor to allow proper cleaning and inspection
- Store food in hard, reusable containers with airtight, fitted lids; keep trash in a can with a tight-fitting lid and take it out on a regular basis; clean or vacuum up crumbs and spills when they occur; keep food in the refrigerator when possible.
- Fix leaky and dripping pipes, faucets, and roofs; control humidity.

Exclusion:

- A rat can enter through a ½” diameter hole. Seal gaps and holes greater than 1/4 inch in diameter along foundations, walls, fascia, and roofs. Screen vents. Fix or replace broken screens.
- Seal around any pipes or wiring; types of materials to use will depend on the situation but include sheet metal flashing, cement, and/or heavy-gauge wire mesh.
- Use metal flashing on tight-fitting doors leading to the outside. Install heavy-gauge kick plates at the base of any doors with evidence of rodent gnawing to prevent access.
- If rats are entering through floor drains, seal these with hardware cloth with mesh smaller than 1/2 inch.
- Remove or trim ground cover and other landscape plants to expose ground and discourage rodent travel ways and rat burrowing. Avoid landscaping that creates ideal habitat for burrows including stone walls with unsealed gaps. Remove mulch from building foundations to reduce harborage. Do not allow grass clippings or leaf litter to accumulate adjacent to buildings. Prune trees, shrubs, and groundcover so they are not touching the building.

Education:

- Educate staff and the public on sanitation strategies, not only for City properties but for homes and commercial properties throughout the City.
- Educate staff and the public on how to identify signs of rodents.
- Provide notification information in staff break rooms and on bulletin boards.

Non-chemical Management Strategies

Bait and set snap traps designed for rats and check daily; use and place these traps with where staff will not be able to contact. Bait traps with peanut butter, chocolate candy, dried fruit or a small piece of hot dog or bacon tied securely to the trigger. Set them so that the trigger is sensitive and will spring easily.

Set traps close to walls, behind objects, in dark corners and in places where evidence of activity is seen. Place them so that rats will pass directly over the triggers as they follow the natural course of travel, usually close to a wall. Traps can be set on ledges or on top of pallets of stored materials if rats are active in such locations.

Use enough traps to eliminate the rodents quickly. Rats often avoid traps and baits for several days or more following their initial placement.

Leaving traps unset until the bait has been taken at least once (pre-baiting) often increases the success of trapping.

Biocontrol Availability

One birth control product is on the market and registered in Oregon (active ingredient is 4-vinylcyclohexene diepoxide).

Chemical Management Strategies

Rodenticides are not recommended for rat control inside buildings. Poisoned rats can die in hard to reach places and cause a bad smell. Also, ectoparasites such as fleas and mites often leave dead rat carcasses and can infest the entire house if the carcass isn't removed promptly.

Baits to control rodents are formulated with an attractant (generally food) and a rodenticide (toxin). Newer "second-generation" anticoagulant compounds such as brodifacoum, bromadiolone, difenacoum, and difethialone can be fatal after a single feeding. Since not all rats will consume bait when it first becomes available, bait application directions typically recommend providing an uninterrupted supply of bait for at least 10 or 15 days or until evidence of rodent activity ceases. The recommended strategy of bait application, which is often needed for optimum rodent control, can result in a rodent ingesting an overdose of the second-generation anticoagulants, which are more effective in part because they persist longer in the rodent's body than do the first-generation anticoagulants. Thus, they also have the potential to be hazardous to predators and scavengers, which may consume poisoned rodents. This secondary hazard from anticoagulants, as well as the primary hazard of nontarget animals directly ingesting rodent baits, is substantially reduced when baits are applied and used properly, according to label directions.

For Norway rats, place bait stations near rodent burrows or suspected nest sites, against walls, or along travel routes. For roof rats, place baits in elevated locations, such as in the crotch of a tree, on top of a fence, or high in a vine.

Place bait-block formulations outdoors on rods in tamper-resistant bait stations that are secured so that they cannot be easily moved, such as attached to permanent masonry or 40-pound concrete blocks.

Around larger commercial facilities experiencing significant rodent activity, bait stations are often placed 75-feet apart around fence lines, spaced at 50-foot intervals against the building's exterior.

Baiting of burrows outdoors is permitted only for pelleted baits that are placed at least six inches down active rat burrows. Burrows can be checked for activity by stuffing newspaper, leaves, etc., into the openings, then checking 24 hours later to see if rodents have reopened the burrows. If activity is noted, a cup of bait pellets (not block bait or place packs, due to their greater potential for being kicked out of the burrow) can be inserted deep into the burrow. A few days later, the burrow can again be checked for activity to see if the rodents were eliminated.

Disposal of Dead Rodents

Always wear intact rubber or plastic gloves when removing dead rodents and when cleaning or disinfecting items contaminated by rodents. Soak or spray dead rodents with a disinfecting solution (3 tablespoons of bleach per gallon of water or a commercial disinfectant containing phenol) until thoroughly wet and place in a plastic bag. The bag should be placed in a second bag and tightly sealed. Dispose of rodents in trash containers with tight-fitting lids. After handling rodents, resetting traps and cleaning contaminated objects, thoroughly wash gloved hands in a general household disinfectant or in soap and water. Then remove gloves and thoroughly wash your hands with soap and water. More recommendations for cleanup and disposal of rodents and areas where rodents have been located is available at the Centers for Disease Control website <https://www.cdc.gov/rodents/cleaning/index.html>.

Sources for Further Information

European Biocidal Products Forum. 2013. Guidelines on Best Practice in the Use of Rodenticide Baits as Biocides in the European Union. <http://www.rrac.info/content/uploads/CEFIC-EBPF-RWG-Guideline-Best-Practice-for-Rodenticide-Use-FINAL-S-.pdf>

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UC IPM. Pest Notes: Rats. 2011. <http://ipm.ucanr.edu/PMG/PESTNOTES/pn74106.html>

Scotch Broom*Cytisus scoparius*ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Thrives in open, dry meadows, along roadsides, and disturbed sites.

Identification and Characteristics

Scotch broom is an attractive perennial, evergreen shrub with many slender, erect, dark-green branches. It can grow up to 8 feet tall. In May it is adorned with a profusion of yellow flowers maturing to flattened pods with up to a dozen seeds each. Mature dried pods will crackle and pop in midsummer ejecting the seeds a short distance. Flowers are typical of those in the pea family. They are bright yellow, about 3/4 inches long and have 5 petals. Stems are woody and dark green. Young branches have 5 green ridges with hairs. When mature, stems become glabrous and ridges disappear. Young stems remain green throughout the year.

Look-alikes

Similar in appearance to gorse. Can be confused with the less common Spanish or Portuguese broom.

Reproduction and Spread

Spreads primarily by seed, each plant producing anywhere from hundreds to thousands of seeds. Seeds can live up to 50 years in the soil.

Non-chemical Management Strategies

Hand pulling and digging up young plants can be accomplished to control small patches. Early spring is the best time for this as soils are still moist and roots are more easily removed. Root systems go deep on more mature plants, making pulling difficult and often ineffective. Tools can be used to provide leverage when pulling plants.

Cutting or mowing can be done on gentler ground, but the plants must be cut below the lowest limb and as flush to the ground as possible to prevent re-sprouting. Cutting tends to be most effective when the plants are drought stressed in late summer.

Repeated prescribed fire has been used to attempt control with varying results by encouraging seed germination and killing small plants. There are obvious risks of fire escape that contribute to making this a rarely utilized method.

Biocontrol Availability

Three biological control agents, a beetle, a seed weevil and a twig miner are approved for release and have been established in Oregon: *Bruchidius villosus*, *Exapion fuscirostre*, *Leucoptera spartifoliella*. They can significantly reduce seed production and can shorten a broom's life span.

Chemical Management Strategies

Herbicide application to the cut surface of scotch broom stems can improve control if done immediately after cutting. In addition, there are herbicides that are labelled for scotch broom control when applied to the plant and to the soil as a pre-emergent that inhibits or kills germinating seeds.

Sources for Further Information

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<https://www.swcd.net/invasive-noxious-weeds/scotch-broom-3/>

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<https://www.nwcb.wa.gov/weeds/scotch-broom>

Spurge Laurel*Daphne laureola*Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Thrives in heavy shade.

Identification and Characteristics

Evergreen shrubs to 3-4 feet tall. Thick, waxy, dark green leaves grow in dense whorls. Green to pale pink small flowers appear in clusters of 5-20 late winter to early spring; flowers grow between the leaves near the tops of the stems. Berries are spherical to egg-shaped, turning from green to purple-black as they ripen.

Look-alikes

Similar in appearance to rhododendron and laurel. Spurge laurel flowers are borne in clusters below the top whorl of leaves.

Reproduction and Spread

Spreads primarily by seed. Birds and small mammals eat the fruits and spread seeds.

Non-chemical Management Strategies

Pull small plants when ground is moist; dig or use a weed wrench on larger plants. Remove seeds from site; bag plants and seed and dispose of in the trash. Roots left in the soil may resprout, so sites should be rechecked every few months.

Chemical Management Strategies

Not recommended by 4-county CWMA unless infestation is too large to handle with hand methods. Cut stump method with triclopyr or glyphosate has been effective in some trials.

Sources for Further Information

4-County CWMA. Spurge Laurel. https://4ccwma.files.wordpress.com/2018/02/ipm_18_spurgelaurel-web.pdf

St. Johnswort*Hypericum perforatum*ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Saint Johnswort is a widely distributed plant throughout the state except in the SE region counties. It is very common on forest roads, in pastures and non-crop environments of western Oregon.

Identification and Characteristics

This tansy ragwort look-a-like herb grows 1 to 2 ft. tall. Stems erect, numerous branched, somewhat 2 ridged, rust-colored and woody at their base. Leaves are opposite, oblong, not over 1 in long and covered in transparent dots. Flowers are 3/4 inch in diameter, bright yellow, and numerous in flat-topped cymes with five petals with occasional small black dots around the edges. It blooms June through July. It is perennial, dying back each winter to a sparse low-growing plant.

Look-alikes

Tansy ragwort or common tansy.

Reproduction and Spread

Spreads primarily by seed.

Non-chemical Management Strategies

Pulling should only be considered an option on new or small infestation sites. Repeated pulls will be necessary to ensure removal of the whole plant and any lateral roots. Do not leave plants at the site since vegetative growth will occur, and the seed source will remain. Tillage is effective when repeated in croplands. Mowing is a limited option depending both on site accessibility and whether seed formation has occurred. Repeated cuts are necessary.

Biocontrol Availability

The Klamath weed beetles, *Chrysolina quadrigemina* and *Chrysolina hyperici*, adults and larvae feed on the leaves of common St. Johnswort. The St. Johnswort moth, *Aplocera plagiata*, larvae feed on the leaves. The St. Johnswort root borer, *Agrilus hyperici*, larvae feed within plant roots.

Chemical Management Strategies

2,4-D can be applied as a post emergent before any blossoms open. Metsulfuron can be applied when emergent and reapplied to any resprouts, best if used with a surfactant.

Sources for Further Information

Oregon Department of Agriculture. 2018. St. Johnswort.

<https://www.oregon.gov/oda/shared/Documents/Publications/Weeds/StJohnswortProfile.pdf>

Washington State Noxious Weed Control Board. 2018. Common St. Johnswort. <https://www.nwcb.wa.gov/weeds/common-st-johnswort>

Tansy Ragwort*Senecio jacobaea*ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Tansy ragwort is opportunistic plant often found in disturbed areas. Tansy ragwort likes a cool and wet climate, well-drained soils and full to partial sun. Patches are found in pastures, fields, grasslands, vacant land, waste places, horse trails, roadsides, rangeland, riparian areas, forested areas, and clear cuts. Areas of greatest concern are improperly managed pastures and disturbed areas.

Identification and Characteristics

Tansy ragwort is a tall biennial plant in the sunflower family. It can grow up to 6 feet in height at maturity. The rigid stems of tansy ragwort are green with an occasional reddish tinge. Plants typically arise from a single stem that becomes branched at the top of the plant, forming flat clusters of bright yellow flowers. The yellow daisy-like flowers have dark yellow to orange centers. Leaves are dark green and ruffled in appearance. Tansy ragwort grows as a rosette in its first year before transitioning into the mature flowering form in its second year of growth. Tansy ragwort can form dense patches, particularly on disturbed sites. This noxious weed is dangerous to humans and livestock due to a poisonous alkaloid (hepatotoxic pyrrolizidine) in its tissue which causes liver damage when ingested.

Look-alikes

Common Groundsel and Woodland Groundsel rosettes can be confused for tansy ragwort rosettes. Common tansy and Common St. Johnswort in their flowering stage can also be confused for tansy ragwort.

Reproduction and Spread

Tansy ragwort reproduces predominantly by seed, but in some instances can also spread vegetatively. Seeds are dispersed by wind or by wildlife. Seeds can also be transported by machinery, contaminated soil and hay, and boots and clothing, and by seed. Vegetative reproduction occurs when roots or the crown are injured and new shoots develop. The fragments from the injured roots can generate new shoots.

Prevention

Clean shoes, clothing and tires of seeds prior to moving to other areas.

Non-chemical Management Strategies

Tansy ragwort can be effectively controlled by biological, chemical, and manual methods. It is an important plant to control, especially in hay and pasture lands, where it can harm grazing animals. As with any control method, it is important to avoid disturbing the soil as much as possible. Soil disturbance can bring buried seeds to the surface, and lead to increased soil erosion. Due to the toxicity of tansy ragwort, be sure to wear gloves and protective clothing when removing this plant.

Tansy ragwort can be controlled by digging or pulling. Plants should ideally be pulled between May and June, after they bolt and before they flower. Pulling and digging is easier when the soil is moist. Later in the season, soils dry and harden making tansy ragwort plants much more difficult to remove. Rosettes should be dug up, removing as much as the root as possible.

Biocontrol Availability

Ragwort flea beetle (*Longitarsus jacobaeae*), Ragwort seed fly (*Botanophila seneciella* syn. *Pegohylemia seneciella*), Cinnabar moth (*Tyria jacobaeae*) are all effective at tansy ragwort control. The Ragwort flea beetle is the most effective of the biological controls. Originally introduced in 1971, this species is widespread throughout Clackamas County and redistribution is not necessary.

Chemical Management Strategies

2,4-D, dicamba, triclopyr, metsulfuron, and aminopyralid are considered effective as post-emergents. Apply in late fall through spring (November through April) after seedlings have emerged and before rosettes have bolted.

Sources for Further Information

Clackamas SWCD WeedWise. 2018. Tansy Ragwort. <https://weedwise.conservationsdistrict.org/weeds/tansy-ragwort>

King County Noxious Weeds. 2017. Who's Who? Noxious Weeds and Their Look-alikes.
<https://kingcountyweeds.com/2017/06/27/whos-who-noxious-weeds-and-their-look-alikes/>

Oregon Department of Agriculture. 2018. Tansy Ragwort.
<https://www.oregon.gov/oda/shared/Documents/Publications/Weeds/TansyRagwortProfile.pdf>

Termites

Pacific dampwood termites (*Zootermopsis angusticollis*)

Western subterranean termite (*Reticulitermes hesperus*)

Typical Habitat

Stumps, fallen trees, logs, buildings with decaying wood and poor ventilation allowing condensation on wood. Large numbers of winged termites appearing around the outside edges of a structure or through flooring may indicate the presence of a colony in the siding or supporting timbers.

Dampwood termites live in moist wood. Subterranean termites live and breed in soil, sometimes 10-20 feet below the surface. The western subterranean termite is more common east of the Cascades.

Identification and Characteristics

Dampwood termite nymphs are similar to adults but are wingless and whitish or cream-colored to light caramel. Reproductive winged males and females measure one inch in length. Soldiers protect the colony and are distinguished by large dark mandibles.

Subterranean termites are much smaller than the dampwood termites (winged adults are 0.4 inch and black; workers are white and 0.2 inches and resembles a grain of rice).

Dampwood termites create large, open galleries within the wood where they live and feed. Termites occasionally construct shelter tubes ("mud tubes") over concrete foundations to reach wood from the soil beneath.

Subterranean termites create four types of tubes:

- working tubes are constructed from the nest in the soil to wooden structures and they may travel up concrete or stone foundations;
- exploratory and migratory tubes arise from the soil but do not connect to wood structures;
- drop tubes extend from wooden structures back to the soil; and
- swarm tubes for new and swarming reproductive kings and queens to emerge from and fly away during swarm season.

Opened tubes may expose live workers and soldiers. Darkened or blistered structural wood may indicate infestation; wood in damaged areas is typically thin at the surface and easily punctured with a knife or screwdriver.

Look-alikes

Winged ants are similar in appearance. Ant fore and hind wings are of unequal length, while termite wings are of equal size. Ants also have a constricted waist while termites do not. Carpenter ants may also be confused with termites but their damage is evident in sawdust expelled from their borings. Termites do not expel sawdust.

Reproduction and Spread

Dampwood termite nests are located in wood. Subterranean termites nest in soil. Swarms of winged reproductives may be seen in late summer and early fall evenings. Kings and queens generally fly less than 100 meters from their colony to mate and start a nest site. Queens and kings can live ten years or more, while individual workers can live for one to several years. Subterranean termite colonies may also be established by division of an existing colony.

Colonies may contain hundreds of thousands of individuals and pose a serious threat to structures.

Prevention

Design or retrofit facilities so that timbers are not in direct contact with the soil. Ensure adequate ventilation to crawl spaces. Eliminate obstructions to existing vents (i.e. plants or debris). Vapor barriers can reduce high moisture levels in crawl spaces. Use only exterior-grade, pressure-treated lumber for areas that are exposed to weather; otherwise, the chemical in the lumber may leach from the wood. All topical treatments that will be exposed to weather must also have a sealer coat to prevent leaching into the soil following rain.

Non-chemical Management Strategies

Correct poor drainage conditions near buildings. Repair plumbing or structural leaks. Replace structurally unsound wood with pressure-treated lumber. Eliminate tree stumps, stored or scrap lumber, untreated fence posts, and buried scrap or concrete form wood near the structure that may contribute to a termite infestation. Destroy shelter tubes whenever possible to interrupt access to wooden substructures.

Biocontrol Availability

Entomophagous nematodes are sold for termite control. While effective in the laboratory under controlled conditions, they have not worked under real-world conditions. The PNW Handbook recommends against using nematodes for termite control.

Chemical Management Strategies

The primary methods of controlling subterranean termites are insecticides, either applied to the soil adjacent to the structure, directly to nests via shelter tubes, or through bait stations.

Chlorantraniliprole, fipronil, and imidacloprid have been shown to be effective in California (as barriers or as local treatments) at low dosage rates.

Bait treatments are designed to attract termites to bait stations containing a toxicant, allowing termites to return to their nest and spread toxicant among colony members. Generally, termite bait is delivered within a cellulose or wood matrix infused with the active ingredient and installed underground at regular intervals around a structure. Commercial bait products are also available for above-ground use, where there is no soil for in-ground station installation. This method of controlling termites is very appealing because it doesn't require extensive site preparation, such as trenching, or extensive application of insecticides to the soil or structure, and because the most effective baits use insect growth regulators (IGRs) to suppress or destroy the entire colony.

According to the PNW Handbook, chemical application alone will not eradicate termites and is discouraged.

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<http://ipm.ucanr.edu/PMG/PESTNOTES/pn7415.html>

Typical Habitat

Turfgrass, ornamental beds.

Identification and Characteristics

White clover is a perennial often found in association with turfgrass. It is considered problematic in some heavily used park areas because of its attractiveness to bees.

White clover leaves are trifoliate with 1/4- to 1/2-inch-long leaflets. The flowers of white clover are formed in heads that are white to pale pinkish. White clover has a creeping stem system, allowing it to form large clumps.

Look-alikes

The native *Oxalis* has larger leaflets and yellow flowers with five regular petals.

Reproduction and Spread

Germinates in fall. Germination continues throughout the winter and early spring months. Clover seed remains viable for several years. The seed is heat-tolerant and hence somewhat resistant to composting and solarization.

Non-chemical Management Strategies

In turfgrass adjust cultural practices to favor grass. A fertilizer program to include more nitrogen and less phosphorus in turfgrass can help exclude clovers (though this may not work to eliminate already established clover in turfgrass). UC IPM recommends 1 pound of active nitrogen per 1,000 square feet of turfgrass during each month of active turfgrass growth (not to exceed 4 lb active nitrogen/1,000 sq ft/year). Use slow-release or time applications to avoid runoff. Higher mowing is also recommended by some as a way to allow grass to be more competitive.

Mulching can prevent establishment in ornamental beds. Hand-pulling and cultivation can also be effective.

Biocontrol Availability

Bacterial isolates have been explored as potential biocontrol agents but none are commercially available at this time.

Chemical Management Strategies

In turfgrasses a number of post-emergent herbicides are available. According to UC IPM, 2,4-D is not effective.

Sources for Further Information

UC IPM. 2007. Pest notes: Clover. <http://ipm.ucanr.edu/PMG/PESTNOTES/pn7490.html>

Yellow Nutsedge*Cyperus esculentus*ODA Noxious Weed List – **B listed**Clackamas SWCD Weedwise – **Maintenance****Typical Habitat**

Grows best in moist areas, and can be found in irrigated agricultural areas, ditches, and along the shores of lakes, rivers, streams, and marshes.

Identification and Characteristics

Yellow nutsedge is an erect, grass-like perennial, characterized by its shiny yellowish green leaves, triangular stem, golden-brown flower head and shallow rhizomes (horizontal underground stems) that produce many nut-like tubers. Stems (1/3 to 3 feet tall) are erect, hairless, unbranched and triangular in cross-section. The leaves are light yellowish-green (4 to 12 inches long or longer, 1/8 to 1/2 inch wide) with a prominent mid-vein, a waxy surface and a gradually tapering, pointed tip. Young seedlings are often confused with grasses. This species reproduces primarily by tubers and less often by seeds. Rhizomes help to enlarge patches.

Look-alikes

May be confused with other sedges that have triangular stems, especially tall flatsedge. However, yellow nutsedge has a loose, open flower head, while tall nutsedge has more of a dense, spherical cluster.

Reproduction and Spread

It can be difficult to control because of its underground system of rhizomes, tubers, and bulbs. If even one tuber is left behind, the plant can quickly regenerate. The tubers can also stay viable in the soil for 3 to 4 years. Some research suggests it produces a chemical that is harmful to crops.

Non-chemical Management Strategies

Tillage at four-week intervals depletes the energy reserves of the tubers. Crop competition can be used effectively since fast growing crops, planted at high densities, will form dense canopies that can then outcompete yellow nutsedge.

Chemical Management Strategies

Halosulfuron methyl, Glyphosate, Dichlobenil, S-metolachlor are all effective in controlling Yellow Nutsedge.

Sources for Further Information

Clackamas SWCD WeedWise. 2018. Yellow Nutsedge. <https://weedwise.conservaiondistrict.org/cyes-2>

Oregon Department of Agriculture. 2018. Yellow Nutsedge.

<https://www.oregon.gov/oda/shared/Documents/Publications/Weeds/YellowNutsedgeProfile.pdf>

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<https://pnwhandbooks.org/weed/agronomic/corn/sweet-corn/yellow-nutsedge-control-0>

Washington State Noxious Weed Control Board. Yellow Nutsedge.

<https://www.nwcb.wa.gov/weeds/yellow-nutsedge#>

Yellowjackets (Stinging)	Western yellowjacket (<i>Vespula pensylvanica</i>) - native Common yellowjacket (<i>Vespula vulgaris</i>) - native Aerial yellowjacket (<i>Dolichovespula arenaria</i>) - native German yellowjacket (<i>Vespula germanica</i>) – not native
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Typical Habitat

Yellowjackets make two types of nests:

- ground nests, in mouse burrows or similar sites (western and common yellowjackets), also sometimes inside walls of structures
- aerial nests in trees, in sheds, or under the eaves of buildings (aerial yellowjackets).

Aerial nesters tend to be less of a nuisance at picnics or barbecues since they are almost exclusively predators. The exception is when they build nests over doorways or in well-trafficked areas.

Identification and Characteristics

Yellowjackets are about 1/2 inch long, sparsely haired, with jagged bands of bright yellow and black on the abdomen. The head and thorax are black with yellow spots and bars. They have a short, narrow waist and a broad abdomen that tapers off like a cone to a sharp point.

As the colonies grow, they require large amounts of sugar to maintain the queen and workers; foraging wasps are particularly interested in sweet things through summer.

Defensive behavior increases as the season progresses and colony populations become larger while food becomes scarcer. In fall, foraging yellowjackets are primarily scavengers, and they are attracted to picnics, barbecues and garbage.

Look-alikes

Paper wasps are distinguished from yellowjackets by their long legs and thinner bodies. Paper wasps are much less defensive and they rarely sting humans. They typically shy away from human activity except when their nests are located near doors, windows, or other high-traffic areas.

Paper wasps hang their paper nests in protected areas such as under eaves, rocks, or tree branches, or in attics, exterior light fixtures and birdhouses. The umbrella-shaped nest hangs from a stalk and has lacks an enclosing envelope. The cells are open, and may reveal heads of the larvae.

Baldfaced hornets are generally nonaggressive yellowjackets. They are about 3/4 inch long with black and ivory markings on most of their body. They can have nests close to human activity all summer without being discovered or being a nuisance. Full sized nests are about the size of a basketball. Nests are pear-shaped and completely enclosed by a "paper" covering.

Reproduction and Spread

Nests are started by a single inseminated queen that emerges during the spring after overwintering in a protected location. Nests are generally built no more than 400 meters from a protein source or one kilometer from a honey source. By the end of summer thousands of yellowjackets may be present in a nest. Most yellowjackets die with the first frost; the queen overwinters in sheltered locations like buildings or outdoors under bark, stones, loose leaves. Nests are not reused in Oregon by either paper wasps or yellowjackets; however, paper wasps often construct nests in the same location each year.

Prevention

Restrict the food supply. Pay particular attention to garbage cans and dumpsters. Use garbage cans with a domed top fitted with vertical spring-loaded doors and empty frequently, ideally in early afternoon and at dusk. Use strong liners otherwise. Keep dumpster lids closed. Clean garbage cans regularly with soap and water. Eliminate standing water. Place outdoor trash cans, recycle bins and dumpsters away from building entrances. Avoid planting flowering trees, shrubs or flowers immediately adjacent to building entrances, walkways or playground areas.

Reduce nesting site by capping open fence-pipe ends, and by sealing gaps, holes and other openings into voids in walls, doorways, eaves and roofs.

Collapse rodent burrows once a year, particularly in areas where there is regular rodent burrow activity and human foot traffic. This is best done December – February to avoid stirring up ground-nesting yellowjackets.

Avoid perfume, scented body care products, and red, orange or yellow clothes to reduce harassment.

Monitoring

Conduct regular inspections around structures. Look for nests tucked under eaves, in/on playground equipment, inside utility boxes, ground holes, etc. Early detection and removal is less likely to result in stings.

Non-chemical Management Strategies

Yellowjacket traps which contain food baits or pheromones as attractants are widely available. It is important to use non-insecticidal baits for traps to avoid harming birds or other animals which may feed on poisoned yellowjackets or baits. Traps should be placed near the nest and away from people.

Lure traps can help reduce the number of localized foraging workers, but they don't eliminate large populations. Lure traps contain a chemical that attracts yellowjackets into the traps, but the common lure in traps, heptyl butyrate, attracts primarily the western yellowjacket and not other species. Meat such as chicken can be added as an attractant and is believed to improve catches of *V. vulgaris*.

Alternatively, bait yellowjacket traps with pheromones or with proteins in early summer, and sweets in late summer. Protein baits need to be moistened or renewed more often than sweet baits. Some protein baits include cat food, spam, beef, ham, fish or liver. Apple juice and grenadine/cherry drink baits are effective sweet attractants.

To reduce the number of yellowjackets foraging in specific areas such as patios, picnic tables, concession stands, and Dumpsters, place lure traps with heptyl butyrate around the periphery. In large areas such as parks, place traps about 200 feet from the area to be protected and about every 150 feet along the circumference.

Periodically check traps to remove trapped yellowjackets, replace lures, and make sure workers are still attracted to the trap.

Trapping queens during the 30 to 45-day emergence period has the potential to provide an overall reduction in the yellow jacket population for the season. Typically one trap per acre is adequate in spring for depletion trapping of queens.

Vacuuming is commonly used for ground-nesting yellowjacket nests. A vacuum hose may be placed near the nest entrance. Careful observation of nest response may convey the size of the nest and therefore how

long it may take (2-3 hours). Yellowjackets may begin to ignore the vacuum, so it may be effective to turn the vacuum off for 20 minutes after the first hour, then resume vacuuming. A bee suit is strongly recommended.

Soapy water poured down a nest hole, or sprayed/hosed onto a paper wasp nest. Water alone will simply bead up on the exterior of their waxy cuticle, but the soap will facilitate not only suffocation, but make it difficult for them to fly as well. This knock-down method allows you to vacuum up the wasps and remove the nest.

Ground nests have been eliminated in some cases by placing a clear bowl over the nest entrance, securing bowl edges by pushing the bowl into the dirt and filling any gaps with cloth. The yellowjackets are unable to leave the nest, but because they could still see sky, they did not dig a new way out. After a few weeks the colony starved and died.

Fill ground nests with fine, dry sand, preferably after dark.

Biocontrol Availability

A study investigating nematodes (*Steinernema feltiae*) suggests that these organisms could be successful biological controls for yellowjackets.

Chemical Management Strategies

Chemical methods should be avoided. Wasps are important beneficial insects, preying upon plant-feeding insects and nuisance flies. In addition, western yellowjackets defend their nests vigorously and may attack as they sense poison.

Silica aerogel combined with pyrethrins is an effective insecticidal dust that can be used to destroy an underground nest or a nest in a wall void. Silica aerogel is made from sand and works by absorbing the outer waxy coating on insect bodies. Once this coating is gone, the insects cannot retain water and die of dehydration. For outdoor ground nests, apply at night and then plug the entrance with dusted steel wool.

When necessary, aerosol pyrethrins can be used to quickly knock down guard wasps at the nest entrance and to kill yellowjackets in aerial nests when they must be destroyed in the daytime. Such products are designed to project a stream of spray 10 to 20 feet and contain highly evaporative substances that "freeze" or stun the yellowjackets. After chemical treatments, inspect the area after 24 hours to ensure that the colony was eliminated. Hornets, yellowjackets and wasps sometimes attempt to rebuild a nest where one was removed. If so, treatment may need to be repeated.

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APPENDIX M-CONTRIBUTORS TO THE IPM PLAN

This plan was developed as a team effort with contributions from the following individuals.

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