City of Watsonville

Integrated Pest Management (IPM) Program Summary and Review

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IPM Program Summary and Review

Watsonville, California

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Limitations

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1. INTRODUCTION

The City of Watsonville is responsible for keeping Watsonville's open spaces, trails, parks, streets, infrastructure in optimal condition in a manner that is consistent with community values. Key goals of operations and maintenance practices include protecting public health and the environment, supporting economic revitalization efforts, and enhancing the City's recreational opportunities. One of the many facets of achieving these goals includes the management of pests and their damage.

Pest management on City properties is primarily conducted by the following departments:

- Parks and Community Services Department
- Public Works & Utilities Department
- Municipal Airport

The Parks Division ("Parks") within the Parks and Community Services Department is responsible for pest control, including landscaping, in City parks and rights-of-way, while the Municipal Airport ("Airport") staff are responsible for managing pests at the Watsonville Municipal Airport. The Field Services Division ("Field Services") within the Public Works & Utilities Department is responsible for non-landscaping vegetation and burrowing rodent control in trails, open space, rights-of-way, alleys, levees, and other sites. Vegetation management is supplemented by the City's Water Operations Division as needed and by contractors hired to assist in the maintenance of landscaped areas and the Watsonville Wetlands Trail System.

The City takes an Integrated Pest Management (IPM) approach to pest management. For the purposes of this report, the University of California Statewide IPM Program's (UC IPM's) definition of IPM is used:

*"**IPM** is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment."*

Furthermore, UC IPM provides the following definition for pests:

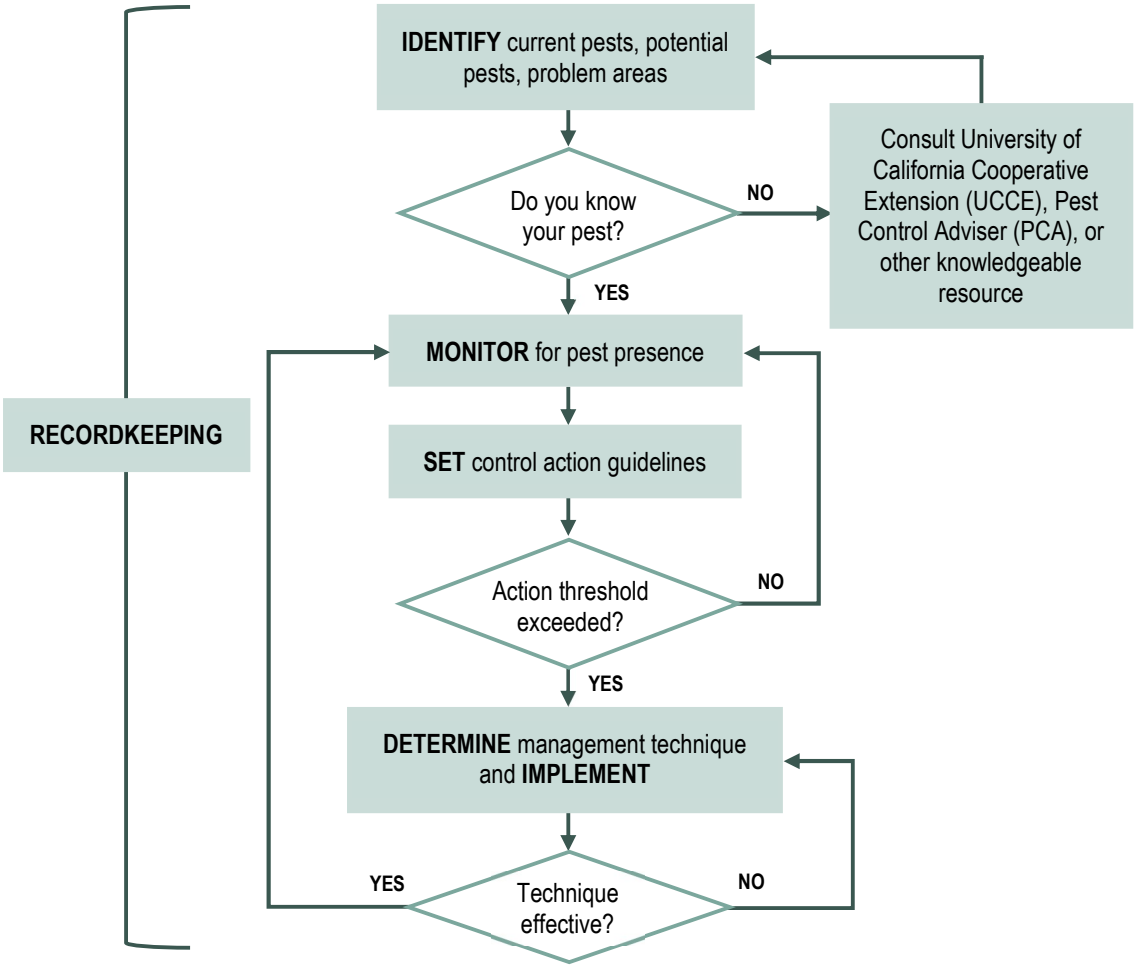
"***Pests** are organisms that damage or interfere with desirable plants in our fields and orchards, landscapes, or wildlands, or damage homes or other structures. Pests also include organisms that impact human or animal health. Pests may transmit disease or may be just a nuisance. A pest can be a plant (weed), vertebrate (bird, rodent, or other mammal), invertebrate (insect, tick, mite, or snail), nematode, pathogen (bacteria, virus, or fungus) that causes disease, or other unwanted organism that may harm water quality, animal life, or other parts of the ecosystem."*

In general, comprehensive IPM programs generally consist of the following components:

1. Pest identification
2. Monitoring for pest presence
3. Establishment of control action guidelines, including action thresholds
4. Implementation of one or more pest management techniques
5. Recordkeeping

A simplified flowchart summarizing these components is shown in **Figure 1** below.

Figure 1. Simplified IPM Flowchart



1.1. Background

On April 23, 2019, the Watsonville City Council passed a resolution discontinuing the use of glyphosate-based herbicides (e.g., Roundup®, etc.) on all City properties. The glyphosate ban went into effect on July 1st and prohibits City departments and City landscape contractors from using Roundup and other glyphosate-based herbicides for weed control on public property.

Following the ban on using glyphosate-based herbicides on City properties, City staff from three departments formed an Integrated Pest Management (IPM) Committee. The IPM Committee's purpose is to develop standardized policies and practices for safe and effective landscape pest control on City properties that prioritizes human and environmental health. The IPM Committee intends to be proactive in communicating pertinent information to all impacted departments. The IPM Committee is composed of representatives from all departments that conduct landscape maintenance to ensure each department's interests are represented in decision-making.

The City of Watsonville does not currently have a formally adopted IPM policy or plan; however, an Interim Pesticide Use & Notification Policy (**Attachment A**) was developed and implemented on November 1, 2019 as a temporary measure to guide the City's pesticide usage, following the ban on glyphosate-based herbicides and public interest to limit the overall use of pesticides to protect human and environmental health.

1.2. Purpose

The purpose of this report is to describe findings pertaining to the City's IPM activities, provide recommendations to support practical IPM best practices and enhance field and administrative planning efforts, and to assist in the development of a final IPM policy.

Findings and recommendations in this report pertain to weeds, gophers, ground squirrels, and moles that occur in City properties including: public rights-of-way, public parks, the municipal airport, and wetlands, trails, and open space.

2. CITY OF WATSONVILLE IPM PROGRAM OVERVIEW

To learn about the pest management practices employed on City-maintained grounds, Blankinship performed site reconnaissance and spoke with City staff and contractors. Documents and data such as Pesticide Use Reports (PURs), Pest Control Adviser (PCA) written recommendations, training records, maps, activity logs, pesticide inventories, staff reports, and contracts were also reviewed.

The following subsections describe findings on the current state of the City's IPM policy and program activities. A tabular summary of these findings, as well as findings pertaining to recordkeeping, reporting, and training, for the City of Watsonville and other organizations is presented in **Attachment B**.

2.1. IPM Policy

On October 14, 2019, the City's IPM Committee prepared an Interim Pesticide Use & Notification Policy for Fiscal Year 2019/2020, referred to by staff as an IPM Policy. The Interim Policy describes the City's goal of minimizing the use of pesticides on City property, bans the use of glyphosate and pesticides categorized by the U.S. Environmental Protection Agency

(USEPA) as Category I (i.e., high toxicity), outlines IPM program procedural guidelines, and establishes posting and notification procedures for pesticide applications. Refer to **Attachment A**.

2.2. Pest Management Approaches

The primary site types in which IPM is performed include: public rights-of-way, public parks, municipal airport, and wetlands, trails, and open space. A description of each site type, associated pests, and typical management approaches is provided in the subsections below.

Note that management approaches can be generally grouped into one or more of the following categories:

- ***Physical/mechanical control*** tools are practices that kill or damage a pest directly, physically block or prevent pest entry, or make the environment unsuitable for pests.
- ***Biological control*** is the use of natural enemies or other species to manage pests, typically in an effort to restore, enhance, or mimic naturally occurring conditions.
- ***Cultural control*** techniques are preventative measures that discourage damaging pest populations from developing by reducing a pest's ability to establish, reproduce, disperse, and survive.
- ***Chemical control*** is the use of pesticides which are intended to kill, prevent, repel, or mitigate pests. Pesticides intended to control plant pests are referred to as herbicides, while pesticides intended to control rodent pests are referred to as rodenticides.

Descriptions of a number of control techniques that are currently used or may potentially be used for the control of weeds, burrowing rodents, and moles on City properties are provided in **Attachment C**.

2.2.1. Public Rights-of-Way

Description: The City is responsible for maintaining public rights-of-way (i.e., roads, medians, and street alleys), including approximately 25 miles of roads, 13 acres of medians and roadside planters, and 48 alleys. Diagrams illustrating alley maintenance areas are provided in **Attachment B**. Street medians are maintained by Parks to maintain clear sightlines, maintain structural integrity, and for aesthetic purposes. Parks is also responsible for maintaining several planters installed along sidewalks and in medians for aesthetic purposes.

Maintained right-of-way, Pennsylvania Drive

City roadsides, lots, and alleys are maintained by Field Services to maintain roadway and traveler safety. To accomplish this goal, several objectives have been established for road maintenance activities. These objectives include minimizing traveler safety risks, preserving the integrity of existing infrastructure, and reducing fire risks.

Maintenance efforts in street medians, sidewalks, planters, and roadsides by City Departments are also supported by contractors. Contractors maintain specific sites with the goal of providing a pleasing landscape environment and minimizing impacts of invasive species on City property.

Pests: Pests in medians and planters include weeds such as dandelion, clovers, spotted spurge, kikuyu grass, English daisy, bermudagrass, thistles, pigweed, annual bluegrass, plantains, mustard weed, poison hemlock, foxtail, johnsongrass, and purslane. Overgrown vegetation in all managed right-of-way sites also warrants control. Weeds are often identified based on institutional knowledge of physical characteristics and historical problem sites. In some cases, weeds may be indiscriminately identified based on presence in an undesirable location.

Gophers and ground squirrels invading and causing damage to street medians and roadsides are also considered pests. As gophers spend most time underground, they are identified based on observations of the presence and shape of fresh soil mounds created as a result of gopher activity.

Action Thresholds and Typical Management Techniques: Weed tolerance is low in areas that require bare ground control such as hardscape cracks, curb lines, and fence lines. In bare ground areas, seedbanks are treated with pre-emergent herbicide twice per year to control both cold-season and warm-season germinating plants. For weeds that are not adequately controlled by pre-emergent herbicide or that grow in areas that require more selective, non-bare ground control, Parks undertakes control activities once seedlings reach the 3-4 true leaf stage and before the flowering stage of more mature plants. Weeds that have exceeded 12 inches in height are typically weed whacked then treated with post-emergent herbicide to discourage regrowth.

Maintained fence line along access road

In medians, careful consideration is given when selecting and using control tools. Some weed management tools may not be suitable for use on medians due to their size, while use of some other mechanical tools such as mowers and weed whackers can cause rocks and debris to ricochet off fast moving parts and damage nearby property or passing vehicles.

Airport Boulevard median landscaping

Weeds occurring along roadsides or in alleys are typically controlled by Field Services through a combination of mowing, weed whacking, pre-emergent herbicide application, and post-emergent herbicide application once they exceed 2 inches in height. Parks staff have also undertaken several projects aimed at reducing weed pressure in large rights-of-way areas through the combined use of herbicide application, sheet mulching, and weed mat installation. In some sites such as medians on Bridge Street, these areas are further enhanced through the installation of drought-tolerant plants.

In areas where there is higher tolerance for weeds, control via weed whacker is implemented once weeds reach a height of approximately 18 inches.

Vegetation management activities performed by contractors are typically performed based on a calendar schedule. Assigned project areas are visited and touched up on a weekly to bi-weekly basis for routine maintenance using a variety of control techniques such as weed whacking, hula hoeing, hand pulling, herbicide application, mowing, pruning, weed raking, blowing, and mulch and weed mat installation. Some areas, such as bioswales and certain planter beds, are controlled through manual weeding only. In addition, where specific control activities are not needed on a weekly basis, thresholds are established based on knowledge of pest physiology, influence of environmental conditions, plant size, and expected longevity of individual control tools. For example, pruning and edging are performed based on species and seasonal considerations, while fertilizer applications may be scheduled just prior to an irrigation event. Fertilizers are not applied during the rainy season to prevent excess offsite runoff. Tree branches extending below the target canopy height of 15 feet are pruned and installed mulch and weed mats are replaced every 2-3 years once the materials begin to deteriorate or lose effectiveness.

Gophers and ground squirrels occurring in medians and other right-of-way areas are fumigated using carbon monoxide-generating devices and trapped as needed to maintain public safety. Management activities are triggered by the presence of gopher or ground squirrel burrows in walking paths or maintenance roads where pest presence can pose safety hazards and/or damage equipment.

Maintained median

Special Considerations: Keeping up with necessary pest management activities is particularly important along rights-of-way because overgrown vegetation can directly and indirectly contribute to public safety risks. Obscured sight lines and tripping hazards can be a significant safety issue for the traveling public, while staff must spend additional time working next to moving traffic to achieve acceptable levels of control. Furthermore, additional precautions must be taken in the event that temporary lane closures are necessary to complete pest management activities and the normal flow of traffic is interrupted. Another issue is that gopher mounds can create an uneven surface that reduces mowing and weed whacking effectiveness, wears down blades and other equipment parts, and increases the frequency of necessary equipment servicing. Landscaped vegetation on rights-of-way also carries a low pest tolerance due to the aesthetic value placed on certain planters, particularly those located along major City thoroughfares, by the public and other stakeholders.

2.2.2. Public Parks

Description: Approximately 75 acres of public park land is maintained by the Parks Division as well as hired contractors. Pests are managed in parks to enhance recreational safety and enjoyment, promote park stewardship, protect native and other beneficial or desirable species, and support existing uses of associated facilities. City parks are classified as either pocket parks, neighborhood parks, or community parks.

Pocket parks are small parks that serve residents in immediately adjacent neighborhoods and provide basic recreation amenities, such as playgrounds, benches, and landscaping. The City currently maintains 19 pocket parks, each ranging from 0.5 to 2 acres in size.

Franich Park

Neighborhood parks are mid-sized parks that support close-to-home recreation activities for surrounding neighborhoods. These parks are designed primarily for non-supervised, non-organized recreation activities and provide facilities such as playground equipment, outdoor courts, picnic tables, pathways, and multi-use open grass areas or small sports fields. Neighborhood parks provide access to recreation for nearby residents, enhance neighborhood identity, and preserve open space. The City oversees 4 neighborhood parks, generally 2 to 10 acres in size.

Community parks are larger parks that provide both active and passive recreation opportunities that appeal to the entire community. Active recreation in community parks is supported by facilities such as sport fields, outdoor courts, skate parks, and recreation centers. These parks may also include natural areas and trails. The City maintains 3 community parks that typically occupy at least 15-20 acres each.

Community event hosted at a City park

Pests: The primary pests occurring in public parks include weeds such as *Malva* spp., Bermudagrass, kikuyu grass, bristly oxtongue, crabgrass, and white clover in lawns and pampas grass in surrounding areas. These turf weeds create several problems that include uneven turf and bare spots that may result in trip hazards. Pampas grass may displace native vegetation and be a fire hazard when dry. Weeds may be indiscriminately identified based on presence/absence or identified based on institutional knowledge.

Burrowing turf pests such as gophers, ground squirrels, and moles also require management. These pests are identified based on observations of tunnel mound shape and size in affected areas.

Joy McKenzie Park

Action Thresholds and Typical Management Techniques: Within the City's system of public parks, certain structures such as fence lines, hardscape cracks, building foundations, and turf perimeters have a low tolerance for weed presence and are typically treated as bare ground areas. In such areas, preventative applications of pre-emergent herbicides are applied twice annually to reduce the number of undesired weed seeds that germinate during the cold and warm seasons. For weeds that are not adequately controlled by pre-emergent herbicide or that grow in areas that require more selective, non-bare ground control, control activities are undertaken once seedlings reach the 3-4 true leaf stage and before the flowering stage of more mature plants. Weeds that have exceeded 12 inches in height are typically weed whacked then treated with post-emergent herbicide to discourage regrowth. In park areas with large weedy areas, Parks staff may also use a combination of herbicide application, sheet mulching, and weed mat installation to reduce weed pressure. In some sites such as the Main Street entrance of Ramsay Park, these areas are further enhanced through the installation of drought-tolerant plants.

On hillsides and slopes in areas that have a higher tolerance for pests and may be prone to erosion, overgrown vegetation is controlled via weed whacker once the threshold height of 18 inches has been reached and not usually sprayed with an herbicide.

Vegetation and pest management efforts in some public parks are at times supplemented by the use of contractors depending on operating budgets. Examples of contractor activities in parks include biweekly turf mowing, tree pruning, and gopher control. No edging or weed management is performed by contractors.

Weedy area replaced with drought-tolerant plants and mulch groundcover at Ramsay Park

Control of burrowing turf pests is typically implemented in anticipation or in response to public complaints regarding aesthetic and functional impacts to turf areas and athletic fields. Management activities may also be triggered if the need to manually knock down burrow entrance mounds significantly impacts the City's ability to perform other activities such as routine mowing, or if burrows are observed in walking paths or under structures such as sound walls, benches, and garbage cans. Where the presence of or damage from these pests interfere with the intended functional use of facilities such as ball fields, tolerance is low and control activities are prioritized accordingly. When management is needed, gophers, ground squirrels, and moles inhabiting public park areas are controlled through the use of baits, traps, and/or carbon monoxide burrow fumigation.

Special Considerations: Because of their high degree of public use, pest management strategies in public parks are carefully planned and considered so that management activities themselves do not introduce actual or perceived undue risk to the public. For example, in light of current public perception regarding pesticides, pesticide use and application frequency is minimized to the extent possible in public parks in favor of alternative non-pesticide control methods.

2.2.3. Municipal Airport

Watsonville Municipal Airport

Approach end of Runway 20 at Watsonville Municipal Airport

"Crack weeds" well controlled on airport tarmac

Description: The Watsonville Municipal Airport is a regional general aviation airport and the sole airport within Santa Cruz County. Airport staff are responsible for maintaining approximately 330 acres of land to support the safe navigation of aircraft departing from and returning to the airport. Specifically, Airport staff manage pests to maintain site, sign, taxiway, lighting, and runway visibility and minimize obstructions and debris that could interfere with aircraft operations and to meet Federal Aviation Administration (FAA) requirements.

Pests: Airport pests include weeds that are interfering with operational items such as pavement, safety areas, markings, signs, and lighting. “Crack” weeds that deteriorate asphalt integrity are also considered airport pests.

Wildlife hazards that can interfere with aircraft operations must also be managed. While wildlife hazards typically refer to birds and large mammals such as deer, ground squirrels that invade airport grounds are considered pests because they can attract predators such as raptors and coyotes in addition to undermining runways, taxiways, and roads with their burrows.

Action Thresholds and Typical Management Techniques: Action thresholds are primarily established to comply with FAA regulations. No weeds are tolerated within areas such as runways and taxiways. Specifically, all weeds growing within 6 feet of taxiways, 12 feet of Runway 9-27, and 30 feet of Runway 2-20 must be cleared and are typically maintained at bare ground levels through the use of herbicides.

Vegetation occurring in the in-field area is maintained through scheduled mowing. “Crack” weeds growing in and around hangars and aprons are considered lower priority pests and are spot treated with post-emergent

herbicide as needed. Alternatively, cracks may be resealed to reduce or prevent further weed establishment.

Action thresholds for ground squirrels are based on an assessment of the risk and magnitude of the wildlife strike problem for their airport. When ground squirrel levels are high enough to warrant control, carbon monoxide-generating burrow fumigation devices are typically used to reduce populations to acceptable levels. Due to concerns over the potential secondary poisoning of nontarget animals such as red-tailed hawks, no rodenticides are used for ground squirrel control.

Santa Cruz tarplant conservation area

Santa Cruz tarplant

Special Considerations: The airport is home to the largest population of Santa Cruz tarplant in California, a native annual wildflower that is listed as endangered under the California Endangered Species Act (CESA) and as threatened under the federal Endangered Species Act (ESA). Because of its status as a protected species, the Santa Cruz tarplant is prohibited from being killed or removed. As such, approximately 25 acres of airport grounds have been designated and maintained as permanent conservation easements. To maintain current populations and promote the propagation of the tarplant, vegetation managed in tarplant habitat is conducted based on guidelines outlined in the City's *Mitigation Plan for Santa Cruz Tarplant and Coastal Terrace Prairie at the Watsonville Airport*. These guidelines include, for example, modifications to the airport mowing regime in tarplant easement areas such as specifications on blade height and timing of maintenance mowing.

2.2.4. Open Space, Wetlands, and Trails

Description: The City maintains approximately 250 acres of open space, 482 acres of wetlands (includes approximately 70 acres of water at Pinto Lake City Park and 7 acres of the Pajaro River abutting the Water Resources Center), and 10 miles of trails.

Open space refers to permanent, undeveloped spaces which are managed primarily for their natural resource value and secondarily for recreational use. Open space and other natural areas may include wetlands, wildlife habitats, steep hillsides, or stream corridors and often serve to preserve or protect environmentally sensitive areas such as rare or endangered species as well as provide flood control.

Extensive bike paths exist on levees adjacent to Salsipuedes Creek and the Pajaro River. Vegetation and burrowing rodent management on these levees is done by both the City and the

Santa Cruz County Flood Control Division. Currently, the City is responsible for mowing and weed whacking on the dry side of the levee (within City limits) and the County is responsible for mowing, weed whacking, and/or herbicide application on the wet side of the levee.

The Watsonville Wetlands is a system of six freshwater sloughs that are home to over 220 bird species and 23 native plants that are State and federally listed as threatened or endangered species or species of special concern. The Watsonville Slough System is recognized as one of the largest and most significant freshwater wetlands remaining on California's central coast, providing 800 acres of freshwater marsh, seasonal wetland, and estuarine habitat.

Watsonville levee bike path on Salsipuedes Creek near Atri Park

Trails are linear open spaces that provide corridors and/or green buffers within neighborhoods and communities and serve to provide public access to natural features, preserve open space, and support trail-related recreation and transportation. The Wetlands Trails include approximately 9 miles of trails and abut multiple urban land uses, including residential areas, commercial developments, school facilities, and City recreational areas, providing opportunities to walk, jog, or bicycle. Additionally, Watsonville residents use the City's levees for recreational purposes, which include approximately 6 miles of developed trails within the City and local unincorporated County areas.

The City currently contracts with a non-profit organization, Watsonville Wetlands Watch, to maintain wetland areas and associated trails with the goal of restoring native conditions through invasive species removal, routine mowing and vegetation management, native plant seed collection/distribution, garbage removal, public education and promotion of volunteer opportunities, mulching, and native species planting efforts. Trail maintenance is supported by the City's Field Services Division, along with maintenance of open space. This work also includes vegetation management designed to reduce fuel loads and improve fire safety as well as provide safe conditions for trail users, such as by providing clear lines of site and reducing dense vegetation within areas adjacent to the trails in an environmentally appropriate way so as to limit unsafe activity within the trail network.

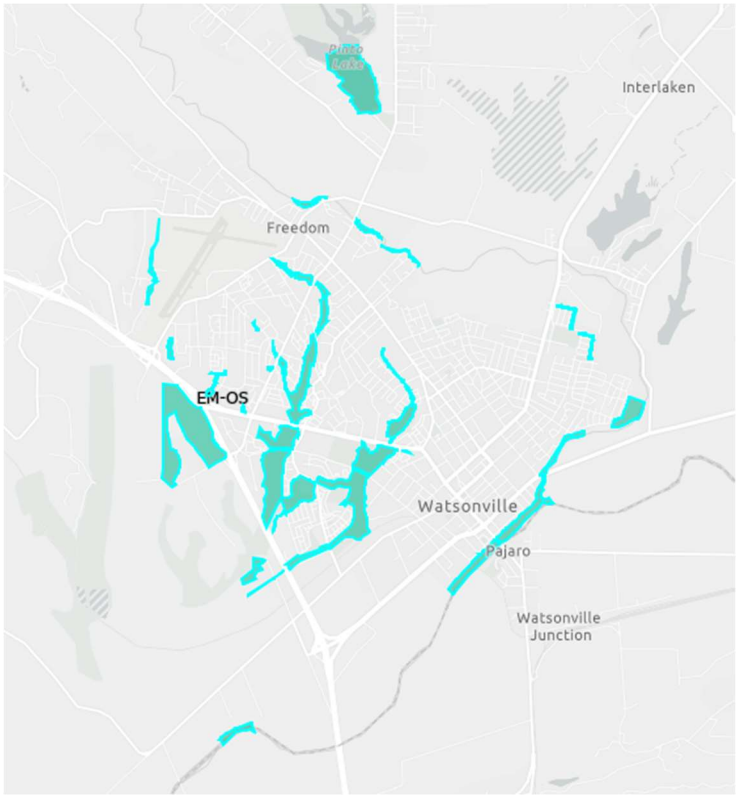
Pests: Within the Watsonville Wetlands Trail System, pests include noxious and invasive weeds, which compete with native plants for growing space, soil moisture, and nutrients and, as a result, can hinder natural habitats, degrade visual features of public spaces, and increase fire hazards on public lands. Invasive weeds can also adversely affect the progress of riparian and wetland revegetation efforts in the Trail System. To support efforts to preserve and enhance native slough habitats and natural resources, extensive pest identification and distribution mapping has been conducted. Examples of target weeds within the Wetlands Trails include poison hemlock, fennel, Italian and bull thistles, wild mustard and radish, yellow starthistle, teasel, bristly oxtongue, and harding grass. Additional information on these weeds and other target weeds is provided in the *Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual*.

Pests occurring in other trail areas and in open space are more generalized and include all weeds growing within trail walking areas that may pose a safety hazard for trail users. The presence of weed pests in open space areas may create a fire or aesthetic hazard or allow for the establishment and expansion of weeds that may displace native plants and disrupt the local ecology.

Action Thresholds and Typical Management Techniques: The Watsonville Wetlands Trail System is monitored weekly by contractors and City staff who maintain a 2- to 4-foot bare ground swaths or low vegetation through regular mowing along all trails using a combination of control tools such as tractors, weed whips, brush cutters, hoes, shovels, and mulch. A variety of mechanical methods are similarly used to control vegetation in the surrounding open space and natural areas to enhance native habitat and reduce unsafe conditions.

Entrance to wetlands trail path

To prevent the inadvertent spread of weed seeds, special care is taken to rinse vehicle tires between sites and regularly clean tools. Management activities are guided by species-specific considerations and typically timed to take place prior to the onset of flowering to prevent seed dispersal. Poison hemlock, for instance, is managed with mowing followed by rototilling and mulching. The space is then revegetated with native species.



Areas with an Environmental Management Open Space (EM-OS) designation in Watsonville

Chemical controls (i.e., herbicides) are used sparingly and only when there is a short-term need to gain control to initiate restoration efforts. They are always used in compliance with federal, state, and local laws and regulations, including environmental regulations that govern use of these methods within environmentally sensitive areas. Additional information on acceptable control methods, relevant species considerations, and details on mitigation and restoration strategies can be found in the *Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual*.

Weeds occurring in other trail areas are controlled through a combination of mowing, weed whacking, and herbicide application once they exceed 2 inches in height. In open

space, overgrown vegetation 18 inches or taller is weed whacked. In addition, by mid-June each year, staff carry out a coordinated effort to clear weeds and excess biomass in open space areas to reduce fire risks in preparation for anticipated Independence Day fireworks and an upcoming fire season. Particular attention is paid to managing weeds in open space areas that abut residential homes and fence lines. Resident complaints about nuisance pests also prompt management action.

Special Considerations: Because the Watsonville Wetlands provide habitat for a variety of protected species, the City and its contractors collaborate with agencies such as the California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (USFWS) to maintain compliance with State and Federal guidelines when planning and conducting maintenance and restoration activities. These guidelines include, for example, obtaining project work permits as necessary, conducting amphibian and nesting bird surveys prior to working in riparian/grassland areas, and avoidance of noise generating activities such as mowing in certain areas during nesting bird season.

3. IPM PROGRAM RECOMMENDATIONS

Based on the findings presented above and in **Attachment B**, the following recommendations are proposed to support IPM best practices and continued IPM program development.

The recommendations outlined below, if implemented, should be prioritized and the effort scaled according to need and resources and refined as needed to fit the City's IPM program goals and implemented with a schedule that allows for continued enhancement of the program while not interfering with necessary City activities.

3.1. Pest Identification, Monitoring, and Thresholds

Recommendation 1: Enhance plant identification skills and overall understanding of pest biology.

While several target weeds were identified by Parks as particularly challenging, the City departments responsible for pest management could benefit from enhancing plant identification skills and in-field use. Effective long-term pest management requires pest managers to know their pest, including when the pest is most vulnerable to control and critical windows for control. For example, inadvertent mowing of weeds during or after the plant has gone to seed will only temporarily reduce weed presence. Depending on the timing of seed germination, new plants will replace the mowed plants for one or more subsequent seasons. Potential resources for pest identification assistance include training sessions or seminars, species identification reference cards for field use, consultation with PCAs or the Santa Cruz County Department of Agriculture, consultation with research organizations such as the University of California Cooperative Extension (UCCE), and smartphone applications such as iNaturalist and PlantNet for weeds. In addition to pest identification, these resources may also help identify native or other non-target species that are similar in appearance but are not themselves target pests.

Accurate pest identification provides valuable information related to pest biology, including sites and conditions that encourage or discourage pest presence, damage potential, which control methods are most likely to be successful, and when to implement control measures. For example, the use of pre-emergent herbicides after plant emergence is not effective. Proper

weed identification can also provide information on when specific species are likely to emerge or set seed, viability and potential density of the seedbank, and how to time treatments so that desirable or native vegetation is minimally impacted by pest control activities. This type of information is useful in strategizing and planning management activities. For instance, mowing annual weeds and some perennial weeds once they have begun flowering and setting seed will merely spread the seeds and exacerbate weed issues by creating a seedbank for future plant growth. Because annual plants reproduce solely by seed, management activities such as mowing and post-emergent herbicide application are more impactful when implemented prior to flowering and seed development and dispersal. If management activities are conducted after the plant has gone to seed, weed pressure the following season may not be reduced.

In contrast, many herbaceous perennial weeds persist for multiple growing seasons and reproduce primarily by way of underground vegetative structures such as stolons, rhizomes, tubers, bulbs, and creeping roots; therefore, management activities are more impactful when implemented in a way that reduces or prevents the development of new weeds from such structures. For this reason, post-emergent systemic herbicides applied during the growing season or shortly before senescence is recommended. This approach is typically more effective than the use of post-emergent contact herbicides. Management activities such as mowing and hand pulling may provide short-term control but do not typically result in long-term control of perennial weeds.

Additional examples of using plant identification to strategize and plan management activities are found in the *Mitigation Plan for Santa Cruz Tarplant and Coastal Terrace Prairie at the Watsonville Airport* and the *Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual* (**Figure 2**). Photos and habitat information for the weeds listed in Figure 2 can be found in Appendix A of the *Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual.*

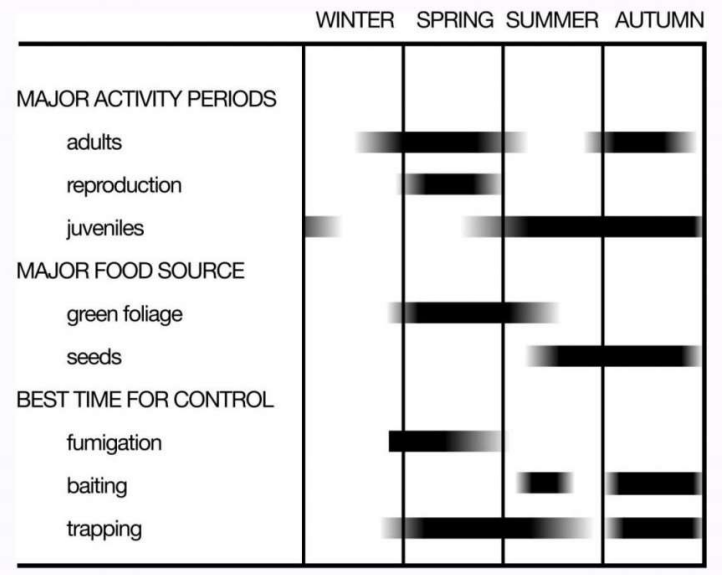
Figure 2. Typical Flowering Period of Invasive Weeds in the Watsonville Wetlands

Table 5. Typical Flowering Period of Invasive Weeds, Watsonville Wetlands Trail System Project Area

Common Name	*Scientific Name*	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Cape ivy	*Delaireia odorata*	■	■										■
English and Algerian ivy	*Hedera helix, H. canariensis*	■	■										■
Bermuda buttercup	*Oxalis pes-caprae*	■	■	■								■	■
Eucalyptus	*Eucalyptus ssp.*	■	■	■	■	■							■
Wild Mustard	*Brassica ssp.*		■	■									
Wild radish	*Raphanus sativa*		■	■	■	■	■						
Acacia	*Acacia spp.*		■	■									
Harding grass/ canary grass	*Phalaris aquatica, P. arundinacea*			■	■	■	■	■	■	■			
French broom	*Genista monspessulana*			■	■	■	■						
Teasel	*Dipsacus sativus*			■	■	■	■	■	■	■	■		
Poison hemlock	*Conium maculatum*				■	■	■	■					
Fennel	*Foeniculum vulgare*				■	■	■	■					
Kikuyu grass	*Pennisetum clandestinum*				■	■	■	■	■	■	■		
Bristly ox-tongue	*Picris echioides*				■	■	■	■	■	■	■	■	■
Himalaya berry	*Rubus discolor*				■	■	■						
Curly dock	*Rumex crispus*				■	■	■	■	■				
Iceplant	*Carpobrotus edulis*					■	■	■	■	■	■		
Italian thistle Slender-flowered thistle	*Carduus pycnocephalus* *Carduus tenuiflorus*					■	■	■	■				
Jubata and pampas grass	*Cortederia jubata, C. selloana*					■	■						
Yellow star thistle	*Centaurea solstitialis*						■	■	■	■			
Bull thistle	*Cirsium vulgare*							■	■	■	■		

For burrowing rodents and moles, accurate pest identification can provide information on eating and mating habits, burrow size and appearance, and seasonal or daily periods of typical activity. Refer to **Figure 3** for an example of how pest identification and understanding of pest biology helps to guide management decisions such as selection of appropriate tools and timing for ground squirrel management.

Figure 3. Ground Squirrel Biology and Control



Source: Baldwin, R.A. 2018. An integrated approach to managing ground squirrels and pocket gophers (Presentation).

For general information on pest biology, including descriptions of plant life cycles and burrowing pest biology and behavior, refer to **Attachment D**. For additional information on pest biology and how it can be used to inform management activities for these pests or others, consult a PCA, UCCE adviser, or other knowledgeable resource.

***Recommendation 2*: Encourage site monitoring, especially for sites with both substantial pest issues and a high degree of public use.**

Monitoring records can be valuable in resource load allocation, budgeting, justifying pest management decisions to concerned citizens and in tracking pest populations over time. Monitoring also inherently increases knowledge of the pests and allows pest managers to more accurately assess the impacts of environmental factors such as weather on pest populations, which in turn allows for more efficient and effective selection of pest control methods and timing.

Based on information gathered, inconsistencies exist regarding systematic site monitoring and post-treatment monitoring practices. If City resources don't allow for systematic monitoring of all management sites, consider implementing a monitoring program for only a limited number of sites at a time. At minimum, encourage pest managers to note monitoring observations if they visit a management site for non-IPM tasks. If the site is visited for a scheduled treatment or maintenance activity, note if the action threshold has not yet been met and consider postponing

treatment until the threshold is exceeded. For weeds, monitoring can also help assess the weed seed bank to plan for future management. Post-treatment monitoring is also recommended to evaluate efficacy and determine whether additional control efforts are required for problem pests.

Recommendation 3: Continue to develop and fine-tune action thresholds for pest management.

If current weed thresholds are primarily in reference to areas that require bare ground control (e.g., Airport taxiways and runways), think about what conditions typically trigger the need to perform weed control in non-bare ground areas such as landscape plantings or open space. Similarly, action thresholds for burrowing pests such as gophers, ground squirrels, and moles should continue to be refined. For example, when burrows exceed 6 inches in height and 5 or more burrows occupy 100 square feet or less, action is needed. This may be further refined based on usage where this criterion is lowered on an actively used baseball outfield but in raised in an area not commonly used. Action thresholds help pest managers determine when it's necessary to control a given pest and should reflect the City's tolerance of that pest.

Thresholds can be pest species-specific (e.g., control activities are prompted once a pest species reaches a certain density or height), site-specific (e.g., based on degree of public access), or time-specific (e.g., when a pest is in a particular life stage). For example, Parks aims to apply post-emergent control to weeds while they are in the 3-4 true leaf stage and before flowering. On hillsides, a string trimmer is used to control weeds once they reach 12-18 inches in height. In Field Services, weeds are typically controlled when they exceed 2 inches in height along rights-of-way. By establishing and implementing appropriate action thresholds, the unnecessary expenditure of City time and resources is minimized and the risk of incurring unacceptable property damage or economic loss as a result of pest presence is reduced.

3.2. Recordkeeping and Reporting

Recommendation 4: Collect data to allow for activity-specific cost analysis and informed pest management decisions.

While data related to pesticide use is generally well-recorded through the use of standardized forms, consider collecting equivalent data for non-pesticide-related activities such as mowing, hand pulling, mulching, weed whacking, and pruning for weeds and trapping for burrowing pests. All City departments were able to provide records or estimates of the annual time spent conducting specific vegetation control activities; however, to optimize the utility of this information, it should be supplemented to more easily allow for estimation of total cost per unit area.

Data collection associated with burrowing rodent and mole management is unknown at this time. In addition to data on time spent, data on cost of labor, cost of specific equipment and materials, and size of area treated should be collected for all pest management activities and can be used to track the cost of each management technique per acre and per year. Consider this cost along with other factors such as safety of staff and the public, staff resources, community values, regulatory requirements, and site management/service level goals to prioritize and plan future management activities.

***Recommendation 5*: Consider adopting a City-wide electronic database system to easily store, view, and analyze data.**

In addition, the use of structured PDF forms such as the Herbicide and Pesticide Application Log Sheet (**Attachment F**) which prompt staff to input specific pest management-related information should continue to be used. Development of an analogous form for non-pesticide management activities such as mowing, mulching, weed whacking, and hand pulling for weeds and trapping for vertebrate pests would also be beneficial. Such forms can be made interactive for rapid import to an electronic database or spreadsheet application.

Currently, City departments have different methods for memorializing IPM-related data and do not always record the same types of data or data that is directly comparable to other departments. Additionally, applicators struggle to fill out the Herbicide and Pesticide Application Log Sheet consistently due to lack of time and training. By utilizing standardized forms and a shared electronic database for recording data, the City can achieve greater consistency in the content and quality of pest control information that will simplify data analysis efforts and serve as a valuable tool in planning future work. Pesticide application details entered into the database can also be queried and used to quickly generate monthly Pesticide Use Reports. Inclusion of non-pesticide data such as square feet or acres treated and time spent using specific physical/mechanical control tools aids in demonstrating that the City takes an integrated approach to pest management rather than solely or primarily relying on pesticides. Maintaining records of both pesticide and non-pesticide activities can be a valuable tool in conveying this to and gaining support from stakeholders.

The work tracking system utilized by Field Services may serve as a good starting point for developing a template to be used by all departments for standardized data collection and analysis purposes. This approach may also be valuable for equipment and materials inventory control and future budgeting. Further, if the buying power of City departments are combined, potential cost savings from suppliers may be realized.

***Recommendation 6*: Document decision-making criteria for IPM program implementation.**

Information obtained from City staff suggests that treatment method selection decision-making is often pesticide-focused. While identifying scenarios in which pesticides are prohibited from use is important for decision making, there are many other IPM-related activities that are likely carried out based on criteria that may be generally understood and followed by pest managers but are not documented.

To document decision-making criteria, consider developing control technique selection flow charts or decision trees, outlining the pros and cons of various pest control strategies, and/or using standardized field forms to record which management activities were conducted and why. Consider phasing in selection criteria for different pest control techniques (e.g., biological, mechanical, physical, cultural, chemical) and new pesticide products, for example. In addition, keep records of public complaints and document areas where pesticides are not typically applied or where requests have been made that residents are notified prior to applications.

This information can help educate applicators, other City staff, and the public about when and why specific pest control methods are used and can help pest management staff make more informed decisions in the future.

Refer to **Attachment G** for examples of decision-making documentation developed by Contra Costa County, including a grazing flowchart and decision documentation for vegetation management on roadsides and road rights-of-way.

Recommendation 7: Maintain a list of known and identified pests in each management area or site type.

Include for each pest information on its location(s), life cycle, action thresholds, approved treatment methods, and, if necessary, site-specific management notes. Note that action thresholds may need to be tailored to address specific pest control objectives (e.g., fire hazard reduction, aesthetics) or site features (e.g., rights-of-way, open space, proximity to facilities or riparian habitat). Records of the pest population density and geographic distribution may aid in prioritizing pest control activities. When applicable, record relevant pest prevention mechanisms (e.g., vehicle wash-off when leaving sites hosting problem weeds, implement techniques to allow native grasses to out-compete the weed). The *Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual* provides a variety of relevant information for a number of target weeds and can be referenced or supplemented to maintain similar information for other City properties.

Recommendation 8: Document the system used to evaluate the effectiveness of the IPM program and/or individual IPM projects.

This can be done on the City- or department-level and may include tracking of hours spent on planning and control activity, acreage treated, efficacy of the control activity, material and/or labor costs for each pest control method employed, and progress in controlling specific pest populations. Remember that IPM involves integration of more than one control method and that pesticides can be an important tool in effective population management and habitat restoration. The amount of pesticides applied may vary from year to year based on any number of factors such as resources available, weather, type of pests, extent of infestations, product type (e.g., concentrations, application rates), and policy changes. Therefore, sole reliance on metrics such as gallons or pounds of pesticide use per year is not recommended as the metric to measure IPM success. Alternatively, evaluate more integrated metrics such as acres managed, resources spent, and resulting trends in pest population levels. Modify the IPM program as needed in response to factors such as changes in pests, the environment, and policy. Share areas of success, failure, and challenges faced along the way with other City staff, City Council, and other pest managers.

3.3. Training and Guidelines

Recommendation 9: Establish IPM Program administrative roles and responsibilities.

Implementing an effective IPM Program is a collaborative effort that is often most successful when the roles and responsibilities of those involved both directly and indirectly with pest management are clearly defined. In addition, communication among those involved is an important factor in seeing that IPM activities remain consistent with Program objectives. When individuals have a clear understanding of their respective roles and responsibilities, in addition to the roles and responsibilities of others, the potential for duplicated efforts, unfulfilled or unnoticed tasks, and confusion is reduced and the program has a greater chance of success.

One often impactful role to establish is that of an IPM Coordinator. The IPM Coordinator would be the primary overseer of the Program and would work with or be part of the IPM Committee to keep the Program active and support its successful implementation, including serving as a liaison between City staff and the public. Should a full- or part-time IPM Coordinator position be created, the person filling the role should have experience and background in IPM and be able to make sound IPM decisions.

***Recommendation 10*: Develop a formal IPM Policy.**

The City's Interim Pesticide Use & Notification Policy is a good first step in accomplishing this task and demonstrates a general understanding of the concept and practice of IPM; however, some areas of the Interim Policy appear to suggest that the purpose of IPM is to minimize or eliminate pesticide use.

It is important to acknowledge that IPM is not intended to be a formula to eliminate or reduce pesticide use. Rather, it is a coordinated application of all suitable management techniques, providing pest managers with options and the necessary tools to manage pests in a given system. By integrating information developed from research, field monitoring, and historical records with an understanding of the pest and surrounding ecosystem, IPM is a process which allows more reliable and effective decisions to be made. Thus, well developed, science-based IPM programs may result in reduced pesticide use by implementing a wider array of pest management techniques in a strategic manner rather than relying on pesticides alone. For this reason, IPM programs result in safer, more judicious use of pesticides rather than their "phasing out" or elimination.

In developing a final Policy, consider revisiting the definition and intention of IPM, why pest management on City properties is important, and the potential consequences of overly restricting the use of tools that may be critical in the long-term management of certain pests. Indicate what the goal of the policy is and develop objectives that help guide the City toward achieving that goal. Refer to **Attachment H** for suggested IPM Policy language which incorporates these elements into an example of a modified version of the City's Interim Pesticide Use & Notification Policy. Also see related Recommendations #14 and #15. Note that the level of detail and content of policies is a stylistic preference that varies widely between organizations.

Regarding the City's current Interim Pesticide Use & Notification Policy, it is recommended that an exemption process be established for one-time or short-term use of prohibited pesticides such as EPA Toxicity Category I and glyphosate-based herbicides, if such prohibitions remain in future updates to the Policy. Remember that all IPM tools, including pesticides, come with advantages and disadvantages and may be appropriate for use in some scenarios but not others. It should also be noted that based on the current state of the science, herbicides containing glyphosate, when used according to label instructions and best practices, do not pose an unacceptable risk to humans (applicators and the public), wildlife, or the environment.

The City's current Interim Pesticide Use & Notification Policy also includes guidelines for pesticide application notification procedures. This language was retained in Attachment H; however, it should be noted that the physical posting of notification signs is not typically required by product labels and can be a time-consuming and labor-intensive task. If it is desirable for notification procedures to remain in future updates to the Policy, consider implementing an online alternative in which virtual notifications of planned applications are posted to the City's

website. Note that this does not preclude the need to keep the public away from treated areas during and immediately after pesticide applications, or to post notification signs, if it is required by the product label. Such requirements are outlined on individual product labels and must be followed to maintain compliance with Federal law. If staff are unable to remain in the area after applying a product with a label that requires that people and pets be kept out of the area until sprays have dried, the physical posting of signs may be an appropriate alternative for the protection of both staff and the public.

***Recommendation 11*: Standardize training material and training requirements for all staff with pest management responsibilities and encourage all City employees that handle pesticides to obtain a QAL or QAC.**

In the Parks Department, for example, monthly safety meetings are held and checklist-style pesticide safety training records are maintained to document pesticide-related training events for the department. Consider adopting a similar approach in other departments as well as supporting staff who have obtained or intend to obtain a Qualified Applicator Certificate (QAC) or License (QAL) from the California Department of Pesticide Regulation (DPR), or who may otherwise benefit from obtaining one.

The knowledge gained from getting and maintaining the QAL/QAC credential allows staff to make informed decisions about pest control and keep abreast of new laws and regulations. Further, because the QAL/QAC is more knowledgeable, he/she is more able to communicate IPM techniques the public. Last, staff who hold a QAL/QAC are more informed on mixing/loading/applying pesticides and are less prone to making mistakes, and as a result are acting in a loss prevention capacity.

Remember that QALs and QACs must be held in a category consistent with the environment(s) in which pesticides will be applied. For example, staff who handle pesticides in residential, industrial, or institutional settings should obtain Category A certification, while those who perform landscape maintenance or right-of-way pest control should seek certification in Category B or Category C, respectively. All uncertified staff should receive annual pesticide handler training pursuant to 3 CCR § 6724 and be knowledgeable about new and existing laws and regulations related to pest control. Many City employees with QAL/QAC credentials appear to maintain their credentials by obtaining DPR Continuing Education Units (CEUs) from attending Pesticide Applicators Professional Association (PAPA) seminars. If the information provided at such seminars is not particularly relevant for tasks performed on City property, consider seeking CEUs from other training providers or workshops that are more targeted toward the City's needs.

For example, consider developing general IPM training for all relevant departments, covering topics such as: basic steps and practices of IPM, updates to the City's IPM program, laws and regulations, public communication and outreach, equipment calibration, chemical modes of action, interpreting product labels, recordkeeping requirements, worker protection, and other IPM-related Best Management Practices (BMPs). The training could be used in part to obtain DPR CEUs for QAL/QAC holders and satisfy the required annual pesticide handler training, pursuant to 3 CCR § 6724. City departments may also benefit from an open forum portion of the training where each can share with other departments or similar organizations information on treatment efficacy of new products or control methods, proposed treatment strategies for the

following year, new and emerging pest problems, and BMPs for preventing impacts to non-target organisms.

By creating more uniformity in training requirements, City departments with unique priorities and protocols are joined by common goals and approaches to manage pests in a way maximize efficacy and compliance and minimizes risks to non-target organisms and the environment. Such training also aids staff in making informed pest control decisions. Dialogue between departments sharing experimental, effective, or ineffective control strategies for problem pests will help work units learn from each other and may lead to new pest control strategies. Last, staff will gain tools to help communicate principals of IPM when they interact with members of the public.

Recommendation 12: Develop a written set of City-wide Standard Operating Procedures (SOPs), guidance documents, or an IPM Implementation Plan for activities that should be performed in a specific manner.

Potential utilities of these guidelines include standardizing protocols for activities such as monitoring, treatment timing, equipment calibration, and pesticide storage, transportation, and disposal; establishing Best Management Practices (BMPs) for erosion, drift, and runoff control and protection of special status species; and outlining important considerations in the selection, purchase, and use of pesticides. Department-specific details can be added as needed.

An example of mowing guidelines specifically implemented by Airport staff can be found in the *Mitigation Plan for Santa Cruz Tarplant and Coastal Terrace Prairie at the Watsonville Airport*. These guidelines may be designed for internal use and provided to the public upon request or made publicly available as part of an IPM Plan or similar reference document. Remember to periodically review and keep track of suggested modifications to the SOPs and consider incorporating them into an updated guidance document and in training materials.

Implementation of standardized protocols provides City-wide consistency for the IPM program and will assist in training of new staff and enhance the sharing of institutional knowledge. It also provides the public with evidence of the City's IPM policies and practices. Last, regular review of the City's IPM practices demonstrates responsiveness to staff and public concerns, changes in pests or the environment, and changes in pest control practices.

Recommendation 13: Update Parks Division Pesticide Safety Training Record form.

The form currently references the A Series (for production agriculture) of DPR's Pesticide Safety Information Series (PSIS) but should be updated to reference the N Series (for non-production agriculture).

3.4. Pest Control Methods, Strategies, and Considerations

Recommendation 14: Clearly define the City's rationale for pest control, considering how the presence or absence of pests impacts the public, the environment, the City, and City staff.

Consistent with the City's Strategic Plan, City departments are responsible for delivering quality programs, services, and facilities and improving the quality of life of residents. Because residents and staff may not always see eye-to-eye, it is important for staff to be able to communicate on the necessity for, value of, and strategies used for pest management. To

support this effort, the City should clearly define its rationale for pest management and see that staff are familiar enough with both the rationale and with the process of IPM to feel comfortable discussing such topics with members of the public if needed.

Part of defining the rationale for pest management involves understanding whether the benefits of performing control activities outweigh the costs of taking no action or restricting use of specific control techniques. For example, the presence of weeds along roadsides can obstruct the line of sight for travelers, conceal street signs, and prevent necessary roadside drainage. In open space and wetland corridors, weeds can outcompete native or other desirable plants, resulting in decreased biodiversity and reduced habitat for desirable insect and animal species. Weeds growing from cracks in the sidewalk or other paved areas pose tripping and falling hazards and may damage City property over time. Similarly, turf and ballfield holes and damage from burrowing rodents pose a safety hazard and can impact the quality and functionality of the City's recreational facilities. Other examples include pest management for regulatory compliance (e.g., Federal Aviation Administration), fire hazard reduction, public complaints, and site restoration efforts.

If possible, de-emphasize aesthetics and prioritize health, safety, and environmental stewardship. It may also be of interest to identify scenarios where pest management is less of a priority and there is a higher tolerance for pests (e.g., open space). Ideally, the rationale for pest control should be understood and supported by the City Council and other stakeholders in addition to the City departments and contractors responsible for pest management.

Consider making reference to the City's rationale for pest management in the IPM Policy and recording site- or species-specific details in a guidance document or IPM Implementation Plan. The City's Nature Center may also serve as a resource for information; consider preparing an IPM-focused brochure outlining was IPM is and how the control of invasive weeds supports site restoration and conservation efforts in the wetlands. Based on the role that the Nature Center already plays in educating visitors about the wetlands, trails, and utility conservation topics, such a brochure could also be used to highlight IPM activities that visitors can do at home such as pest identification and monitoring, and prevention and control techniques such as maintaining soil health, cleaning up litter which may serve as pest harborage, installing weed mats or mulch, and using clean materials when installing new landscape areas.

***Recommendation 15*: Set realistic, measurable goals for pest management and the IPM program.**

For example, it may not be possible to eliminate the use of pesticides on City property, nor is it the primary purpose of IPM. Goals should be reflected in the selection and implementation of various control methods. In addition, keep in mind that short-term actions may appear to contradict long-term goals, but this may not always be the case. For instance, a short-term increase in pesticide use or use of a higher toxicity pesticide is often required to control an established population of invasive weeds; however, this temporary increase may ultimately reduce the need for future pesticide use by reducing the density and distribution of the weed and/or weed seed population over time.

The Watsonville Wetlands, for example, has Himalayan blackberry, a non-native species that disrupts the ecology of the area. Habitat restoration efforts require removal of Himalayan blackberry that spread not only through the distribution of seeds but also through structures such as the crown, cane tips and nodes, and underground rhizomes. Selective use of a

systemic herbicide such as glyphosate may therefore be an important component of Himalayan blackberry management and wetland restoration efforts. An example of a goal in this case may be to reduce problematic Himalayan blackberry populations by 50% each year.

On an annual basis, consider revisiting the goals previously established to evaluate progress made and supplement them with new or modified goals.

***Recommendation 16*: To enhance knowledge of and protect sensitive species, consult qualified professionals and other resources in pest management activities and planning.**

Qualified professionals can provide valuable information about known and potential threatened and endangered species/habitats occurring within City boundaries as well as recommend or assist in practices to aid in their protection (e.g., nesting bird surveys) and comply with environmental regulations (e.g., California Endangered Species Act and court-ordered injunctions). In addition to providing guidance on special status species protection, qualified professionals may be able to assist with pest identification and support efforts to proactively reduce potential impacts to other non-target organisms that may be present at sites where pest management activities are taking place. Online resources such as DPR's Pesticide Regulation's Endangered Species Custom Realtime Internet Bulletin Engine (PRESCRIBE), the California Department of Fish and Wildlife's California Natural Diversity Database (CNDDB), and the U.S. Environmental Protection Agency (USEPA) webpage are also available for information on threatened and endangered species, including local occurrences and necessary protective measures.

***Recommendation 17*: Continue to utilize a variety of tools in your IPM toolbox.**

Remember that all IPM tools, pesticide and non-pesticide, come with advantages and disadvantages and may be appropriate for use in some scenarios but not others. Mowing, for example, is a common practice that allows for the temporary control of weeds without the use of herbicides; however, its fast-moving parts increase fire risks and the likelihood of debris being ricocheted and damaging nearby property. In sites with limited equipment accessibility, weed whacking may be a suitable alternative to mowing; however, the manual labor involved makes weed whacking less efficient than mowing. Goat grazing is often well received among members of the community and can be used in a variety of sites; however, goats may damage desirable plants or distribute invasive weed seeds to other sites via their droppings.

Shy away from overly restricting the use of management tools that may be important for addressing pest problems. Strategic use of IPM tools should be appropriate for the site type of interest and allow for pests to be managed in a way that action thresholds are maintained. For example, it is not always possible to effectively manage invasive plant populations without the use of conventional herbicides. In some cases, it may not be economically feasible to prohibit their use in favor of organic, "alternative," or "minimum risk" herbicides such as those which are exempt from registration by USEPA. There is often a high up-front cost of organic herbicides, for instance, as well as costs related to the high volume and concentration required to achieve satisfactory control, the "burn down" nature of these chemicals that often result in regrowth of the weed rather than killing the weed, the increased frequency of application likely needed, and associated staff time to maintain weed control throughout the year. Organic herbicides may also have higher acute toxicity than conventional herbicides (i.e., require increased personal protective equipment) and are typically principally effective on very small green weeds, so the

proper timing of applications is critical. Although they may be effectively used in certain areas such as select parks, organic herbicides alone may not be suitable for City-wide use.

Similarly, “minimum risk pesticides” exempt from registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 25(b) can likely be used effectively in some situations but are unlikely to be capable of maintaining service levels City-wide. Pesticides that are not required to be registered under FIFRA are also not required to be tested for efficacy against the target pest or toxicity to non-target receptors. In addition, labels for such products are often significantly less detailed than the labels of their registered counterparts, which are reviewed and approved by USEPA and DPR to their support safe and effective use.

It should also be noted that based on the current state of the science, herbicides containing glyphosate, when used according to label instructions and best practices, do not pose an unacceptable risk to humans (applicators and the public), wildlife, or the environment. Refer to the Cal-IPC fact sheet and position statement on the use of glyphosate for invasive plant management in **Attachment I** and letter to the Los Angeles County Board of Supervisors on herbicide use in **Attachment J**.

***Recommendation 18*: Continue supplementing working knowledge of available pest control tools.**

IPM requires an understanding of which control tools are available and how they can be used to support long-term, sustainable management efforts. When selecting control tools for a given pest population, consideration must also be given to pest biology, management objectives of the site, desired outcome of control activities (e.g., prevention, eradication, containment, or asset-based protection), sensitive or unique site features, potential nontarget impacts, and feasibility. Where possible, develop management strategies that focus on removing only the target pest. Consistent with the definition of IPM, a combination of management techniques should be used to help maintain pest populations at acceptable levels. For example, to maintain the integrity of and reduce safety risks associated with crack weeds growing in walking and other paved surfaces such as sidewalks, trails, and road aprons, consider first spot treating weeds with herbicide, then applying a sealant to fill cracks and prevent future weed establishment. Other tools, such as crevice and sidewalk weeding blades and weed whackers may in some cases be appropriate for use in lieu of herbicides; however, as with all control tools, limitations such as extensive manual labor requirements and the potential for flying rocks and debris to injure bystanders or damage property exist that may preclude them from being used on a large scale or in certain areas.

Working knowledge can also be supplemented by gaining familiarity with pesticide mechanisms of action and other characteristics that play a role in determining appropriate application timing and frequency, use locations, application equipment, target pests, and the potential for nontarget impacts. For example, pre-emergent herbicides are often used for seedbank management and are not effective on seeds that have already germinated. Post-emergent herbicides are applied to actively growing weeds and can be an important component of management strategies for invasive weeds such as Himalayan blackberry that are not likely or not feasible to be adequately controlled solely through non-chemical means. Always read and follow the product label instructions and remember that staff must be properly trained before handling any pesticide.

Valuable information on new and existing control tools, proper use of control tools, accomplishments and challenges of control efforts made by other organizations, and BMPs can be obtained from resources such as Continuing Education seminars, regional IPM coordinator meetings, UC IPM advisers, PCAs, and other knowledgeable sources. For descriptions of select management tools that are currently or may potentially be used for the control of weeds, burrowing rodents, and moles on City properties, refer to **Attachment C**.

Recommendation 19: Consider seeking consistency in pesticide vendor procurement or access.

Utilizing the same pesticide vendors and coordinated purchases allows for simplified tracking of what products are available for purchase and the associated unit costs. Alternatively, allowing City departments to purchase from and consult more than one vendor can be beneficial for having access to a wider variety of products and potentially identifying more cost-effective formulations of the same pesticide. For example, recent efforts to identify effective alternatives to glyphosate-based herbicides have led some City departments to purchase the glufosinate-based herbicide Loveland Forfeit® 280 or UPL Lifeline to manage weeds. While Loveland Forfeit 280 can be purchased from Nutrien Ag Solutions for approximately $80/gallon, UPL Lifeline is available from Target Specialty Products for approximately $200/gallon. Both products contain 24.5% glufosinate-ammonium and can be used in airports and parks. By having access to product and cost information for both products, pest managers are able to seek advice and determine whether differences in safety, efficacy, or utility justify differences in price.

Recommendation 20: Collaborate and partner with the County Flood Control Division to optimize vegetation management on both sides of the levee.

For example, both the City and the County use mowers and weedwhackers, but at different times and locations. Economies of scale may be realized if responsibility for mowing a particular area is that of the City or the County, but not both. Also, the timing of mowing is important so that weed seed in not inadvertently spread. Coordination of the City and the County to prevent this would be a benefit to both parties.

3.5. Additional Opportunities

Recommendation 21: Evaluate the cost effectiveness of various pest management tools to help guide decision making.

Obtain additional insight on the long-term costs and effectiveness of control tools that are currently used or proposed for use. Consider factors such as the cost of labor, equipment, and materials, treatment efficacy, frequency of retreatments, application rates for pesticides, potential for staff or public injury as a result of treatment implementation, and the size of the area on which the tool is intended to be used. A standard way to describe and compare the cost effectiveness of individual control tools is by estimating the cost of implementation per acre.

Recommendation 22: Review and enhance as needed management approaches for other pests and site types.

Findings and recommendations provided in this report pertain to weeds, gophers, ground squirrels, and moles that occur in public rights-of-way, public parks, the municipal airport, and wetlands, trails, and open space. Consider expanding evaluation efforts to other pests such as insects and structural pests as well as other site types such as City facilities.

ATTACHMENT A

City of Watsonville Interim Pesticide Use & Notification Policy

City of Watsonville
Parks & Community Services, Public Works & Utilities Department & Municipal Airport

M E M O R A N D U M

DATE: **October 14th, 2019**

TO: **All Department Heads and City Staff**

FROM: **Integrated Pest Management Committee**

SUBJECT: ***Interim* Pesticide Use & Notification Policy**

Dear Colleagues,

This Memo is to inform City staff on the *Interim* Pesticide Use and Notification Policy to be commencing on November 1st, 2019. Efforts are underway to develop a comprehensive Integrated Pest Management Policy for adoption by City Council in June, 2020. Until that time, this policy is designed to guide the City's pesticide usage, following the ban on glyphosate-based herbicides and public interest to limit the overall use of pesticides to protect human and environmental health.

Background
On April 23rd, 2019, the Watsonville City Council passed a resolution discontinuing the use of glyphosate-based herbicides (*Roundup*) on all City properties. The glyphosate ban went into effect on July 1st and prohibits City departments and City landscape contractors from using *Roundup* and other glyphosate-based herbicides for weed control on public property.

Furthermore, in acknowledgment that the ban may cause more resources to be needed for weed control, the City Council asked City staff to identify and provide an update on operational and fiscal impacts that result from the glyphosate ban in order to develop a long term policy and plan to effectively control weeds and landscape pests while maintaining adequate service levels and protecting public health.

Discontinuing use of glyphosate-based herbicides will require additional resources for vegetation control and may divert maintenance staff away from other work. It is anticipated that this will have an adverse impact on service levels as new methods and techniques for effective pest management on City properties will need to be studied and an integrated pest management (IPM) policy will need to be developed and implemented in order to effectively manage weeds and pests over the long-term in a way that protects City infrastructure and facilities, is acceptable to the community and aligns with the City's budget priorities. Further

studying of effective alternative methods for weed abatement will assist with decision making regarding the further reduction or elimination of use of all pesticides on City maintained properties.

Following the ban (4/23/19 City Council Meeting) on using *Roundup* and similar-type herbicides on City properties, City staff from three departments formed an Integrated Pest Management (IPM) Committee. The IPM Committee's purpose is to develop standardized policies and practices for safe and effective landscape pest control on City properties that prioritizes human and environmental health. With the ban currently in effect, The IPM Committee is examining the operational impacts of banning *Roundup* along with piloting several new pesticide application related procedures as described in this memorandum. Over the next year, the IPM Committee will be working with a consultant to develop a comprehensive IPM Program that will be recommended for adoption by City Council.

This IPM Work Plan for Fiscal Year 2019-20 is designed to meet the following goals:

1. Discontinue use of glyphosate on City properties effective July 1, 2019 (or Fall 2019 for the Airport), while limiting effects on safety and service levels of public areas
2. Determine effectiveness and costs associated with implementing new methods and techniques for effective pest management to minimize the use of all pesticides and eliminate the use of certain higher-risk pesticides on City maintained properties
3. Develop and adopt an Integrated Pest Management (IPM) Policy and Implementation Plan (IPM Program) to guide pest-control decisions that balances City and community priorities with costs.

Discussion

Communicating new policies and practices effectively across departments can be challenging, and the IPM Committee intends to be proactive in communicating pertinent information to all impacted departments. The IPM Committee is composed of representatives from all departments that conduct landscape maintenance to ensure each department's interests are represented in decision-making. If you feel your department or division needs are not being met, there is room on the committee for more members and we encourage participation!

<u>At minimum, it is critical that all staff who oversee or perform landscape maintenance or manage landscape maintenance contracts ensures compliance with these interim policies until the final IPM Program is adopted at the end of this fiscal year.</u>

<u>IPM Committee Members:</u>
Ben Heistein (Parks)
Jose Rocha (Parks)
Rocky Shiraishi (Parks)
Michelle Templeton (Public Works)
John Moreno-Ramirez (Public Works)
Rudy Zaragoza (Public Works)
Sam Rosas (Airport)

Interim Pesticide Use & Notification Policy for Fiscal Year 2019/2020 (eff. 11/1/19)

1. Purpose and Definitions

The City of Watsonville is committed to minimizing pesticide use through the development of an Integrated Pest Management Program. Integrated Pest Management (IPM) is an environmentally sensitive strategy to pest control that focuses on the long-term prevention of pests while minimizing risks to human health and the environment. IPM programs use a combination of techniques such as biological controls, preventative maintenance practices, and mechanical removal before resorting to using pesticides. Pesticides are used only when needed, when pest activity exceeds established thresholds and applied in a way that minimizes impacts to non-target organisms and the environment. Rather than simply treating pests as they are noticed, an IPM approach considers environmental and life-cycle factors helping the pest thrive and aims to create conditions that are unfavorable for the pest. This information is used to manage pest damage cost-effectively and with the least possible hazard to people, property, and the environment.

It is the goal of the City of Watsonville to minimize the use of pesticides on City property. In establishing this policy, it is acknowledged that this is a long-term goal, which cannot be achieved instantaneously. It is also acknowledged that, even after dedicated review and exploration of all available options, it may not be possible to completely eliminate all pesticide use on City property. However, in those situations where pesticides cannot be completely eliminated, it is the City's intention that the quantity and the risk level of pesticides which are used, be reduced to the maximum degree possible. As the city works to develop a comprehensive Integrated Pest Management Program, this policy shall remain in effect until the City Council adopts a Final IPM Policy, which will then supersede this policy. The City of Watsonville further establishes the following:

a. The City shall minimize its use of pesticides through the development and implementation of a City-wide Integrated Pest Management Program

b. Effective July 1, 2019, the following pesticides shall not be applied to City property:
   i. EPA Toxicity Category I pesticides
   ii. Glyphosate-based herbicides

c. When pesticides are used on City property, City departments will follow the Integrated Pest Management Guidelines established below.

d. Contractors applying pesticides to City property shall comply with the terms of this policy.

e. The following pesticides are exempt from restrictions imposed by this policy:
   i. Category I pesticides used to control burrowing rodents on athletic fields and public grounds.

2. Integrated Pest Management Guidelines

For all pest problems on City property, City departments will utilize the following IPM guidelines:

a. Perform thorough in-field assessments of each pest problem conducted by trained staff. Work to establish monitoring programs, tolerance levels, and action thresholds.

b. Utilize the four major components of IPM in the decision on how to control the pest and consider which method is most likely to produce the long-term reduction of the pest:
   i. biological controls (natural predators, pest-resistant plant selections)
   ii. cultural controls (environmental factors, soil, irrigation & fertilizer volume)
   iii. mechanical controls (hand-weeding, mowing, flaming, solarization, mulching, PERC)
   iv. chemical controls (pesticides)

c. Maintain Pest Management Logs and a record-keeping system to catalogue the following:

   i. the identification of the pest
   ii. the description of the pest infestation
   iii. the geographic distribution of the pest problem
   iv. complete information on how you treated the pest, including what, how much, where, when, who, cost, and any application difficulties
   v. the effectiveness of treatment of solving the problem
   vi. any observable side effects of the treatment on nontarget organisms
   vii. any comments from residents

d. Recommended modifications to these guidelines may be submitted to the IPM Committee for consideration.

e. Pest Management Log and pesticide application records shall be made available to the IPM Committee for the purpose of obtaining information to aide in the development and ongoing improvement of the IPM Program.

3. Notification of Pesticide Use

City departments applying, or managing contractors applying pesticides shall comply with the following notification procedures:

f. Signs shall be posted the day before the application of the pesticide and will remain posted at least 2 days after the application of the pesticide.

g. Posting shall only be required in areas where the public can reasonably be expected to frequent and as near as possible to the site of the application.

h. Signs shall be posted at every public entry point where the pesticide is applied, such as in a park, and in highly visible locations around the perimeter of the area where the pesticide is applied if the pesticide is applied in an open area.

i. Signs shall conform to the template distributed by the IPM Committee that is easily recognizable to the public and workers, and posted on barricades or existing sign posts.

j. After signs are posted, an email shall be sent to customerservice@cityofwatsonville.org with the following information: Date of Application, Pesticide Name, Target Pest.

k. Signs shall contain the name and active ingredient of the pesticide, EPA Reg#, Operator ID, the target pest, the date of pesticide use, the signal word indicating the toxicity category of the pesticide, the date for re-entry if required, and the name and contact number of the City department responsible for the application.

l. City Departments shall not be required to post signs in right-of-way locations that the general public does not use for recreation purposes, such as median islands and areas without an adjacent sidewalk. Where right-of-way locations abutt sidewalks, trails, and alleys used by the public, signs shall be posted near the application site or at minimum at 500' intervals facing the pedestrian walk. In median locations and areas that are not used by the general public, each department that uses pesticides in such right-of-way locations shall affix a label to the application equipment that contains legible information (that contains Chemical Name, Active Ingredient, Signal Word) attached to the spray equipment (following current DPR regulation).

m. City Departments using pesticidal baits shall not be required to post notification signs. However, each department using pesticidal baits in areas regularly accessed by the public shall post one permanent sign at the facility where the baits are used. The sign shall indicate the type of bait used in the area, the target pests, the area or areas where the baits are commonly placed, and the contact number of the department responsible for the bait application.

n. City Departments using tree injections shall not be required to post notification signs, since the specific mode of action eliminates the public exposure risk.

o. Recommended modifications to these notification procedures may be submitted to the IPM Committee for consideration.

4. Training

In addition to all training mandated by State and Federal regulations, City departments will provide training in the following areas to staff who are responsible for applying pesticides or who supervise staff who apply pesticides:

p. Principles of Integrated Pest Management

q. Toxicology of commonly used pesticides

r. General introduction to the evaluation of alternative strategic control options

s. Monitoring protocols for different pest problems, including record keeping; and

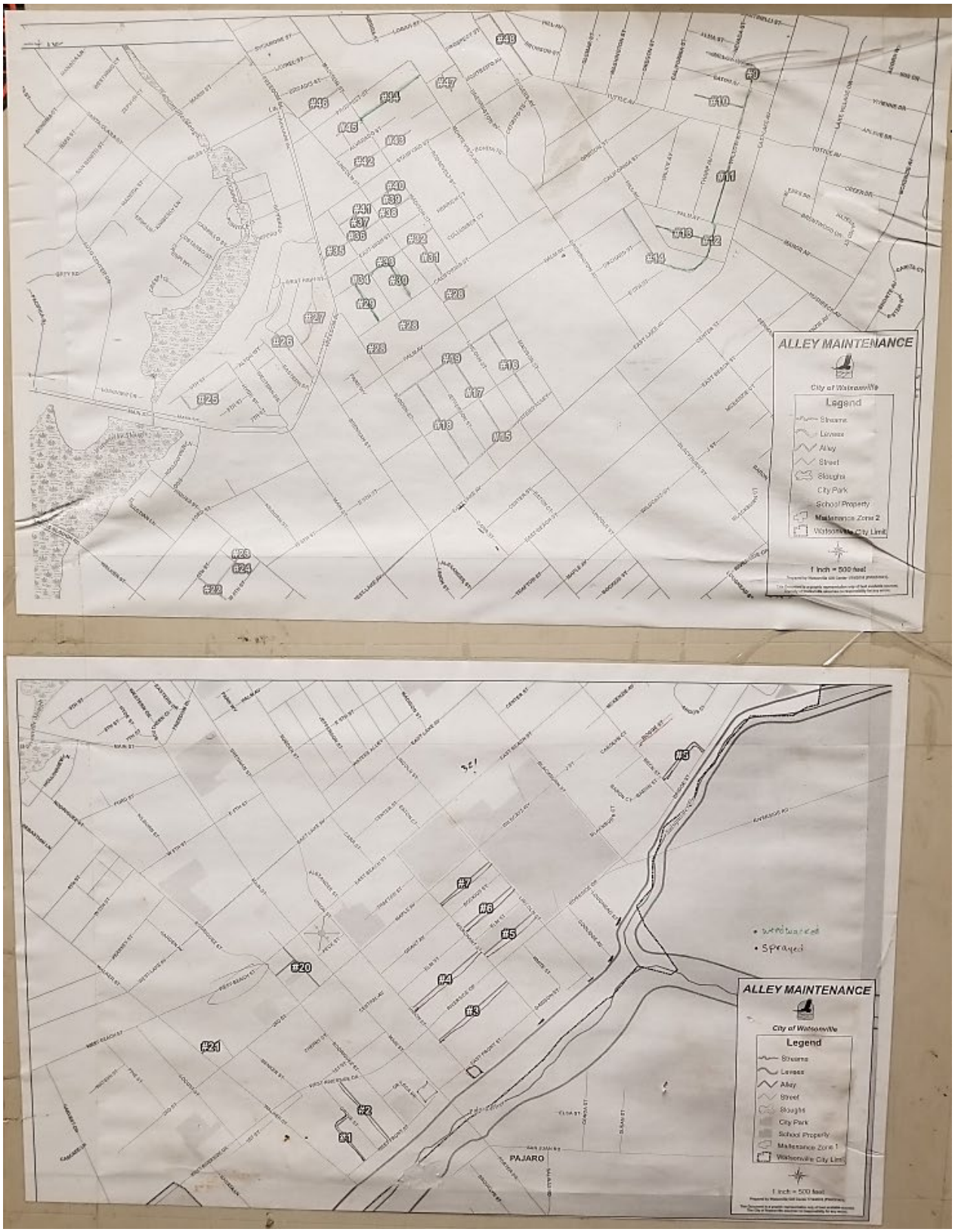
t. General introduction to identification of plant diseases and common pest problems procedures for developing site-specific IPM implementation plans. Recommended modifications to these training procedures may be submitted to the IPM Committee.

ATTACHMENT B

Alley Maintenance Area Maps

Attachment B

Alley Maintenance Area Maps



ATTACHMENT C

Comparison of IPM Policies and Practices

Attachment C

Comparison of IPM Policies and Practices

Organization	Pest ID, Monitoring, & Thresholds	Recordkeeping & Reporting	Training, Guidance, & Contractors
City of Davis[1]	• Collect baseline data on the pest ecosystem(s) to determine pest population(s) occurrence, size, density and presence of any natural enemy population(s); gather information on pest biology and different control techniques available; and document sensitive areas and conditions that may limit control options • Monitor infestations or pest populations and evaluate treatments over time to assess the effectiveness of various treatment strategies and their effects on target and non-target organisms • Establish thresholds for each target pest and site based on: 1) tolerable level of environmental/ aesthetic/economic damage and risk to human health, or 2) size or density of the pest population that must be present to cause unacceptable environmental/aesthetic/economic damage and create a human health risk	• Systematically record all monitoring methods and data • Work logs kept to record treatment elements such as the method(s) used and personnel hours spent implementing treatment at a given location • Log of public complaints (ex. pest management service level, policy violation, etc.) • Departmental IPM plans reviewed and adjusted annually and undergo a full update at a minimum of every five years • Submit information on all pest management to IPM Specialist monthly: target pest, thresholds, treatment selection criteria with final treatment decision, area treated (type of location and size), man-hours, material costs • If pesticides used, submit to IPM Specialist: other control methods tried first, product information and hazard tier, quantity used, treatment method, location of application, time and date, name and license number of applicator, SDS, label • Post annual reports and departmental plans on website	• Pesticide applicators have QAL/QAC or work under the direction of an employee who has one • IPM Technical Advisory Committee • IPM Specialist • Annual pesticide handler training • Pesticide storage, transportation, and disposal guidelines • Contractors must follow IPM policy and procedures • Contractors encouraged to submit proposals that include nonchemical pest control methods • Training on proper use of PPE • Public education – provide IPM and less toxic management info at public events and environmental programs, foster participation in community volunteer weed management projects, support Our Water Our World program to educate consumers about less toxic pest control options at retail stores that participate in the program
City of Encinitas[2]	• Monitor and record each pest ecosystem to determine pest population, size, occurrence, and natural enemy population; if present. Identify decisions and practices that could affect populations • Consult UCCE, San Diego Agricultural Commissioner's office, licensed pest control professionals, and other appropriately trained individuals for pest ID resources • Establish a threshold level for each target pest and site	• Annually review and evaluate the successes and challenges of the IPM Plan in an effort to improve outcomes and adhere to BMPs • Keep records of all pest management activities, including: target pest, type and quantity of pesticide used, site of application, date of application, name of applicator, equipment used, non-chemical controls used, experimental efforts	• Educate city staff, contractors, and the public about the IPM Policy and IPM Plan • Pesticide user training • Reference documents/policies: Environmentally Preferable Purchasing and Contracting Policy; Building Exterior and Hardscape Management Plan; Storm Water Management Ordinance; Grading, Erosion, and Sediment Control Ordinance; Storm Water Best Practices Manual; Jurisdictional Urban Runoff Management Program; Grounds and Landscape Maintenance Services Agreement

Organization	Pest ID, Monitoring, & Thresholds	Recordkeeping & Reporting	Training, Guidance, & Contractors
City of San Francisco[3]	• Determine most effective treatment time based on pest biology, weather, seasonal changes in wildlife use, and local conditions • Monitor each pest ecosystem to determine pest population, size, occurrence, and natural enemy population, if present. Identify decisions and practices that could affect pest populations. Keep records of such monitoring. • Prevention comes first • Set action levels for each pest for each site based on how much biological, aesthetic or economic damage the site can tolerate • Monitor treatment to evaluate effectiveness. Keep monitoring records and include them in the IPM implementation plan.	• Maintain a data bank of information concerning pesticide use by City departments and the efficacy of alternatives used by City departments • Each City department that uses pesticides shall keep records of all pest management activities and submit records to the Department on a monthly basis • Enter data monthly to the online Pesticide Use Reporting System (PURS) • Pest management records shall be made available to the public upon request • Department-specific IPM implementation plans • Mechanism for collecting complaints from City residents regarding inappropriate pesticide use on City properties; any necessary investigations and response to complaints to be completed within 30 days of receipt • Prepare annual report summarizing pest ID and monitoring efforts, thresholds, treatment selection and strategies used, post-treatment evaluation, public education, and staff training	• Acquaint staff with pest biology, the IPM approach, new pest management strategies as they become known, and toxicology of pesticides proposed for use • Annual pesticide safety trainings • Monthly SF IPM Technical Advisory Committee meetings to: help set City's IPM priorities, suggest/remove products in the SF Reduced-Risk Pesticide list, network with City pest control staff, get trained in latest IPM practices, get Continuing Education Units • Sample contractor and lease language • Pesticide disposal guidelines • Public Education – Inform the public of the City's attempt to reduce pesticide use and respond to questions from the public about the City's pest management practices; disseminate public educational information about IPM plans and programs and the City's IPM Policy
City of Santa Cruz[4]	• To Be Determined	• To Be Determined	• To Be Determined

Organization	Pest ID, Monitoring, & Thresholds	Recordkeeping & Reporting	Training, Guidance, & Contractors
City of Santa Rosa[5]	• Establish threshold action levels for pest damage, injury, or nuisance (e.g., % cover, presence/ absence, proximity, abundance) • Identify pest species and track population levels • Identify beneficial species and track population levels • Keep monitoring records to determine when specific control tactics are to be implemented to keep pest levels below the injury level, to measure the effectiveness of specific tactics (at specific time intervals), to pinpoint hot spots, and to plan future control activities • Prior to pest control, assess the site for pest presence and abundance, beneficial insect presence and abundance, site conditions that may contribute to or help solve the pest problem, weather conditions that may contribute to or help solve the pest problem	• All requests for pest control assistance forwarded to the Pest Control Supervisor in writing for the purposes of documentation • Submit pesticide use records to Pest Management Supervisor monthly • Submit PURs to County Agricultural Commissioner's Office monthly • Yearly report – pesticide usage data, how usage compared with target reduction of 50%, methods being used to reduce pesticide usage, revisions or other updating of IPM program • Maintain action plans for each pest type, including applicable locations, specific action thresholds, and treatment options	• Provide pest management information, formally and informally, to maintenance personnel • Provide pest management information to affected and concerned residents and facility users • Where practical and in specific circumstances, provide pertinent pest management information to the community • Training on non-chemical control • Pesticide disposal guidelines • Annual pesticide handler training • Maintenance staff training – principles and components of IPM, management strategies regarding pests common to all areas, management strategies regarding pests specific to specific areas, non-chemical pest control techniques • Public education (by request) – IPM concepts and components; integrated solutions to pest problems, if known; other contacts/agencies/resources that might be able to assist the individual; information regarding the departmental IPM program • Contractors performing work for the Recreation and Parks Department required to follow notification guidelines with regards to sign posting and encouraged to follow sound IPM practices
City of Watsonville[6]	• Some weed ID done; thorough weed ID and weed mapping of Watsonville Wetlands Trail System, including weed density • Thresholds established based on regulatory requirements (e.g., Federal Aviation Administration), site type (e.g., traffic areas, fencelines, hardscape, open space), plant height • Parks Division is working towards defining site-specific vegetation threshold levels	• Record pesticide application details including: date of notification posting and removal, equipment and PPE used, site conditions, some details on target pest and growth stage, site type, products used and amounts, time spent, applicator information, supervisor inspection comments • Field Services Division tracks hours spent, number of employees, and equipment used for specific management activities • Submit PURs to County Agricultural Commissioner's Office monthly • GIS mapping of landscaped areas and square footage	• Monthly safety meetings • Pesticide safety training. Frequency, attendees are TBD • Pesticide applicators have QAL/QAC or work under the direction of an employee who has one • Sensitive species management and protection guidelines • Use of Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual, including training guidelines (e.g., ID of invasive, native, and special status species; proper equipment use; management strategies) • Contractors required to abide by posting & notification policy and glyphosate ban

Organization	Pest ID, Monitoring, & Thresholds	Recordkeeping & Reporting	Training, Guidance, & Contractors
County of Santa Cruz[7]	• Perform thorough in-field assessments of each pest problem • Establish injury levels and action thresholds for each individual pest species based on how much biological, aesthetic or economic damage the site can tolerate to determine when corrective action must be initiated • Establish scouting or inspection procedures to monitor pest population levels and severity of the pest problem	• Mid-year status report on IPM Program • Annual IPM report, including: evaluation of progress towards achieving IPM Policy goals; departmental pesticide use summary; recommendations for modifications/exemptions to IPM Policy; recommendations for necessary increases in staff and materials • Maintain recordkeeping system: pest ID, infestation size/density, geographic distribution of pest problem, management approach and difficulties, treatment effectiveness, unintended non-target impacts, comments from residents	• Contractors required to comply with County IPM Policy • IPM Coordinator • IPM Departmental Advisory Group (DAG) – works with IPM Coordinator to review the effectiveness of the IPM policy and program and make recommendations to the Board of Supervisors • Annual IPM Program public meetings to review the effectiveness of the IPM policy and program and make recommendations to the County Administrative Officer • Guidance for use of antimicrobial pesticides • Annual handler training for pesticide applicators without a QAL/QAC • Training for pesticide applicators and their supervisors: principles of IPM, pesticide toxicology, alternative strategic control options, monitoring and recordkeeping protocols, pest ID, procedures for developing site-specific IPM implementation plans
East Bay Municipal Utility District[8]	• Personnel having pest management responsibilities trained to accurately identify major pests and the damage that such pests may cause. Field manuals and other resources available to staff to assist in pest ID • Review the history of a site and determine pest conditions • Determine the infestation levels that will be intolerable or that will cause unacceptable damage at different times of the year, during various plant growth stages, and for other situations (e.g., nature of the site, topography, weed proximity to structures or roadways, size of the weeds, local fire-suppression regulations) • Prepare monitoring reports including date, time, location, observed pest species, and degree of the pest problem; use reports to evaluate management strategies; records kept for five years • Monitor success of the pesticide treatment and adjust usage based on monitoring	• Work units develop annual reports summarizing types, quantities, and locations of pesticide use • List of acceptable management strategies for specific sites, types of sites, and pests • Maintain, review, and annually update records: list of ID'd pests, action thresholds, acceptable management strategies • Prepare annual PUR: product name, quantity, locations used	• Training to accurately ID major pests and associated signs of damage • Annual pesticide safety training; records kept for 3 years • Spill response and documentation training • Pesticide applicators have QAL/QAC or work under the direction of an employee who has one • Pesticide applicators trained annually in general IPM practices, safe use of pesticides, and proper inspection of applicator equipment to prevent accidental pesticide leaks, spills, and potential hazards to applicators and the environment; records kept for 3 years • Pesticide mixing, storage, and disposal guidelines

Organization	Pest ID, Monitoring, & Thresholds	Recordkeeping & Reporting	Training, Guidance, & Contractors
East Bay Regional Park District[9]	• IPM treatments made only when authorized by policy manual and when monitoring indicates that the pest will cause unacceptable safety, health, economic, or functional damage; use of chemicals for controlling pests for solely aesthetic purposes not permitted • Identify legitimate pest situations & consider biological and social implications • Regularly observe and record population size, life stage, and natural enemies of key pests and other potential pest populations • Perform site visits to offer assessment, prescription development, and implementation guidance on pest management activities and restorative actions throughout the District • Consider developing a day-degree management program to help supervisors prepare in advance for potential pest problems • Pest Control Request - submit detailed description of the problem, history, and desired objective of pest problems • Consider damage and action thresholds with District priorities in mind: 1) public and employee health and safety, 2) economic or structural losses, and 3) aesthetics or cosmetics • Must consider and balance how the public feels about chemicals and pest damage against scientific evidence that a pest species may have reached a damaging threshold	• Treatment strategies developed for each identified pest on a Districtwide basis and incorporated into an overall written pest management program for each parkland • Documentation of pesticide use by staff and contractors via Pesticide Use Report (PUR) • Annual documentation - yearly chemical inventory, mapping, and assessment for continued need or maintenance level control of specific pest problems by individual parks; also serves as initial step in that park's preparation of an IPM plan • Annual IPM Report - summary of pest management projects, narrative and analysis of mechanical/cultural methods, pesticide use and trends • Develop guidelines for monitoring and record keeping system: monitoring purpose, populations to be sampled, monitoring frequency, sites to be inspected, number of plants or locations to be sampled at each site, sampling method, recordkeeping system that is easy to use in the field, system of displaying the field data for ease in decision making, IPM system evaluation and corrections • Park supervisor to fill out the IPM Checklist and submit to District IPM Specialist prior to implementation of any pest management action • Relative costs of treatment strategies assessed and accounted for in future budgets • Annual reports prepared by IPM Specialist and submitted to Pest Management Advisory Committee and Ecology Committee • Acreage owned vs acreage treated with herbicides • Statistics on reasons for applications, locations of applications • Hours spent on various pest control methods • Description of ongoing pest management projects • Summaries of location-specific and pest-specific treatments & current status of control	• Instructions provided to involved field personnel: safe use of approved pesticides, herbicides and other alternative, methods of control; protection of the environment from harmful agents; maintaining safe working conditions where pesticides are present • Training on pest ID and management strategies • Field training programs • Education and training programs for field park employees and, when possible, park visitors provide wide spectrum of information, including findings of entomologists, plant pathologists, landscape architects, agronomists, wildlife specialists, health specialists, soil scientists, etc. • Concepts of and the methods for implementation of District IPM Program to be made available to personnel as needed in future years to keep up to date on new advances and approved practices • Ecological pest management pilot program to be implemented to train park rangers in dealing with the major pest problems • Annual Integrated Methods & Safety Training (mandatory): ecology and biology of pests, ecosystem approaches to pest problems, and best science updates regarding pest and vegetation management • Sustainable Practices Training (supplemental): alternative pest control strategies focusing on mechanical and cultural techniques, vertebrate trapping techniques, developing volunteer programs, Bay Friendly Landscape Maintenance, etc. • IPM Policies & Practices Decision Table • IPM Checklist • Applicators must have QAL/QAC

Organization	Pest ID, Monitoring, & Thresholds	Recordkeeping & Reporting	Training, Guidance, & Contractors
Midpeninsula Regional Open Space District[10]	• ID the pest, determine its life cycle and disruptive potential, and identify relevant site conditions prior to implementing a pest control activity • Develop and implement tolerance levels for pests to determine when to undertake pest control • Review pest control objectives for consistency with other site goals • Monitor results and modify control methods over time as site conditions and treatment techniques change and as needed to obtain an effective level of control • Treatment sites surveyed by District biologist prior to work to determine presence of aquatic features, site conditions, and necessary site-specific measures • Grassland treatment sites surveyed once every five years; brushy and wooded sites surveyed once every three years • Biological surveys prior to brush removal on rangelands • Site inspections - evaluate presence, population size, growth stage, and percent cover of target weeds and pests relative to native plant cover; determine presence of special-status species, their habitat, or sensitive natural communities • Monitor IPM activities within two months after treatment to determine if target pest was effectively controlled with minimum effect to the environment and non-target organisms; excludes routine minor maintenance activities which can be evaluated immediately after treatment • Prior to the start of the winter storm season, inspect sites to confirm erosion control techniques are still effective • Monitoring and treatment considerations for nesting birds	• Develop and implement IPM Guidance Manual to standardize pest management and IPM procedures across all District Lands, including preventative measures, method of application, anticipated annual acres of treatment, and type and amount of pesticide used in a typical year • Summarize ongoing pest control projects in Annual Work Plan and track for staffing, costs, and adaptive management purposes, noting any project-specific changes to be made next year (e.g. change in treatment method, change in level of effort, requirements for periodic pre-treatment surveys) • Prepare description of newly proposed projects consistent with the IPM Guidance Manual, including best management practices and mitigation measures • Annual IPM Report - describe pest control activities (both chemical and non-chemical) on District Lands • Assess IPM Program using adaptive management • Develop IPM Implementation Plan • Pest management programs describe at minimum: definitions and purpose, types of pests, pest ID, prevention, damage assessment, tolerance levels/threshold for action, treatment options • CEQA documentation prepared	• Pest Identification Training • Annual Pesticide Safety Training; records kept for 2 years • All staff, contractors, and volunteers trained to prevent spreading weeds and pests to other sites • Field crew and contractor environmental awareness training for special-status species and sensitive natural communities: review of life history, field ID, habitat requirements, known or probable locations in vicinity of treatment site, potential fines for violations, avoidance measures, necessary actions if encountered. • All staff, volunteers, and trained by qualified biologist on ID of dusky-footed woodrat, Santa Cruz kangaroo rat, and their nests • Staff and contractors using pyrethrin spray trained in problem wasp and special-status invertebrate ID to ensure that proper species are being targeted • Herbicide storage, loading, and mixing guidelines

Organization	Pest ID, Monitoring, & Thresholds	Recordkeeping & Reporting	Training, Guidance, & Contractors
Pajaro Valley Unified School District[11]	• Monitoring and inspecting for pests and conditions that lead to pest problems are done regularly by Maintenance and Custodial staff; results communicated to IPM Coordinator • Practice accurate pest ID and use of appropriate action levels • Typical target pests broadly defined (e.g., "weeds," "rodents," "roaches")	• IPM Plan prepared per Healthy Schools Act (HSA) requirements; reviewed and revised annually as needed • IPM Plan posted on District website and mailed to parents, guardians, and staff annually • School district staff and contractors submit PURs to DPR annually • Maintain records of all pesticide use for at least 4 years	• Designated IPM Coordinator and IPM Team member(s) who are involved in purchasing, making IPM decisions, applying pesticides, and complying with the Healthy Schools Act (HSA) requirements • Annual pesticide handler training • Annual HSA training • Contractors required to complete HSA training and comply with all HSA requirements

Notes:

[1] Sources: City of Davis Integrated Pest Management Policy and Procedures (2017); Staff Report on Updated Integrated Pest Management (IPM) Policy and Procedures (2017)

[2] Sources: Integrated Pest Management Policy (2019); Integrated Pest Management Plan (2015)

[3] Sources: City of San Francisco Environment Code, Ch 3: IPM Program (2011); SF Integrated Pest Management (IPM) Program Compliance Checklist for City Properties and Reduced Risk Pesticide List (2016)

[4] Note that the City of Santa Cruz IPM Program is currently undergoing review; therefore, publicly available information on current or future IPM practices is limited.

[5] Sources: Integrated Pest Management (IPM): A Policy of the Recreation & Parks Department (Undated); News Flash: City Council Approves Organics-Only Weed Control (2018)

[6] Sources: Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual (2007); Mitigation Plan for Santa Cruz Tarplant and Coastal Terrace Prairie at the Watsonville Airport (2007); personal communication; additional documents including but not limited to: Pesticide Use Reports, activity logs, Pest Control Adviser recommendations, training records, staff reports

[7] Source: 2019-2020 Santa Cruz County Integrated Pest Management Policy (2019)

[8] Sources: EBMUD Environmental Compliance Manual (2008); Mokelumne Watershed & Recreation Division Best Management Practice: Integrated Pest Management (2006)

[9] Sources: Pest Management Policies and Practices for East Bay Regional Park District (1987); Annual Integrated Pest Management Report 2016 (2017); Resolution No. 2019-7-187: Resolution on Phase-Out of Glyphosate Use for Maintenance of Developed Parks

[10] Sources: Resource Management Policies (2014); Integrated Pest Management Program Guidance Manual (2014); Draft Environmental Impact Report for the Midpeninsula Regional Open Space District (2014)

[11] Sources: School District Integrated Pest Management Plan (2019); Santa Cruz Sentinel article "Coast Lines, Nov. 18, 2016: PVUSD bans Roundup brand weed killer" (2016)

Organization	Pest Control Methods, Strategies, & Considerations
City of Davis[1]	• Ranking, inventory, mapping, monitoring and evaluation are methods used for determining pest management priorities • Treatment selection based on consistency with Pesticide Hazard and Exposure Reduction (PHAER) analysis, least-toxic, least-damaging to environment, cost-effectiveness (short-term and long-term), and most likely to result in long-term pest population reduction • Prevention – reduce pest food, water, and shelter; use weed-free materials if soil stabilization is needed; use landscape and structural design that is appropriate to the specific habitat, climate and maintenance the area will receive; when designing projects, consider the potential impacts of pests and mitigate through the use of appropriate landscape design (water requirements, weed barriers, etc.) • Cultural control - selection and placement of materials that encourages pest enemies and competitors; modification/removal of pest habitat to reduce pest harborage, food supply and other life support requirements; waste management and proper food storage; heat, cold, humidity, desiccation or light applied to affected regions; irrigation, fertilization, aeration, seeding, flooding • Mechanical/physical control – mulching, pruning, thinning, barriers, traps, mowing, weed whacking, burning, hoeing, hand-pulling • Biological control – prescribed grazing, conservation and augmentation of the pest's natural enemies, introduction of host-specific enemy organisms • Pesticides must be on the Reduced-Risk Pesticide List and used only as a final option in situations where other methods have proven to be ineffective or cost prohibitive • No use of glyphosate in City parks, greenbelts, bike paths, and other areas with high public exposure risk • Pesticide applications require prior approval and written PCA recommendation • Pesticide applications shall be made to time the treatment to the target species most susceptible stage and in a manner that prevents damage to non-target plants, especially when applying a non-selective herbicide • Tiered Reduced-Risk Pesticide List developed in 3 steps: 1) hazard assessment, 2) evaluation of exposure potential, product effectiveness, and available alternatives, and 3) categorization as being least restricted, more restricted, or most restricted for use • Posting required for all pest management activity; signs posted at least 24 hours before and 24 hours after pesticide applications
City of Encinitas[2]	• Require purchase of products and services that minimize environmental and health impacts, pollution, toxicity, and hazards to worker and community to the greatest extent practicable. • Consider a range of potential treatments for the pest problem • Employ non-pesticide management tactics first, unless the economic threshold has already been reached • Determine the most effective treatment time, based on pest biology and other variables, such as weather, seasonal changes in wildlife use and local conditions • Treatment selection and prioritization by: least disruptive of natural controls, least hazardous to human health, least toxic to non-target organisms, cost effective in the short- and long-term • No use of Category I or II pesticides, Prop 65 chemicals, GWPL chemicals, organophosphates, organochlorines, carbamates, carcinogens, endocrine disruptors, neonicotinoids, second generation anticoagulant rodenticides • Use of Category III and IV pesticides minimized to the greatest extent possible • Pesticide use exemption process for: pesticides applied for the improvement and maintenance of water quality, public health emergencies, pest outbreaks likely to result in significant economic damage • Posting and Notification – signs posted 24 hours prior to application and left for 72 hours after application in areas used by the general public for recreational purposes • Cultural control – plant replacement, irrigation changes • Biological control – beneficial insects • Mechanical control – hand pull, mowing

Organization	Pest Control Methods, Strategies, & Considerations
City of San Francisco[3]	• Employ non-pesticide management tactics first; consider use of chemicals only as last resort and regularly assess efficacy of alternatives • Cultural control – modify practices such as watering, waste management, food storage to reduce food and living space for pests • Physical/mechanical control – mulch, hand-weeding, traps, barriers • Biological control – introduce or enhance natural enemies • Use Bay Friendly Landscaping Guidelines • Reduced-Risk Pesticides list with three tiers: Tier I (most hazardous), Tier II (more hazardous), Tier III (least hazardous) • No pesticides used on City or County property unless: included on Reduced Risk Pesticide List, used for improving water quality, lack of effective alternatives, pilot testing, emergency pest outbreak • Notification signs posted in visible locations up to 3 days prior to and remain posted up to 4 days after application depending on pesticide Tier, except: in rights-of-way not used for recreational purposes, baits or other one-time pesticide uses, public health emergencies • Obtain written PCA recommendations for all outdoor pesticide uses • Landscape applications done under QAL/QAC supervision • Threatened/Endangered Species - Follow Pesticide Restrictions for Red-Legged Frog Habitat • Due to concern over primary and secondary poisoning, the type of rodenticide and the manner in which it is applied will be determined by site-specific characteristics • Conditions of Use for "Most Hazardous" Herbicides: General Requirements (treatment areas marked for 4 days post-treatment, indicator dye for sprays, contractor briefing/training on SF IPM ordinance/requirements/policies, supervision of PCA/QAL/QAC), General Prohibitions (buffer zones around public paths/red-legged frog habitat, prohibited application locations), Allowed Uses
City of Santa Cruz[4]	• To Be Determined
City of Santa Rosa[5]	• Use least-toxic pesticides that provide acceptable control of the pest (organics only) • appropriate pre and post-notification of pesticide application in parks and other areas where the public may be affected • Mechanical/physical control – barriers, mulch, hand removal, discs, weed mowers, string trimmers, hoes • Cultural control – sanitation; modification of irrigation times, frequency, amounts; mowing height adjustments; encourage beneficial organisms and healthy plant growth; appropriate plant selection; use of resistant plant materials; emphasize prevention • Biological control – maintain existing populations of beneficial organisms, release of beneficial populations, biological pesticides • Chemical control – bio-rational pesticides (typically derived from plants), least-toxic pesticides, traditional pesticides (PCA recommendation required) • Use non-chemical control first, followed by least-toxic pesticides • When applying insecticides to large areas or many plants, staggered treatments on smaller areas minimize impacts to beneficials • Pesticide notifications via signs (specified dimensions, content, languages; 48 hours pre- and post-treatment), isolation, indicator dye, and/or neighborhood notification
City of Watsonville[6]	• Treatment method selection based on consideration of public safety, staff safety, infrastructure and environment, costs and resources, maintenance of service levels • No use of glyphosate • Use non-chemical controls first and minimize pesticide use to the extent practicable • Cultural control – landscape renovation, consideration of irrigation/fertilizer schedules • Mechanical/physical control – mulch, mowing, hand-pulling, flaming, weed eating, chainsaw • Chemical control – pre-emergent herbicides, non-glyphosate post-emergent herbicides • Pesticides applied by or under supervision of QAL/QAC, sometimes with written PCA recommendation • Posting and notification – signs posted 1 day prior to application and removed no sooner than 2 days after application • Follow sensitive species management and protection guidelines for Santa Cruz Tarplant (e.g., allow plants to set seed before mowing) • Consideration of pest life stage to determine treatment timing • Mindful of erosion issues and erosion prevention BMPs

Organization	Pest Control Methods, Strategies, & Considerations
County of Santa Cruz[7]	• Criteria for control methods: least disruptive of natural controls, least hazardous to human health, least toxic to non-target organisms, least damaging to the general environment, most likely to produce permanent reduction of the pest, easiest to carry out effectively, most cost-effective in the short- and long-term • Consult with IPM Coordinator when planning projects involving the installation of vegetation or other features that have pest management implications • Prevention - Use pest resistant plants and planting systems, reduce pest food and living space through physical and cultural practices and the use of biological pest controls • No use of Category I or II pesticides, Proposition 65 chemicals, or chemicals classified as proven carcinogens by U.S. EPA • No pesticide applications along roadways, except for single or infrequent herbicide applications by means of brushing the materials onto invasive woody plant stumps to prevent re-growth or hand-spraying by means of a backpack sprayer on stands of invasive perennials and grasses • IPM policy pesticide use restrictions not applicable to some pesticides: antimicrobials; Category I pesticides used to control burrowing rodents on the Pajaro and Salsipuedes levees and on athletic fields; Category I pesticides used to control termites in County buildings; pesticides used by Santa Cruz County Mosquito Abatement District; pesticides required for compliance with State/Federal law; glyphosate-based herbicides (1-year exemption); Category II herbicide Mirimichi Green (1-year exemption) • Guidelines for antimicrobial usage • Posting & Notification requirements
East Bay Municipal Utility District[8]	• No Restricted Use Pesticides • Pesticides applied must be included on the Approved Products List; products proposed for addition to the List are evaluated based on consideration of efficacy, feasibility, safety, and cost • Environmental Compliance staff reviews the use of pesticides on new projects, ensures that the work unit uses the pesticides in an appropriate manner, and that alternatives to chemical applications are used to the extent possible. • Use chemical controls to achieve an acceptable maintenance level for the identified pest, then to use a combination of chemicals and physical methods to keep the pests under control • Begin with least toxic pesticides that will adequately achieve IPM goals • Physical/mechanical control - brush rakes, chain saws, disking, hand-pulling, mowing, controlled burns • Biological control - horse, cattle, and goat grazing • Establishment of buffer zones around water bodies, except for spot treatments • Calibrate field equipment regularly to ensure the desired application rate. • Posting & Notification - If there is likely to be public contact within the area to be sprayed with a pesticide, adequate notification or posting must be provided. • Time applications to maximize effectiveness on target pest and minimize runoff • Mix pesticides in an area where spillage can be easily contained • Erosion control - use pesticides and application methods that retain some vegetative cover along roadsides • Drift control – no applications when wind speed is above 5mph • When applying herbicide over a large area, the use of a colorant such as Highlight Blue is recommended to better direct and track the application

Organization	Pest Control Methods, Strategies, & Considerations
East Bay Regional Park District[9]	• Site characteristics, biological timing, pest species, environmental considerations, level of desired control and efficacy factors dictate the strategies selected • Encouragement of a long-term resource management approach • Prioritization of least disruptive, non-chemical controls over pesticide use • If a chemical pesticide application is required, the IPM specialist, PCA, provides a prescription • Cultural control – habitat modification, modify irrigation and fertilization practices, human behavior changes, plant selection • Physical/mechanical control – pruning, mulch, hand-pulling, traps, barriers, torching, mowing, line trimming, scythes, weed whipping • Biological control – grazing, introduce or conserve natural enemies • Use only registered effective materials with least acute toxicity and potential for environmental effects and no evidence of chronic effects (e.g., cancer, mutations, birth defects), except for public health pests for which no alternatives exist • List of approved pesticides • No glyphosate use near playground or drinking fountains. General Manager to phase out all glyphosate use in developed park areas by the end of 2020. • List of site- and pest-specific approved pest control methods • Potential pesticides should be reviewed for their effects on surface and groundwaters. • Any use of chemical controls must be justified and approved (prior to use) by the Park District employee proposing its use • Safety & Environmental Concerns/Considerations • Posting & Notification - Notices of a chemical application shall be posted prominently by the park supervisor or other responsible individual at locations exterior to the treated area but at sites that typically would be considered entrances to that treated area
Midpeninsula Regional Open Space District[10]	• Choose site-specific strategies and times of treatment that provide the best combination of protecting preserve resources, human health, and non-target organisms and that are efficient and cost effective in controlling the target pest • Use the least harmful method(s) to control identified pests. Where the use of pesticides is necessary, apply according to the label using all safety precautions and take all measures needed to protect the environment, the health and safety of visitors, employees, neighbors, and the surrounding natural areas including water and soil resources • Plan for repeat treatments as indicated by the pest's regenerative capabilities. • Coordinate and cooperate with adjacent landowners, neighbors, and other responsible agencies to control pests and limit secondary effects. • If eradication of a pest from a distinct location is not feasible, apply measures to achieve containment, sustained control, slow down a pest's rate of spread, or minimize pest damage. • Develop specific pest management strategies and priorities that address each of the five work categories. • Pest Prevention - Take appropriate actions to prevent the introduction of new pest species to District preserves, especially in natural areas, rangelands, and agricultural properties. • Approved Pesticides List based on human and ecological toxicity analysis and in some cases estimates of exposure • All pesticide use implemented consistent with Pest Control Recommendations prepared annually by a licensed PCA • Appropriate non-toxic colorants or dyes shall be added to the herbicide mixture to determine treated areas and prevent over-spraying • Establishment of buffer zones around aquatic features, red-legged frog habitat, nesting birds, special-status plants • Where appropriate, equipment modifications, mowing patterns, and buffer strips shall be incorporated into manual treatment methods to avoid disturbance of grassland wildlife • Treatment actions and timing are site-specific and based on various factors (i.e., infestation size and density, the life cycle of the pest, the type and sensitivity of the site to be treated, the potential for the presence of special-status species habitat to occur in proximity to the treatment site, and the availability of labor) • Pesticide application requirements for equipment settings & weather conditions • Posting & notification criteria • Suitable onsite disposal areas shall be identified to prevent the spread of weed seeds. • Erosion control and revegetation requirements • Mitigation measures for impacts to special-status amphibians, reptiles, fish, invertebrates, bats, San Francisco dusky-footed woodrat, Santa Cruz kangaroo rat • When conducting chemical treatments within or with potential to affect waters and with the potential to discharge directly or indirectly to waters of the United States, District must consult with the San Francisco Bay RWQCB which may require the District to submit a Notice of Intent to Discharge, develop an Aquatic Pesticide Application Plan

Organization	Pest Control Methods, Strategies, & Considerations
Pajaro Valley Unified School District[11]	• Annually provide written notification of all pesticide products and associated active ingredients expected to be applied by school staff and contractors during the upcoming year; include opportunity for recipients to opt in to receive notification of individual pesticide applications at least 72 hours before the application • No use of glyphosate on school sites • Posting & notification criteria

Notes:

[1] Sources: City of Davis Integrated Pest Management Policy and Procedures (2017); Staff Report on Updated Integrated Pest Management (IPM) Policy and Procedures (2017)

[2] Sources: Integrated Pest Management Policy (2019); Integrated Pest Management Plan (2015)

[3] Sources: City of San Francisco Environment Code, Ch 3: IPM Program (2011); SF Integrated Pest Management (IPM) Program Compliance Checklist for City Properties and Reduced Risk Pesticide List (2016)

[4] Note that the City of Santa Cruz IPM Program is currently undergoing review; therefore, publicly available information on current or future IPM practices is limited.

[5] Sources: Integrated Pest Management (IPM): A Policy of the Recreation & Parks Department (Undated); News Flash: City Council Approves Organics-Only Weed Control (2018)

[6] Sources: Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual (2007); Mitigation Plan for Santa Cruz Tarplant and Coastal Terrace Prairie at the Watsonville Airport (2007); personal communication; additional documents including but not limited to: Pesticide Use Reports, activity logs, Pest Control Adviser recommendations, training records, staff reports

[7] Source: 2019-2020 Santa Cruz County Integrated Pest Management Policy (2019)

[8] Sources: EBMUD Environmental Compliance Manual (2008); Mokelumne Watershed & Recreation Division Best Management Practice: Integrated Pest Management (2006)

[9] Sources: Pest Management Policies and Practices for East Bay Regional Park District (1987); Annual Integrated Pest Management Report 2016 (2017); Resolution No. 2019-7-187: Resolution on Phase-Out of Glyphosate Use for Maintenance of Developed Parks

[10] Sources: Resource Management Policies (2014); Integrated Pest Management Program Guidance Manual (2014); Draft Environmental Impact Report for the Midpeninsula Regional Open Space District (2014)

[11] Sources: School District Integrated Pest Management Plan (2019); Santa Cruz Sentinel article “Coast Lines, Nov. 18, 2016: PVUSD bans Roundup brand weed killer” (2016)

Summary of IPM Program Constituents

Organization	IPM Policy	IPM Coordinator	Annual Report	Glyphosate Ban/Restriction	Exemption Process
City of Davis	Yes	Yes ("IPM Specialist")	Yes	Yes	Yes
City of Encinitas	Yes	No	No	Yes ("Proposition 65 chemicals")	Yes
City of San Francisco	Yes (Ordinance)	Yes (Departmental)	No	Yes ("Proposition 65 chemicals")	Yes
City of Santa Rosa	Yes	No	Yes	Yes ("Non-organic herbicides")	Not Specified
City of Watsonville	Yes (Interim)	No	No	Yes	No
County of Santa Cruz	Yes	Yes	Yes	No (Temporary exemption)	Yes
East Bay Municipal Utility District	No	No	No	No	Not Applicable
East Bay Regional Park District	Yes	Yes ("IPM Specialist")	Yes	Yes	Yes
Midpeninsula Regional Open Space District	Yes	Yes	Yes	No	No
Pajaro Valley Unified School District	No	Yes	No	Yes	No

ATTACHMENT D

Pest Management Techniques for Weeds, Burrowing Rodents, and Moles

Attachment D

Pest Management Techniques for Weeds, Burrowing Rodents, and Moles

If monitoring demonstrates that pest management is needed, a variety of mechanical/physical, biological, cultural, and chemical tools are available to support effective, sustainable control. In each pest management decision, the cost of control activities, including labor, equipment, and materials, in addition to the potential risk to human health and environmental that may result from controlling or not controlling a pest population, should be carefully considered.

Brief summary descriptions of select control techniques that are currently or may potentially be used for the control of weeds, burrowing rodents, and moles on City properties are provided below. Note that satisfactory management of pest populations often requires the strategic use of a combination of techniques.

1. WEEDS

1.1. Physical/Mechanical Control

Mowing involves cutting weeds with motorized equipment or hand tools such as flail mowers, rotary mowers, weed whackers, and brush cutters. When used for weed control, it is important to mow before weeds set seed or before seeds mature in order to decrease the disbursement of viable seed to the ground that then is available for future weed propagation. In some cases, mowing can also be considered a cultural control technique. For example, the mowing quality of cut and the height and frequency of different turf species can have a significant impact on the health and competitive ability of the turf, which can in turn influence the ability of weeds to establish and grow. This approach typically requires regular equipment maintenance. Depending on the type of mower, debris such as rocks can be shot out from the mower and damage property. Mower blades hitting rocks can create sparks that may create fire hazards. Prior to use, areas being mowed may need some degree of survey to assess the presence of protected species or their habitat.

Hand removal involves pulling or cutting weeds by hand or with handheld tools such as hand weeding forks, weeding knives, hoes, and sickles. Hand removal can be particularly effective while weeds are still young and before they set seed. The entire weed, including underground parts such as roots, taproots, and rhizomes, should be removed for biennial weeds and perennial weeds that are capable of propagating by vegetative means. This approach is necessarily very labor intensive.

Tillage disturbs soil, killing weeds by cutting off or smothering aboveground parts and destroying or uprooting underground parts. Tillage is most commonly associated with land preparation for seasonal crop rotation in agricultural fields (e.g., via plowing and discing), but can also be performed in more localized areas using equipment such as rototillers, towed discs, and handheld cultivator tools. Hoes can also serve as a tool for light tillage. Tillage can also be used as a cultural control by helping to incorporate fertilizer, improve water penetration through soil, or otherwise enhance growing conditions for desirable plants (Flint, 2012). Notable drawbacks of tillage include the increased potential of spreading weed seeds and fragments to

non-infested areas with the tillage equipment, bringing additional weed seeds to the surface for easier germination, regrowth of perennial weeds from segmented propagules, and erosion. Like mowing, pre-activity surveys may be necessary.

Flaming and steaming are methods used to expose plants to extremely high temperatures, disrupting cell membranes and causing cell walls to burst (Flint, 2012). Tools such as propane or butane torches and steam machines are commonly used. Some steamers incorporate a foam mixture containing corn and coconut sugars that help keep the water hotter for an extended period of time (Wilen and Hernandez, 2019). While both methods can help selectively control weeds without harming nearby desirable plants, flaming targets aboveground plant parts while steaming can also damage root systems. Flaming and steaming must be conducted with caution to prevent risk of burn injuries to workers or ignition of non-target vegetation. Flaming and steaming are most effective on young plants that are in early growth and are not effective on plants with underground rhizomes. Caution must be used when flaming to ensure treated areas don't smolder after treatment and create a fire hazard.

Example of soil solarization (Wong, 2010)

Soil solarization involves using plastic to trap heat and increase the temperature of the top few inches of soil. Increased temperatures help to control soil-inhabiting pests and kill weeds and weed seeds to prevent germination. Soil solarization is most effective when used on bare soil for 3-6 weeks during sunny and hot weather conditions, particularly if the soil has been irrigated beforehand. This method may not be aesthetically pleasing and also increases runoff and therefore should be used with caution upslope of erosive soils.

Mulches and weed mats are physical control tools that are often used in tandem and cover the soil surface, blocking light and discouraging weed establishment. In addition to discouraging weed growth, these tools serve to conserve soil moisture, enhance the water-holding capacity of light sandy soils, and help maintain a uniform soil temperature (Flint, 2012). In landscapes, mulches are commonly made up of weed-free wood chips but can also use composted material, straw, pine needles, and plastics. Mulches should be at least 3-4 inches thick and are often laid over weed mats. Weed mats typically consist of porous plastic or landscape fabric that reduce weed growth while still allowing water to reach the soil. Bio-degradable cardboard sheets or rolls can also be used. Because weed mats vary in thickness and durability, they require regular inspection and replacement if they show signs of deterioration from UV light, penetrating weeds, or other damage.

Cardboard weed mat installation, Bridge Street

Finished sheet mulching project, Bridge Street

The practice of sheet mulching takes the concept of mulching one step further by attempting to mimic the natural soil building process in forests. Also called “lasagna” mulching, it is used to suppress weeds while establishing new landscapes. For example, an area of established grassy weeds can be covered with a layer of thick cardboard, a 2-3 inch layer of compost, a 4-6 inch layer of wood mulch, and optionally planted or seeded with desirable species. Weeds may need to be mowed and certain species, such as Bermuda grass, may require additional treatment prior to sheet mulching. Mulch layers should be replenished occasionally to prevent weed mats from being exposed and to prevent weed germination of seeds growing in the mulch material itself. Over time, weed mats can tear or sediment may drift in thereby forming a substrate for weeds to germinate.

Prescribed burning is the practice of applying controlled fire to a predetermined area. Prescribed burns can help reduce populations of invasive weeds and also serves to remove dead biomass that contribute to wildfire fuel loads as well as support restoration of natural ecosystems. Burning can stimulate germination of both invasive and desirable plant seeds, so additional controls may be needed. Because of the air pollution generated during burning and the potential contribution to wildfire risks, prescribed burns must be carefully planned and conducted under a permit from the local air district and/or fire agency.

1.2. Biological Control

Grazing involves the use of animals such as cows, sheep, and goats to feed on the aboveground portions of undesired plants. Animals used for grazing often have dietary preferences that can influence how well certain types of vegetation can be expected to be removed. For example, cows primarily graze grasses but will also consume some forbs, while goats will graze woody vegetation (Flint, 2012). In areas of rough terrain, goats and sheep are preferred over cows. Animal excrement must be expected and may present a short to medium-term aesthetic and/or potential water quality impact.

Insects and pathogens can support weed management efforts by selectively feeding on or injuring specific plants or by transmitting disease organisms that injure plants. Insects such as the Scotch broom twig miner, yellow starthistle hairy weevil, Russian thistle casebearer, and gorse spider mite and pathogens such as skeletonweed rust are examples of biological control agents that have previously been released for weed control in California (Flint, 2012). Note that pathogens used for biocontrol in California are regulated as pesticides.

Scotch broom twig miner (Coombs, 2013)

Allelopathy occurs when a plant releases chemicals, often through root exudation or decomposition, that impair the growth of nearby plants. For example, fresh bark or foliage from species such as pine and eucalyptus have been used as organic mulches because they can release natural toxins that temporarily inhibit young weeds. Similarly, using bark and foliage from plants with alleopaths for landscape mulch can inhibit the growth of desirable species and should be used with caution. Living stands of Eucalyptus, Pine, and Cedar will naturally inhibit understory growth, however it has been observed that some species are not affected by alleopaths. For example, Poision Oak and English Ivy have been found to proliferate in Eucalyptus stands. Similarly, some desirable species will tolerate growing under Eucalyptus.

1.3. Cultural Control

Sanitation can play an important role in preventing the spread of weeds into new areas. Examples of sanitation practices include cleaning mowing equipment between sites and using clean irrigation water free of seeds, rhizomes, and other weed parts.

Irrigation and nutrient management are examples of cultural controls that improve the health and vigor of desirable plants to help them outcompete weeds for light, water, and nutrients. For instance, drip irrigation systems, combined with an understanding of the water requirements of plants and how much available water the soil can hold, may be favored over irrigation systems such as overhead irrigation and floor irrigation because they deliver water only to sites where it is needed (Flint, 2012).

Excess irrigation events can increase weed prevalence so routine irrigation system maintenance and winterization are important management practices. Landscape types will vary in their irrigation needs and watering programs should be matched to plant growth needs. Too little irrigation can also increase weed problems. For example, on a sports field, applying too little irrigation can encourage the growth of broadleaf weeds. Excess or improperly timed fertilization can also contribute to higher weed growth. Fertilization should be optimized to plant growth needs and applied during the right season. For example, most sports turf fields should be fertilized with a product high in nitrogen during late Spring when vegetative growth is active and fertilized with a low-nitrogen, high-phosphorous product in fall when plants are producing less leafy growth and more carbohydrates for root development. Irrigation and fertilizer should generally not be applied in the dormant season or allowed to run off-site. Runoff can cause or exacerbate weed problems in other areas.

1.4. Chemical Control

Herbicides used for weed control can be described in a variety of ways. Three common metrics used to describe herbicides include selectivity (i.e., grass-specific, broadleaf-specific, or broad-spectrum), timing of use (i.e., pre- or post-emergence use), and translocation (i.e., contact or systemic). Before using any herbicide, be sure to carefully review the label to confirm that the product is registered for use on the target weeds and that its registered use sites are consistent with the sites at which the herbicide is intended to be used.

Selectivity refers to the range of organisms and life stages of organisms affected by a pesticide. Herbicides that kill only a subset of plants such as grasses or broadleaf weeds but do not damage other non-target plants are called selective. Herbicides that kill both broadleaves and grasses are called broad spectrum. The more selective an herbicide is, the less likely it will be to harm nontarget weeds and the more likely that other herbicides will be needed to address a

wider range of weeds occurring in the area. Selective herbicides are useful for control of specific weed species growing within populations of desirable landscape plants and turf grass.

Pre-emergent herbicides are applied to the soil prior to weed seed germination and are often effective in controlling many annual grassy weeds as well as some annual broadleaf weeds. Because perennial plants primarily rely on vegetative reproduction rather than reproduction by seed, they are typically not effectively controlled by pre-emergent herbicides. Pre-emergent herbicides are available in liquid and granular formulations and typically requires rainfall, watering-in or soil incorporation shortly following application to maximize efficacy. Generally speaking, to control summer annual weeds, pre-emergent herbicides should be applied in the spring when air temperatures reach 65-70° F for four consecutive days; applications to winter annual weeds should occur in the fall when nighttime lows reach 55-60° F for four consecutive days (CUCE, 2019).

Post-emergent herbicides are applied to actively growing weeds and can be used to control both annual and perennial species including broadleaf weeds, perennial grasses, and sedges. In general, most broadleaf weeds are best treated in the spring or fall when air temperatures are between 65 and 85° F (CUCE, 2019). To allow for sufficient uptake, post-emergent herbicides should be applied when no rainfall is expected for at least 24 hours. The addition of an adjuvant may also aid plant uptake and product effectiveness if it is not already formulated into the herbicide product. Post-emergent herbicides are generally most successful when applied to small, young plants.

Himalayan blackberry (Kuntz, 2009)

Contact post-emergent herbicides (e.g., glufosinate-based herbicides such as Forfeit® 280) kill primarily the plant parts on which the herbicide is applied, while translocated, or systemic, post-emergent herbicides (e.g., glyphosate-based herbicides such as Roundup Custom™) are absorbed by the roots or aboveground plant tissue and move throughout the plant, with the potential to kill the entire plant. The potential value of using either a contact or systemic herbicide depends in large part on the life cycle and life stage of species being controlled. Annual plants, for example, may be effectively controlled with a contact herbicide if it is applied to the aboveground tissue before the plants mature enough to set seed. Also important to the successful application of contact herbicides is ensuring adequate coverage of green, non-woody plant tissue, especially growing points. This may be difficult to achieve for some species including grasses, so follow-up applications may be necessary. Perennial plants, on the other hand, have the ability to regrow from underground vegetative propagules that survive year-round, despite seasonal senescence of aboveground tissue; therefore, systemic herbicides may be needed to kill the root system and achieve lasting control. Post-emergence systemic

herbicides work effectively when perennials are metabolically active, prior to senescence. For many perennial plant species such as Himalayan blackberry, post-emergence systemic herbicides are applied mid-summer after flowering to fall before the first frost. In contrast to contact post-emergent herbicides that require significant portions of the plant to come in contact with the herbicide to be effective, systemic post-emergent herbicides can be effective at without full plant coverage.

Organic and Minimum Risk herbicides typically fall under the category of post-emergent contact herbicides and most commonly contain botanically based oils (e.g., clove oil, cinnamon oil, eugenol), soaps (e.g., sodium lauryl sulfate, ammonium nonanoate, fatty acids), or organic acids (e.g., acetic acid, pelargonic acid, citric acid). These types of herbicides work by destroying the leaf cuticle or otherwise damaging plant cells and are often most successful when used on small weeds and annual weeds and often require multiple applications. Some organic herbicides are highly concentrated and may require use of increased Personal Protective Equipment (PPE) to reduce the potential for applicator injury. While certain organic herbicides are registered as pesticides, some organic and inorganic herbicides are categorized as Minimum risk products. As such, they are not required to go through the State and Federal pesticide registration processes and may therefore have labels with significantly less information than their registered counterparts. In many cases, multiple applications may be necessary to provide control.

Adjuvants are often mixed with or formulated into herbicide products to help enhance treatment efficacy. Adjuvants include materials that perform a variety of functions, including, but not limited to:

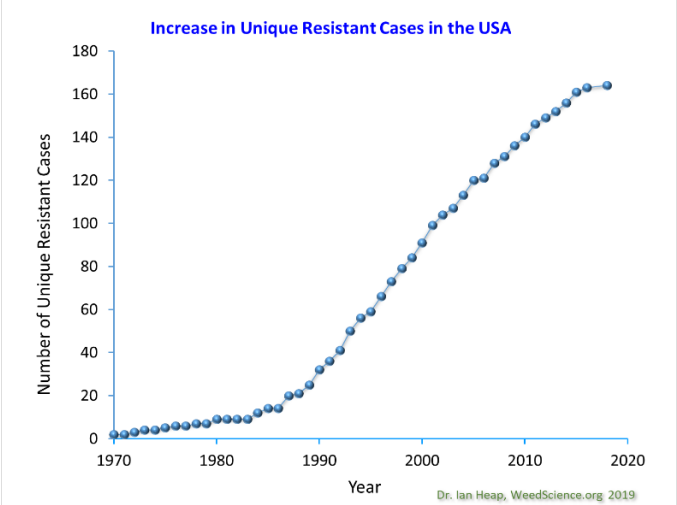
- Aiding in water conditioning and pH stabilization in order keep herbicides dissolved in solution
- Enhancing the penetration of an herbicide into the plant's waxy cuticle layer in order to increase efficacy and limit the amount of herbicide needed
- Controlling spray drift to limit the amount of herbicide that may travel with wind to non-target locations
- Decreasing the surface tension of an herbicide mixture to allow for better deposition and coverage on the plant surface
- Surfactants are a type of adjuvant that are designed and used to enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of an herbicide.

1.4.1. Pesticide Resistance

An important factor in sustainable vegetation management is herbicide resistance management. Herbicide resistance describes the ability of a plant to survive and reproduce after exposure to a dose of herbicide that would normally be lethal to a non-resistant counterpart.

Several factors influence the development of herbicide resistance in weeds. Some individuals of a pest population, for example, may be genetically predisposed to develop resistance. Biological factors such as the species' rate of seed production and germination also influence the rate of resistance development. Humans similarly play a role in herbicide resistance development. Repeated applications of the same herbicide, or herbicides with the same mode of action, over multiple generations of the pest life cycle can quickly lead to widespread resistance in a plant

population, reducing the effectiveness of the herbicide. The use of products which act on a single target site within plant cells rather than having multiple target sites (i.e., products which have a single mode of action) may encourage the development of target-site resistance. Other examples of vegetation management practices that may increase the risk of resistance development are using less than the label rate and improperly timing of pesticide applications resulting in the need for more applications or higher application rates. Note that resistance development has also been observed in association with other pesticide classes such as rodenticides, insecticides, and fungicides and is similarly influenced by such factors.



Trends in herbicide-resistance development (Heap, 2019)

Proactive herbicide resistance management includes rotating herbicides with different modes of action and always following label directions. Species showing signs of potential resistance development must be addressed promptly in order to maintain adequate control of target vegetation. For additional information on herbicide resistance management practices, refer to a University of California IPM Program weed specialist, a crop adviser, the U.S. Environmental Protection Agency (USEPA), or similar resource.

It is important to note that although resistance can and does develop, other factors may influence the ability of an herbicide to control a plant and should be considered before resistance is suspected. These factors include poor herbicide selection, application timing or coverage, rainfall, wind, etc.

1.4.2. Perception of Risk

There is often public concern over the risks that herbicide or pesticide use may cause to humans and the environment. It is important to acknowledge that all chemicals, including herbicides, have the potential to be hazardous. However, the risk of experiencing adverse impacts from a chemical can only be estimated by relating the chemical hazard, or toxicity, to the degree of an individual's exposure to that chemical. Even chemicals which are low in toxicity can pose a risk if the exposure is high enough. Likewise, chemicals that are high in toxicity can be used relatively safely if the exposure is low. Simply put, without both toxicity and exposure, there is no risk. This relationship is often expressed as follows:

Risk = Toxicity x Exposure

Toxicity is an inherent quality of a chemical which describes the amount of a chemical that will produce an adverse effect. USEPA uses four toxicity categories to describe the acute toxicity of pesticides. The acute toxicity of registered pesticides is then expressed as a "signal word" on

associated product labels. Refer to **Table 1** below for a summary of USEPA's toxicity categories and associated signal words.

Table 1. USEPA Toxicity Categories

Toxicity Category	Description	Signal Word
Category I	High toxicity	Danger or Danger-Poison
Category II	Moderate toxicity	Warning
Category III	Low toxicity	Caution
Category IV	Very low toxicity	Caution (optional)

In contrast, risk describes the likelihood that a chemical will produce an adverse effect under a given exposure scenario. This likelihood is based on factors such as which herbicide is used and at what concentration, the quantity of herbicide applied, the formulation used, environmental conditions, how often the herbicide is applied and over what period of time, and the manner in which an individual has contact with it.

In order for an herbicide to produce an adverse effect, an individual must be exposed. Exposure can occur in the following ways:

- Ingestion (e.g., residues in food or water)
- Inhalation (e.g., vapors, droplets, or dust)
- Dermal contact (e.g., getting it on your skin or in your eyes)

An important factor determining exposure is the amount of herbicide that actually enters, or is absorbed by, the body. The ability for absorption varies based on the herbicide and the route of exposure. The time of exposure also influences the potential for pesticide absorption. For example, an herbicide touched shortly after it has been applied to a plant surface has a greater potential for absorption than one touched after it has dried. Once liquid herbicide residues have dried, transfer to human skin or other surfaces is generally minimal.

Based on the understanding that risk is a function of both toxicity and exposure, all conventional herbicides and their labels are subject to a rigorous evaluation and review process by USEPA and DPR before they are permitted for sale and use in California. Directions, precautions, and use restrictions on product labels are based on extensive research studies conducted to quantify toxicity to mammals, honeybees, fish, birds, and invertebrates and identify potential impacts to the environment. Label language developed as a result of such studies is intended to keep exposure below levels that may result in unacceptable risk.

Note that a variety of factors influence how individuals perceive the risk associated with a given event or activity, and effective communication about risk involves first considering the risk perception factors that may be at play. When perceived risk is greater than actual risk, the public is more likely to have a stronger negative response. **Table 2** below, adapted from USEPA (2007), provides examples of factors that may influence whether actual risks are more likely to be considered by the public to be less than or greater than perceived risks.

Table 2. Example Risk Perception Factors

Actual Risk > Perceived Risk	Actual Risk < Perceived Risk
Controlled by the individual; voluntary	Controlled by others; involuntary
Natural, organic, "green"	Man-made, synthetic, industrial
Scientifically well understood	Scientifically unknown
Little attention from media or public health officials	Wide coverage by media and public health officials
Personal impact not anticipated	Personal impact likely or anticipated
In the hands of a reliable source; trust	Managed by an unreliable source; lack of trust
Reversible, temporary	Irreversible, permanent or long lasting
Benefit known and understood (cost-benefit ratio)	Benefit not known or understood (cost-benefit ratio)
Immediate health effects	Delayed health effects

The use of pesticides in public areas can increase the perceived risk of such an activity, regardless of what the actual risk is. As a result, it is important to be able to communicate with stakeholders and address concerns as needed. Keep in mind that although it is unlikely that such conversations will change strong initial opinions, they will help build rapport with the community by demonstrating the City's transparency, responsiveness, and efforts to resolve concerns. For example, the California Invasive Plant Council's (Cal-IPC) guide *Talking about Glyphosate: Communication Guide for Natural Resource Managers* provides a number of discussion tips and examples of key points that can be used when discussing herbicide use and glyphosate in particular, and may be a good resource to refer to and adapt for City use. Cal-IPC's *Talking about Glyphosate: Communication Guide for Natural Resource Managers* can be found here: https://www.cal-ipc.org/wp-content/uploads/2019/08/Talking_about_Glyphosate.pdf. Examples of discussion tips can include:

- Listen to and acknowledge public concerns
- Show empathy
- Be direct in answering questions and describe what you are working to protect
- Referrals to your Supervisor

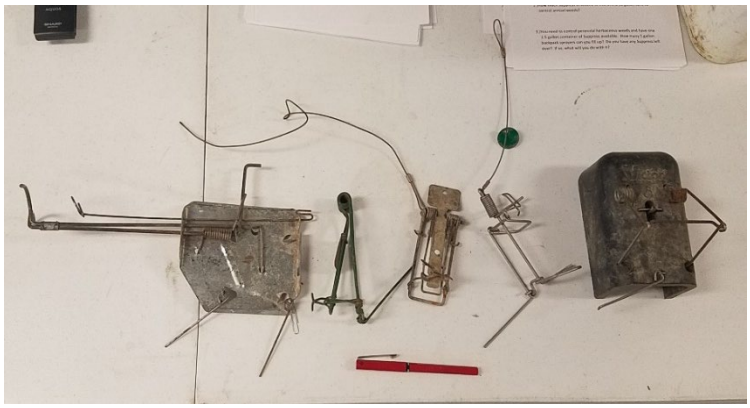
Once the City develops its IPM Policy, flyers carried by City employees can be distributed to interested citizens as a way to communicate the City's approach and begin the conversation on pest management. Written and/or verbal discussion points may include:

- Goal/rationale of the IPM program and pest management
- Reference to the array of pest management tools and strategies implemented
- Examples of ways in which the City reduces the potential for adverse or non-target impacts as a result of pest management activities
- Reference to the City's Adopt-A-Trail program, if appropriate
- Reference to relevant staff training and certifications
- Your contact information

2. BURROWING RODENTS & MOLES

2.1. Physical/Mechanical Control

Trapping can be a safe and effective method for controlling burrowing pests. Traps most suitable for burrowing pest control can generally be categorized as kill traps or live traps.



Examples of gopher kill traps

There are several types of kill traps available for use. While many of these traps are designed to be inserted into the burrow, some are intended to be set on the ground surface. The shape, size, and placement of kill traps often make certain traps more effective for some species over others. For example, common ground squirrel traps include box and tunnel traps that are set on the ground surface and conibear traps that are placed in burrow openings. Alternatively, two-pronged pincer traps and choker-style box traps are commonly used for gophers while harpoon and scissor-jaw traps are commonly used for moles. Electronic traps that deliver a high voltage shock are also available.

Live-catch traps (e.g., wire cage traps) are less commonly used and because they are designed for aboveground use, they are most suitable for ground squirrels. One of the primary challenges associated with live trapping is that, because the relocation of wildlife in California is prohibited without a permit, trappers are responsible for either the immediate onsite release of captured animals or the legal and humane euthanization (e.g., gassing with carbon dioxide) of captured pests (Quinn et al., 2018). A study conducted by the Contra Costa County Department of Agriculture (2013) also found that a significant portion of captured squirrels were injured from fighting with other squirrels in the trap. The study also noted that some traps were vandalized in apparent attempts to free the captured squirrels, which can increase the risk of bites, scratches, and exposure to transmissible disease.

Traps should be inspected frequently and reset as needed, and any carcasses present should only be handled with appropriate protective gear. Furthermore, when using traps, it is important be mindful of nontarget animals that may unintentionally be captured or injured. Access to traps can similarly be a hazard to small children. When used in publicly accessible areas such as parks, care should be taken to prevent inadvertent contact with patrons or their pets. Covering the trap slightly with dirt, flagging the trap and posting notifications at entrances to grounds can be helpful in making park users aware that traps are in-use so they can avoid them.

Exclusion is a form of physical control that keeps pests from invading areas where they are not wanted. Exclusion is commonly used to prevent pest entry into buildings but can also be used in landscape environments using materials such as hardware cloth or mesh wire. For example, underground fencing, gopher baskets, and wire mesh can be used to protect ornamental shrubs, landscape trees, or flower beds from damage from gnawing gophers. In addition to preventing or slowing breakthrough into the protected area, gophers tend to find metal materials

unpleasant to chew on. Note, however, that persistent gophers and moles can burrow under or around the fencing.

2.2. Biological Control

Natural predator introduction or enhancement can help support efforts to keep pest populations at manageable levels. Owls, snakes, cats, dogs, and coyotes are examples of predators that feed on gophers and hawks, eagles, rattlesnakes, and coyotes are examples of predators that feed on ground squirrels. Use of natural predators as the sole pest control mechanism is often not sufficient to keep populations at acceptable levels, partially due to the fact that they may have foraging ranges that are larger than the control area and may move on to hunt in more prey-rich areas. Furthermore, an overabundance of natural predators can result in the predators themselves becoming pests. Enhancement of predator presence includes the use of owl boxes and raptor perches.

2.3. Cultural Control

Habitat modification involves altering habitat to reduce the desirability for pests. For example, reducing gopher food sources can decrease the attractiveness of lawns and gardens to gophers (Baldwin, 2019). Removing brush piles and other debris used as cover during burrow retreat can make an area less desirable to ground squirrels (Quinn et al., 2018).

Burrow destruction is another method of habitat modification, although it may not be feasible in urban locations. Ground squirrel reinvasion of vacant burrows, for instance, can be slowed by destroying old burrows (Quinn et al., 2018).

2.4. Chemical Control

Rodenticide baits can be an effective chemical control when appropriate precautions are taken to prevent unintentional consumption by nontarget animals and humans. First-Generation Anticoagulant Rodenticides (FGARs), Second-Generation Anticoagulant Rodenticides (SGARs), and some Non-Anticoagulant Rodenticides (NARs) are frequently applied as a component of rodenticide baits.

FGARs (e.g., chlorophacinone, diphacinone, warfarin) usually require multiple feedings to be lethal. As such, a relatively large amount of bait or multiple applications may be necessary to ensure availability for multiple feedings (Baldwin, 2019). Death generally occurs within 5-7 days. FGARs interfere with blood clotting and cause excessive bleeding. They do not generally persist in poisoned animals.

SGARs (e.g., brodifacoum, bromadiolone, difethialone) are generally more toxic and persistent than FGARs and also act by interfering with blood clotting. A lethal dose can be consumed in one feeding but animals may consume more because death usually occurs 5-7 days after the initial lethal dose. Because SGARs persist in poisoned animals, predators and scavengers may be at risk for secondary poisoning. To reduce risks associated with secondary poisoning, SGARs are typically only registered for use on commensal rodents and not used in publicly accessible spaces to avoid any perceived harm to domestic pets and local wildlife.

As of January 1, 2021, Assembly Bill (AB) 1788 resulted in the passing of the California Ecosystems Protection Act of 2020 which significantly restricts or prohibits the use of SGARs.

Most uses of SGARs are currently prohibited in California; however, some exceptions exist. Examples of exceptions to this prohibition include:

- The use of SGARs by any governmental agency employee who complies with Section 106925 of the Health and Safety Code, who uses second generation anticoagulant rodenticides for public health activities
- The use of SGARs by any governmental agency employee for the purposes of protecting water supply infrastructure and facilities in a manner that is consistent with all otherwise applicable federal and state laws and regulations
- The use of SGARs by a mosquito or vector control district to protect public health
- The use of a registered SGAR to control an actual or potential rodent infestation associated with a public health need, as determined by a supporting declaration from the State Public Health Officer or a local public health officer

NAR baits (e.g., bromethalin, cholecalciferol, strychnine, zinc phosphide) are toxic in other ways, such as asphyxiation and nerve disruption. Some NAR baits such as 4-vinylcylcohexene diepoxide and triptolide act as reproductive sterilants.

T-Bait Station

T-bait stations are effective for use on ground squirrels which can be purchased commercial or economically constructed with PVC pipe. They are placed on the ground in an upside-down T-shape. They can be made with three 2-foot lengths of 4-inch PVC pipe with 3-inch reducers at the two bottom ends and a cap on the top which prevents bait from spilling out and weather-related contamination of the bait. Since ground squirrels will feed on the bait over a 5-7 day period, the station must be checked frequently and refilled from the top. Bait can further be constricted to the center of the station by installing a 3-inch coupling in the center of the T, which will help prevent ground squirrels from dragging bait outside of the station. Ground squirrels will come in from either bottom end and feed on the bait. It is important to use bait approved for ground squirrels, which is typically an FGAR mixed with a pelletized carrier that mimics their natural food source. Modifications can be made to exclude kangaroo rats from the station by adding angled sections of pipe to elevate entrances to 12 inches above the ground in areas where kangaroo rat populations are present.

In public grounds such as parks, extreme caution must be exercised to exclude passersby and domestic animals from tampering with the bait. Bait applications should be confined to enclosed burrows, made in areas where the public does not frequent, and/or be identified with signage and monitored.

Note that some rodenticide products are categorized as California Restricted Materials. Purchase and use of such products must be conducted by qualified applicators certified or

licensed by the California Department of Pesticide Regulation (DPR) and under a permit administered by the local County Agricultural Department. Always carefully read and follow product label instructions.

Fumigation is a popular alternative to rodenticide baits. NAR fumigants (pesticide gas or vapor) act in several ways. Aluminum and magnesium phosphide fumigants react with moisture in the air and soil to form phosphine gas. Whether formed in this manner, or used as phosphine gas directly, phosphine is an acute toxicant that inhibits central nervous system function. Methyl bromide causes cellular damage and alters CNS function. Sulfuryl fluoride interferes with and disrupts cardiovascular function. Most available fumigants containing these active ingredients are classified as California Restricted Materials and may have additional use requirements. For example, applications of aluminum phosphide can only be made within burrow systems located more than 100 feet from any building where humans, domestic animals, or both are or may potentially be found (Baldwin, 2019).

Some fumigants, such as potassium nitrate and sodium nitrate come in the form of smoke or gas cartridges that, when ignited, produce a variety of gases, including carbon monoxide. Carbon monoxide acts by reducing blood's oxygen-carrying capacity and impairing cardiac output. Fumigation with smoke or gas cartridges is often not effective for gopher control because gophers quickly seal off their burrow when they detect smoke or gas (Baldwin, 2019). Carbon dioxide-based fumigants work by displacing breathable air with carbon dioxide, resulting in asphyxiation.

Pressurized exhaust systems that inject concentrated carbon monoxide into burrow systems such as the Pressurized Exhaust Rodent Controller (PERC®) machine, BurrowRx®, and Cheetah® rodent control machine are also available for use and can be effective for burrowing pest management. Unlike other fumigants discussed above, these carbon monoxide delivery devices are not regulated as pesticides.

BurrowRX

Burrow fumigation is most effective when soil moisture is high. In addition to supporting containment of the fumigants within the burrow, some fumigants such as aluminum phosphide require adequate soil moisture in order to properly activate (Quinn et al., 2018). Where possible, it's often beneficial to utilize a smoke indicator to more easily monitor the movement of fumigants underground. Smoke can be used prior to treatments to determine the extent of burrow systems and/or during treatments to identify and address areas where the fumigant is escaping from the soil.

When using fumigants, consider the typical burrow system length for the pest of interest in determining appropriate buffer distances between the application and occupied buildings, particularly if smoke indicators are not used or if the manufacturer's instruction manual does not

specify a recommended buffer distance. For example, gopher burrow systems are generally much larger than those of ground squirrels, so a larger buffer should be observed (Eisemann et al., 2016). The distance that a fumigant is capable of traveling underground and its inhalation toxicity to humans and domestic animals can also influence the determination of appropriate buffer distances.

Fumigation should only be used in active burrows. Note that ground squirrels plug their burrows with soil during hibernation and therefore should not be treated via fumigation during these periods. Furthermore, additional care should be taken to avoid the unintentional injury of nontarget species that may be inhabiting inactive ground squirrel burrows.

PERC machine

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ATTACHMENT E

Pest Biology Notes

Attachment E

Pest Biology Notes

1. PLANT LIFE CYCLES

The plant life cycle generally consists of four life stages: seed, seedling, vegetative growth (branches/shoots, leaves, roots), and flowering (reproduction). Depending on the species and environmental conditions such as sunlight exposure, moisture, and temperature, these life stages occur during different times of the year and are completed over a time period ranging from months to years (Dreistadt, 2013).

1.1. Annual

Annual plants such as yellow starthistle complete their life cycle and die within 1 year. Because they reproduce by seed, annuals must be controlled before they mature enough to set seed. Annual plants can be further divided into summer and winter annuals. Summer annuals germinate in the spring or early summer and produce seed and die by late summer, fall, or early winter. Winter annuals germinate in the fall and generally produce seed and die by spring or early winter.

Yellow starthistle (Folini, 2014)

1.2. Biennial

Biennial plants such as bristly oxtongue require 2 years to complete their life cycle, growing leaves, stems, and a taproot during the first year and flowering, maturing, and dying in the second year. Biennials typically experience active growth during the summer and dormancy during the fall and winter. They should be controlled prior to flowering to prevent seed production. For lasting control, the taproot may need to be killed or removed.

1.3. Perennial

Perennial plants persist for many growing seasons, some maturing and reproducing on an annual basis and others (e.g., trees) maturing and reproducing several years after completing their seedling stage. While most perennials initially develop from seed, many herbaceous perennials reproduce primarily by way of vegetative parts such as stolons, rhizomes, tubers, bulbs, and creeping roots. Most grasses and many low-growing broadleaves such as cape ivy, fennel, and kikuyu grass are considered herbaceous perennials. While their aboveground parts such as stems and leaves often die back seasonally, herbaceous perennials can be difficult to control due to their ability to regrow from underground vegetative propagules that survive year-round.

In contrast, conifers, oaks, and various other broadleaf trees, shrubs, and vines such as eucalyptus, acacia, and Himalayan blackberry are categorized as woody perennials. Some woody perennials such as certain conifers and evergreen broadleaves retain their foliage and grow throughout the year, while others such as deciduous broadleaf trees and shrubs seasonally lose their leaves and become dormant, typically in winter. Despite becoming

dormant, the roots and aboveground tissue beneath the bark of these perennials remain alive throughout the year. Many species of woody perennials such as madrone, red alder, and some true oaks are known to regrow from cut stumps and underground buds, while most conifers characteristically do not regrow if the main trunk is cut (Dreistadt, 2013).

2. BURROWING PEST BIOLOGY AND BEHAVIOR

2.1. Pocket Gophers

Pocket gophers have a short tail and are 6-10 inches in length. Because gophers typically remain underground in their burrow system, their presence is often most easily identified based on observations of mounds of fresh soil which are pushed to the surface as new tunnels are created. When viewed from above, gopher mounds are typically crescent- or horse-shoe-shaped with a hole off to one side that is usually plugged with earthen plugs.

Pocket gopher (Hofmann, 2007)

About 2.5-3.5 inches in diameter, pocket gopher burrows can span 200-2,000 square feet. Feeding burrows are usually 6 to 12 inches below ground, and the nest and food storage chamber can be as deep as 6 feet (Baldwin, 2019).

Gophers usually live alone within their burrow system, except when females are caring for their young or during breeding season, and can live for up to 3 years after reaching sexual maturity at 1 year of age (Baldwin, 2019). Gophers usually breed in late winter and early spring in non-irrigated sites, producing a single littler of 5-6 pups per year; however, they can produce up to 3 litters per year in irrigated sites.

Gophers are active year-round and can also be active at all hours of the day and night. While they feed on a wide variety of vegetation, gophers prefer herbaceous plants, shrubs, and trees and often feed on roots and fleshy portions of plants they encounter while digging. In some cases, gophers may venture a body length or so from their burrow opening to feed, evidenced by a circular band of clipped vegetation around the hole (Baldwin, 2019). These “feed holes” lack the characteristic dirt mound typically surrounding burrow entrances.

Gopher mound (Cheney, 2012)

Gopher "feed hole" (Roger Baldwin, UC ANR)

2.2. Ground Squirrels

Ground squirrels have mottled brown fur with some white and gray markings on the back and a lightered colored underside. Their tails are less bushy than those of tree squirrels and bring their body length to 14-20 inches. California ground squirrels have a white ring around each eye.

Ground squirrel burrows are usually about 4 inches in diameter and 5-30 feet in length. Most burrow systems are within 2-3 feet of the ground surface, but may extend up to 6 feet or more in depth (Quinn et al., 2018). Burrow systems range in complexity and can be occupied by one or many squirrels.

California ground squirrel (Cheng, 2009)

Most adult ground squirrels hibernate during winter months and go into estivation, another period of inactivity that can last a few days to a week or more, during the hottest months of the year (Quinn et al., 2018). During estivation, ground squirrels plug their burrows with soil near the nest, despite appearing open at the tunnel entrance.

Breeding season can vary depending on weather, elevation, and latitude. While peak mating occurs from March through June, mating can start as early as January in warmer locations and continue until July. California ground squirrels produce a single litter per year, typically containing 5-8 kits that emerge from the burrow when they are about 6 weeks old.

Ground squirrels forage above ground, typically within 75 yards of their burrow, and exhibit seasonal dietary preferences (Quinn et al., 2018). After emerging from hibernation, they feed primarily on green grasses and herbaceous plants. When annual plants begin to dry and produce seed, squirrels switch to seeds, grains, and nuts.

2.3. Moles

Contrary to popular belief, moles are small insect-eating mammals and are not rodents. Moles have cylindrical bodies with short tails, spade-like limbs, pointed snouts, non-visible ears, and poorly developed eyes (Baldwin et al., 2012).

Mole (Hill, 2005)

Moles live almost entirely underground, often creating shallow tunnels just below the surface where they feed on worms, insects, and other invertebrates. Sometimes temporary, these surface feeding burrows appear as ridges that the mole pushes up by forcing its way through the soil (Baldwin et al., 2012). Permanent tunnels extend deeper underground, about 8-12 inches below the surface. Mole tunnels are approximately 2 inches in diameter and are characterized by mounds that are circular when viewed from the top and volcano-shaped when viewed from the side. Mole mounds have a plug in the middle that might not be distinct (Baldwin, 2019).

Mole mound (Mellor, 2007)

Moles are active throughout the year, with activity increasing after rainfall or irrigation when digging new tunnels is easiest and decreasing at the surface during periods of extreme cold, heat, or drought.

Mole burrow systems typically only have a single occupant, with the exception of late winter to early spring when breeding occurs. Moles produce one litter of 3-4 pups per year.

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ATTACHMENT F

City of Watsonville Herbicide and Pesticide Application Log Sheet

CITY OF WATSONVILLE

HERBICIDE AND PESTICIDE APPLICATION LOG SHEET

1. NOTICE INFORMATION

It is the applicators responsibility to document each application. One log sheet per application.

Area/Nearby Address: _____ Area/Nearby Address: _____

Area/Nearby Address: _____ Area/Nearby Address: _____

Date Posted: _____ Start Time: _____ End Time: _____

Removal Date: _____ Start Time: _____ End Time: _____

2. EQUIPMENT

☐Backpack ☐Hand Gun ☐Boom ☐Dry Applicator ☐Broadcaster ☐Spill Kit ☐Other _____

PPE ☐Close Toe Shoe ☐Rubber Boot ☐Long Sleeves ☐Apron-Chemical Resistant ☐Long Pants _____

☐Gloves-Chemical Resistant ☐Safety Glasses/Goggles ☐Face Shield ☐Eye Wash ☐Other _____

3. SITE CONDITIONS

Weather (sunny/cloudy): _____ Temperature: _____ Wind Speed: _____ Wind Direction: _____

Target Pest (weeds, ants, etc.): _____

Pest Stage of Growth: _____

4. SITE TREATED – LOCATION(S)

Location(s) _____ Start Time: _____ End Time: _____

Description: ☐East ☐West ☐North ☐South Bound From/To: _____

☐ROW ☐Open Space ☐Park ☐Trail ☐Alley ☐Facility ☐Other: _____

5. COMPONENTS

Products: _____ Active Ing: _____ Total Used (oz., lbs., gal. etc.) _____ Rate: _____

Products: _____ Active Ing: _____ Total Used (oz., lbs., gal. etc.) _____ Rate: _____

Products: _____ Active Ing: _____ Total Used (oz., lbs., gal. etc.) _____ Rate: _____

6. APPLICATOR INFORMATION

Applicator(s) Name: _____ Application Date: _____

Division: _____ Operator I.D.: _____

Certificate/Lic No.: _____ Expiration Date: _____

Comments: _____

Applicator(s) Signature: _____ Applicator(s) Signature: _____

7. SUPERVISOR INSPECTION

Inspection Date: _____ Observations: _____

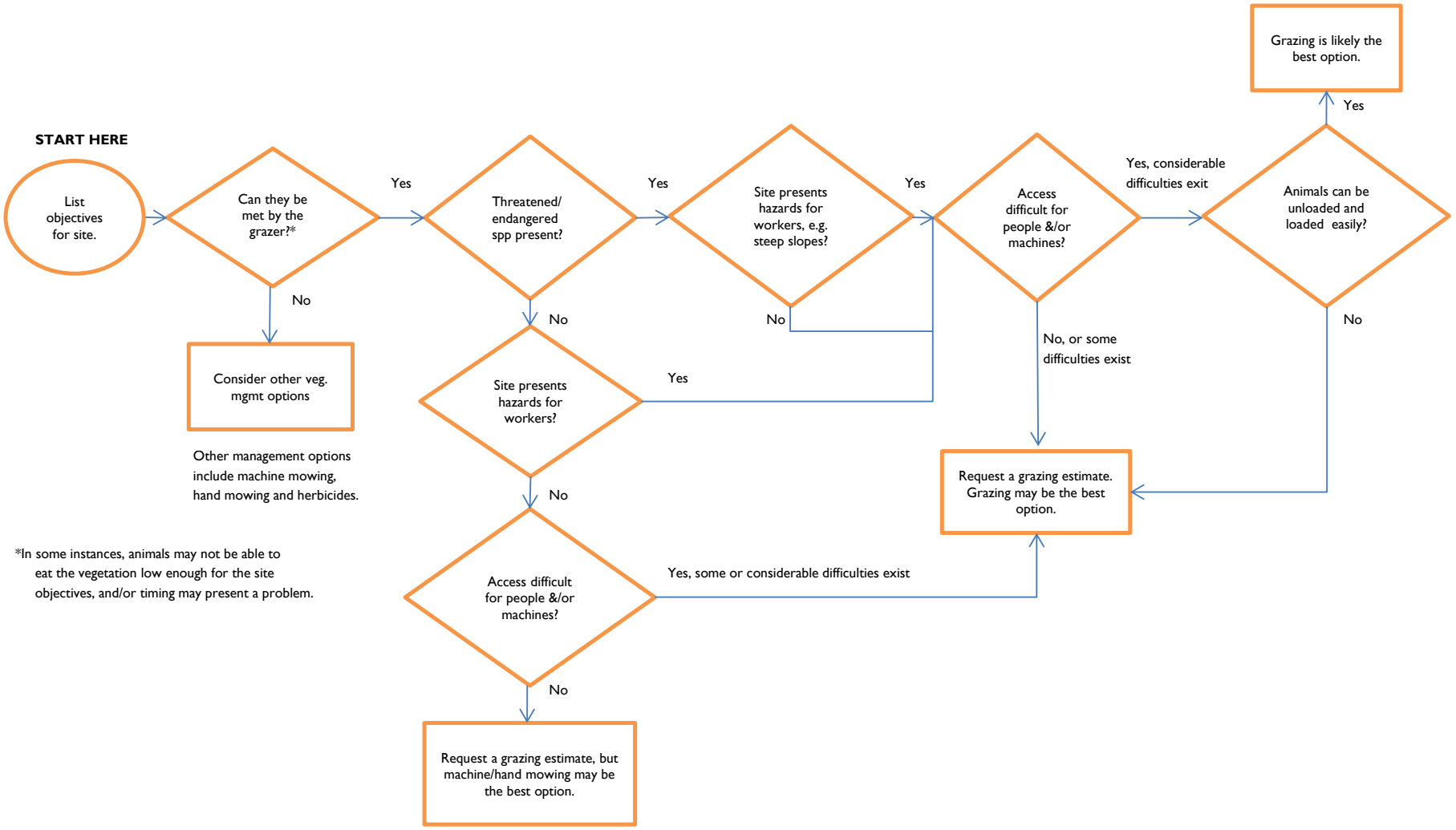
Supervisor Signature: _____ Start Time: _____ End Time: _____

Comments _____

ATTACHMENT G

Example Contra Costa County Decision-Making Documentation

Public Works Vegetation Management Decision Tree for Grazing
Revised 8-18-15



Contra Costa County
DECISION DOCUMENTATION for VEGETATION MANAGEMENT
on County Roadsides and Road Rights-of-Way

Date: February 3, 2017 (last revised on 11/29/18)

Department: Public Works Maintenance Division

Location: Unicorporated rural areas

Situation: Vegetation management along roadsides and road rights-of-way

Note that management decisions are site specific for roads. Not every management technique will work equally well at all sites and for all weeds, and the costs of each technique will vary depending on the site. The County has developed a flowchart to aid the decision-making process.

See the CCC General Pest Management Decision Tree for a summary of the decision-making process.

What are the management goals for these sites?	<u>To reduce fire risk:</u> The County is subject to the regulations of 8 separate fire districts. The following are the districts and the links to their regulations (if available): • Contra Costa Fire Protection District (ConFire) http://www.cccfpd.org/pdfs/WA-2-minimum-standards-17.pdf • Crocket-Carquinez Fire Protection District (regulations not apparent on website) • East Contra Costa Fire Protection District (same regs as ConFire) • Kensington Fire Department (same regs as Richmond) • Moraga-Orinda Fire District http://www.mofd.org/_literature_196457/Exterior_Hazard_Abatement_Standards • Pinole Fire Department (regulations not apparent on website) • Richmond Fire Department http://www.ci.richmond.ca.us/DocumentCenter/View/38822 • San Ramon Valley Fire Protection District -- http://www.firedepartment.org/civica/filebank/blobdload.asp?BlobID=4207 The County manages to the most restrictive regulations of the 8 fire districts, which are described in the County's fire protection ordinance: Title 7, Division 722, Section 320.4.1 says, "No person who has any ownership or possessory interest in or control of parcel of land shall allow to exist thereon any hazardous rubbish, weeds, trees, or other vegetation that constitutes a fire hazard." Title 7 Division 722, Section 320.4.2.1 says, "The Fire Code Official is authorized to cause areas within 10 feet (3048 mm) on each side of portions of streets which are improved, designed, or ordinarily used for vehicular traffic to be cleared of flammable vegetation and other combustible growth." The Public Works Department tries to maintain an 8 foot strip, where practical, of vegetation-free ground (not including trees, shrubs, or landscaping) along each side of a road. Fire district regulations stipulate that vegetation management must typically be completed by May 1, and at the very latest by July 1, in order to avoid abatement notices from the local fire district. The May 1 deadline is a recent change and makes it more difficult for the crew to perform all the needed work between the time that weather conditions permit work and May 1. <u>To maintain road safety:</u> The County maintains road safety in accordance with the County's best management practices. The following are some of the management practices: • Prevent sight line obstruction of signs, pullouts, ditches on sides of the road, obstacles on sides of the road (California Streets and Highways Code, Sections 1480-1485) • Prevent a perceived narrowing of the roadway from large plants growing close to the side of the road that can force drivers to move to the center of the road • Maintain adequate road drainage (vegetation can clog ditches and drains) • Keep pavement intact as long as possible o Plants next to pavement or growing into cracks in pavement can allow water to move down under the asphalt causing it to buckle and crack more. o Weeds growing along the shoulder can hasten the deterioration of the shoulder which can lead to hazardous roadside conditions, especially for bicycles, but also for cars if the drop from the road surface

	becomes large. To reduce liability for the County: Fires, accidents, and law suits against the County are a regular and costly occurrence. To prevent the movement of invasive plants along roadway corridors: Invasive plant seeds and parts can be carried far and wide by animals, wind, and water moving along roadsides. Even vehicle tires and undercarriages, bicycle tires, and people's footwear can move weeds from one place to another. With these management goals in mind, the most appropriate management tactics are chosen based on cost, efficacy, impacts to the environment, public health, and other impacts to the public.
Who has jurisdiction over the areas in question?	The County owns the roads and rights-of-way and is responsible for their maintenance. The local fire districts are responsible for insuring that property owners and managers follow their regulations. Note: In general, in unicorporated areas where there are curbs, gutters, and sidewalks, the homeowner is responsible for vegetation management.
Number of road miles under management	The total number of road miles is 660 (a road mile includes both sides of the road). Approximately 325 to 375 road miles are under active vegetation management (the number changes with the weather and other factors from year to year). Not all of the 660 road miles are rural roads, many are in unicorporated residential areas where the Public Works Department does not manage roadside vegetation.
Number of staff available for vegetation management activities	Currently the Division has no Vegetation Management Supervisor; the position has been vacant for a year. There are 2 Senior Vegetation Management Technicians; both positions are vacant. There are 3 Vegetation Management Technicians; 2 positions are filled and the other is vacant. The 4 Maintenance Worker positions are filled.
Source of funding	Road maintenance, including vegetation management, is funded solely from the gasoline tax. The County does not contribute any money from the General Fund except for a small amount going to specific drainage projects. The funds coming from the gas tax have been declining for years because the tax has not been increased, while at the same time cars have become much more fuel efficient. In addition, there are many electric vehicles on the road that pay no gas tax for maintenance of the roads on which they drive. With the passage of California Senate Bill 1 in December 2016, the County saw a much needed increase in funds for road maintenance; however, the extra funds must first go to bring the average Pavement Condition Index up to 80 or better. At present, CCC's arterial Pavement Condition Index is in the 60s. Thankfully, SB 1 sustained an attempt at repeal in November 2018. The following are the main provisions of SB 1: • $0.12 increase in gasoline tax/gallon, with inflation adjustment • Increase to the Vehicle License Fee of between $25 and $175, with inflation adjustment, depending on the cost of the vehicle • $0.20 increase in the tax/gallon on diesel • An increase in vehicle registration fee for 2020 and later model zero-emission vehicles of $100 with inflation adjustment • The bill imposes various requirements on the department and agencies receiving these funds. The bill authorizes a city or county to spend its apportionment of funds under the program on transportation priorities other than those allowable pursuant to the program if the city's or county's average Pavement Condition Index meets or exceeds 80.
How often is the site monitored?	All sites in the county are monitored every few days. The Vegetation Management Supervisor spends part of every day inspecting roadways on a rotating basis. The road crews, the road crew supervisors, and the vegetation management crew are all trained to recognize vegetation issues on roadsides and road rights-of-way and to report them to the Supervisor. Monitoring information is recorded on the Vegetation Management Supervisor's Daily Report. If a new weed species is found, the Supervisor identifies and researches the weed. If he/she cannot identify the specimen, he/she consults the County Department of Agriculture. If a weed on the California Department of Food and Agriculture A-rated list is found, the County Agriculture Department is also consulted.
Weeds have been identified as the following:	Any species that can pose a fire danger or sight obstruction, including volunteer trees and otherwise desirable species, will be managed to maintain the integrity of the road and road shoulder. Key weeds are listed below. The list is continually updated as vegetation changes. Invasive species: • Yellow starthistle (*Centaurea solstitialis*) • Purple starthistle (*Centaurea calcitrapa*) • Russian thistle, or tumbleweed (*Salsola tragus*) • *Kochia (Kochia scoparia*) • Stinkwort *(Dittrichia graveolens*) • French broom (*Genista monspessulana*) • Pepperweed (*Lepidium latifolium*) • Tree of heaven (*Ailanthus altissima*) • Algerian ivy (*Hedera algeriensis*)

<table>
<tr><td></td><td colspan="2">• Himalayan blackberry (Rubus armeniacus)
Other species:
• Poison oak (Toxicodendron diversilobum)
• Poison hemlock (Conium maculatum)
• Mare's tail (Conyza canadensis)
• Mustard (Brassica spp.)
• Mallow or cheeseweed (Malva spp.)
• Various grasses

The Department does not have a specific invasive weed management program; however, the vegetation management crew is trained to look for invasives when they are out working.</td></tr>
<tr><td>Are populations high enough to require control?</td><td colspan="2">The Vegetation Management crew manages vegetation as necessary to meet the management goals noted above.

At times, vegetation re-growth may be sparse enough and the fire risk low enough that a decision might be made to leave the re-growth alone.</td></tr>
<tr><td rowspan="9">Are these sensitive sites?</td><td>Are any areas "highly sensitive sites" as defined by PWD Environmental staff? A highly sensitive site contains a known habitat for, or is close to sightings of, endangered or threatened species. Refer to the attached flow chart for an outline of how sensitive sites are determined and handled.</td><td>No</td></tr>
<tr><td>Are any areas under the Routine Maintenance Agreement with Fish and Wildlife?</td><td>It's possible if a road shoulder is under the riparian canopy.</td></tr>
<tr><td>Are any areas part of the court-ordered injunctions? (see: https://www.epa.gov/endangered-species/interim-use-limitations-eleven-threatened-or-endangered-species-san-francisco-bay)

Some areas are included in the red legged frog injunction. The Department has a map of areas included in the red legged frog injunction. The injunctions specify buffer zones around designated habitat for certain species for particular pesticides, but they do not preclude the use of those pesticides outside the buffer zones.</td><td>Yes</td></tr>
<tr><td>Are any areas known or potential habitat for any endangered or threatened species?

Some areas border habitat or potential habitat for species, but the actual gravel road shoulder is not suitable habitat for most vertebrates.</td><td>No</td></tr>
<tr><td>Are these areas places where people walk or children play?

Most of the roads and rights-of-way covered by this document are not suitable for pedestrian traffic or for children to play. Areas where people walk are the following:
• Iron Horse Trail
• Clyde Pedestrian Path
• Delta De Anza Trail (county only maintains a small portion)</td><td>Occasionally</td></tr>
<tr><td>Are they near an above ground drinking water reservoir?</td><td>Yes, some</td></tr>
<tr><td>Are they near crops?</td><td>Yes, in some cases.</td></tr>
<tr><td>Are they near desirable trees or landscaping?</td><td>Yes, occasionally</td></tr>
<tr><td>Is the soil highly permeable, sandy, or gravelly?

Yes, in some areas. Hoffman Road is one.</td><td>Yes</td></tr>
<tr><td>Is the ground water near the surface?</td><td>Unknown, other than Hoffman Road</td></tr>
<tr><td>Are they within a Groundwater Protection Area?</td><td>No</td></tr>
<tr><td></td><td>Are they within an infiltration basin?</td><td>No</td></tr>
<tr><td>What factors are taken into account when determining the management technique(s) for vegetation?</td><td colspan="2">• Species of plant
• Stage of growth
• Plant density
• Plant location (accessibility, topography, adjacent properties)
• Weather (precipitation, wind, temperature, relative humidity)
• Road condition—if a road is in very poor condition, vegetation growing close to the edge can cause more</td></tr>
</table>

	damage than if a road is in good condition. Every 7 to 10 years, the road is scheduled for resurfacing and there must be a clear corridor for the work. • Personnel available to perform the management activities when they are needed • Safety (for the public, staff, wildlife, adjacent property, the general environment) • Proximity to water resources and wildlife • Aesthetics of the site • State and local regulations • Budget available
Are special permits required for work?	If the Department were to use Vanquish (dicamba), which is restricted because of volatility, it would need to file with the County Department of Agriculture a Notice of Intent (NOI) to apply the material. Note that the Department has not used Dicamba in 5 years.
Which cultural controls were considered?	**Mulching** • It is difficult to contain mulch on the side of the road. There is a danger that it could clog drainage ditches and drains, run off into waterways, present road hazards to bicyclists. • Wood chip mulch is combustible and would only add to the fire danger. • The cost of buying and/or spreading mulch along roadsides would be prohibitive and very dangerous for the crew. **Weed Barriers** • Rubber mats can be used around guard rails, but are very expensive. Weeds can grow up through the joints in the mats and on top of the mats in accumulated soil and organic matter. Rubber mats are combustible, and the resulting fire releases noxious fumes. • Fabric barriers are expensive and very costly to install, hard to anchor to the ground, and vehicles can tear them, rendering them ineffective. • Weed seeds can germinate in the organic matter that accumulates on the weed barrier or is intentionally placed there. **Planting Desirable Species** • This has been used in some limited circumstances in Yolo County, but these areas are still managed with mowing, burning, and spot applications of herbicide. • Establishment takes time, money, water, and attention. • The plants must conform to very limiting specifications so as not to be sight hazards, fire hazards, etc. They could not be planted adjacent to the road. **CONCLUSIONS:** **Mulching and weed barriers are problematic on roadsides. The Department has not found any areas where these would be appropriate.** **Planting desirable species is not used at this time because the Department must maintain a vegetation-free zone next to the road.**
Which physical controls were considered?	**Pruning:** This is used on large vegetation where needed to meet management goals. **Mowing by machine:** Mowing is used on French broom to reduce the amount of vegetation before herbicide applications. Mowing is also used for blackberries and for willows in place of, or before, herbicide treatment. Mowing on the Iron Horse Trail is contracted out. Machine mowing is not used more extensively because of the following: • Terrain is a limiting factor. Many of the County's rural roads have unimproved shoulders that are very uneven and have trees growing on them. This makes mowing very difficult. • Mowing may not meet fire regulations in many areas. • Moving in areas with threatened or endangered species can kill these creatures. • Mowing usually requires more than one pass per treatment which increases cost. Depending on the terrain, it may take several passes per treatment to mow down the vegetation. • With mowing there is always the risk of starting a fire when mower blades create sparks from striking rocks or other obstacles. This is a regular occurrence with both machine and hand mowing. • Recent changes in safety regulations for mowing have increased costs and the number of staff needed for each mower. This may have the effect of further limiting the work window. • Mowing can also transport invasive plant seeds and parts from one area to another. • There is a narrow window of time when mowing is most effective for meeting fire regulation deadlines. This is the same window of time in which flood control channels must be mowed. If mowing is done too early, the vegetation can grow back and require mowing a second or even third time to meet fire regulations. The Department does not have enough crew and equipment to complete all work by mowing in that space of time. • It is more costly than herbicide treatment. See Table 1 below. • The County's Climate Action Plan requires a reduction in greenhouse gas emissions, and increasing mowing would substantially increase those emissions.

	Mowing by hand: This has limited use on roadsides, but it can be useful around guard rails.
	• Mowing by hand (weed whacking) can be particularly dangerous for employees:
	  ○ Traffic presents serious hazards.
	  ○ Workers can sustain injuries from slipping on steep or rocky terrain.
	  ○ Workers can sustain injuries from debris being thrown up and onto workers: rocks, glass, barbed wire, pieces of metal and pieces of mower blades.
	• Hand mowing is even more costly than machine mowing.
	• There is always a risk of starting a fire.
	
	Grazing
	• Logistics and safety on the side of a narrow country road are very difficult. The liability to the County is high.
	• Grazing animals can distract motorists, which can be a danger to both the animals and motorists. The animals temporarily remove the emergency parking available on the shoulder.
	• Grazing is costly for this application, especially because grazing a narrow strip necessitates moving the animals frequently, which is expensive. (See Table 1)
	
	Burning: Besides being dangerous, this technique could not be used on roadsides because the Bay Area Air Quality Control Board would not allow it.
	
	Electrothermal weeding (Ubiqutek): This method uses a probe carrying electricity at a high voltage (3, 000 to 5,000 to volts) and low amperage (0.5 to 2 amps) to heat plant tissue and kill both roots and above ground plant material. The probe must contact each individual weed. This method is more efficient than steaming or flaming weeds, but would be very slow compared to mowing by machine or hand. High voltage can be lethal, so the device is potentially dangerous to the operator. This method also poses a fire risk because of the intense heat at the point of contact with the plant that can produce sparks and small flames. Currently there have been no independent evaluations of this method. At this time, the Department does not consider this a viable tactic for use on roadsides.
	
	Steam weeding (Weedtechnics): This method works by sending water under pressure through a diesel boiler and then out through hoses to an application head. The water comes out at 205 to 218 degrees Fahrenheit. This method is slower than other weed management techniques (it appears that the applicator must drive around 2 mph to treat effectively). A new model (the SW3800KD) is advertised as killing weeds faster. It uses 30 L of water per minute, and with a 1000 L water tank (apparently the largest size available), staff would have to refill the tank about every ½ hour. This tactic should be considered as a contact-only treatment and should not be expected to kill underground portions of the plant. Treatment would have to be repeated periodically during the season. At this time, the Department does not consider this a viable tactic for use on roadsides.
	
	Concrete under guard rails or cement treated base for road shoulders: These treatments are long lasting, but very expensive. Currently the County is not installing any new guard rails or shoulders.
	It is quite difficult to make repairs to concrete slabs if they crack or erode. Once cracks form, weed seeds can sprout in the cracks. Repairing concrete or cement-treated base used on the road shoulder is also very difficult, especially if damage occurs at the edge from erosion. Everything must be torn out and replaced.
	
	See Table 1 for more information on costs.
	
	CONCLUSIONS: Pruning and machine mowing are used by the Department where they are appropriate. At this time, the other techniques are too dangerous, too costly, or not practical. The County continues to explore new tactics as they emerge.

Which biological controls were considered?	**Biological controls are not applicable in this situation unless a particular invasive weed is the target, and it has an available biological control.**
Which chemical controls were considered? For more information on pesticides listed here visit the National Pesticide Information Center (NPIC). This a joint project of Oregon State University and the US EPA. http://npic.orst.edu/ You can communicate with an actual person at **1.800.858.7378** or	**During many years of research, experience, and experimentation, including consulting the literature, researchers, and colleagues about materials that are labeled for, and effective on, weeds in rights-of-way, the Division has chosen the herbicide options listed below. The Division continues to consult researchers and colleagues, as well as new literature, to identify new choices that may be more effective, more environmentally friendly, and of lesser human toxicity.** **Pesticides may potentially exhibit both acute and chronic toxicity. The Signal Words below refer to acute hazards. For information on chronic toxicity, contact NPIC (info on left).** **Herbicides and application methods are chosen that prevent or minimize the potential for drift and exposure to humans and wildlife.** As with all weed control techniques, herbicides must be reapplied periodically to suppress weeds over the long term. **Note that the Weed Science Society of America (WSSA) and the Herbicide Resistance Action Committee (HRAC) both create resistance group designations to help weed managers reduce the likelihood of creating resistant weeds.** Every 2 to 3 seasons, the Division rotates herbicide active ingredients according to the resistance group designations from WSSA to limit the buildup of herbicide resistant weeds along the roadsides.

npic@ace.orst.edu They are open from 8:00AM to 12:00PM Pacific Time, Mon-Fri	**Possible herbicide choices (These product names are subject to change.)** **Pre-emergent Herbicides** **Esplanade, Gallery, and Resolute are pre-emergent herbicides that are used in the buffer zone next to the road to maintain bare ground. They each belong to a different resistance management group and are used in rotation to prevent herbicide resistance. The Division uses pre-emergent herbicides to reduce the amount of post-emergent herbicides that are needed.** **Indaziflam (Esplanade®)**: This pre-emergent herbicide controls a broad spectrum of weeds if applied before germination. It does not generally control weeds after they have emerged. For maximum weed control, the herbicide needs to reach the soil surface and be activated by rainfall or adequate soil moisture. It is applied in the fall to control winter germinating weeds and in the spring to control spring germinating weeds. Signal Word (indicates acute, or immediate, toxicity): CAUTION Rate: 3 to 5 oz/acre Timing: Before weeds sprout in either fall or spring near the time rain is expected. Cost to apply (includes material cost): $125/acre Herbicide Resistance Management Group: 29 On Ground Water Protection list (b): potential to contaminate ground water, but not yet found in groundwater **Isoxaben (Gallery® S.C.):** This pre-emergent controls certain broadleaf weeds. Signal Word (indicates acute, or immediate, toxicity): CAUTION Rate: 20 to 30 oz/acre Timing: Before weeds sprout in either fall or spring near the time rain is expected. Cost to apply (includes material cost): $210/acre Herbicide Resistance Management Group: 21 On Ground Water Protection list (b): potential to contaminate ground water, but not yet found in groundwater **Prodiamine (Resolute® 65 WDG):** This pre-emergent herbicide controls grass and broadleaf weeds by preventing the growth and development of newly germinated weed seeds. Weed control is most effective when the product is activated by at least ½" of rainfall or irrigation, or shallow (1" to 2") incorporation before weed seeds germinate and within 14 days following application. Signal Word (indicates acute, or immediate, toxicity): CAUTION Rate: 1 to 2 lbs/acre Timing: Before fall weeds or spring weeds germinate, and close to the time rain is expected. Cost to apply (includes material cost): $97/acre Herbicide Resistance Management Group: 3 **Post emergent (contact) herbicides** **Glyphosate (Roundup® Pro Concentrate):** Glyphosate is a systemic herbicide (it is absorbed into the plant and circulates to kill the entire plant) that will kill most types of vegetation—grass, broadleaf, vines, brush, etc. Roundup is used as a contact herbicide for emerged grasses on road shoulders. Signal Word (indicates acute, or immediate, toxicity): CAUTION Rate for spot spraying on roadsides using a boom mounted on a truck: 2 pts in 20 gal of water/acre Rate for spot spraying by pulling hose with a handgun attached: 6 pts in 100 gal of water/acre This method is used mostly for parcels where a crew must walk rather than drive. Timing: Varies depending on the location, the weather, the weed growth, the work load Cost to apply (includes material cost): • $135/acre for Roundup application from a boom mounted on a truck • $673/acre for Roundup application from a hose with a handgun Herbicide Resistance Management Group: 9 **Enjoined for red legged frog On Ground Water Protection list (b): potential to contaminate ground water, but not yet found in groundwater **Triclopyr TEA (Garlon® 3A)**: **Garlon 3A is specific for woody plants and broadleaf weeds (but not grasses) and is used for spot treatments. It is usually tank mixed with Roundup.** Signal Word (indicates acute, or immediate, toxicity): DANGER (for eye damage to mixer/loader and applicator) Rate for spot spraying on roadsides using a boom mounted on a truck: 2 to 4 pts in 20 gal of water/acre Rate for spot spraying by pulling hose with a handgun attached: 4 to 6 pts in 100 gal of water/acre This method is used mostly for parcels where a crew must walk rather than drive. Timing: Varies depending on the location, the weather, the weed growth, the work load Cost to apply (includes material cost): • $146/acre for Garlon 3A application from a boom mounted on a truck • $714/acre for Garlon 3A application from a hose with a handgun Herbicide Resistance Management Group: 4 **Enjoined for red legged frog

	On Ground Water Protection list (b): potential to contaminate ground water, but not yet found in groundwater **<u>Herbicides with both Pre- and Post-Emergent Activity</u>** **Chlorsulfuron (Telar® XP)**: Telar XP is both a pre-emergent and post-emergent herbicide for the control of many invasive and noxious broadleaf weeds. Warm, moist conditions following application enhance the effectiveness of Telar XP since moisture carries the herbicide into weed roots and prevents them from developing. Weeds hardened off by drought stress are less susceptible to this herbicide. Telar is used primarily for control of difficult broadleaf weeds such as pepperweed. Signal Word (indicates acute, or immediate, toxicity): CAUTION Rate: 1.6 oz/acre Timing: Before fall weeds or spring weeds germinate and close to the time rain is expected. Cost to apply (includes material cost): $113/acre Herbicide Resistance Management Group: 2 On Ground Water Protection list (b): potential to contaminate ground water, but not yet found in groundwater **Dicamba diglycolamine salt (Vanquish®):** Vanquish is used selectively as a spot treatment for difficult to control broadleaf weeds but has not been used in the County for 5 years. It is registered for selective broadleaf and brush control and has both pre- and post-emergent qualities. Dicamba is a systemic herbicide that acts as a plant growth regulator and is a federally restricted material due to the potential for harm to non-target plants. It can volatilize when temperatures are high. A special permit must be obtained from County Ag, and the applicator must notify County Ag in advance of the application. If the application is cancelled, County Ag must be notified. Signal Word (indicates acute, or immediate, toxicity): CAUTION Rate: 1 to 2 pts/acre Timing: Best when weeds are small Cost to apply (includes material cost): $95/acre Herbicide Resistance Management Group: 4 Not on any injunction list On Ground Water Protection list (b): potential to contaminate ground water, but not yet found in groundwater **Aminopyralid (Milestone®):** Milestone is a systemic herbicide with both pre- and post-emergent properties that controls broadleaf weeds without affecting grasses. Milestone is used for the more woody and thick-stemmed weeds on road shoulders. Signal Word (indicates acute, or immediate, toxicity): CAUTION Rate: 5 to 7 oz/acre Timing: Between fall and spring before seeds germinate, but it is a more flexible chemical because it also has contact properties Cost to apply (includes material cost): $96/acre Herbicide Resistance Management Group: 4 Not on any injunction list On Ground Water Protection list (b): potential to contaminate ground water, but not yet found in groundwater **Sulfometuron methyl (Oust XP®)**: This pre-emergent and early post-emergent herbicide controls many annual and perennial grasses and broadleaf weeds. The Department rarely uses this on roadsides. Signal Word (indicates acute, or immediate, toxicity): CAUTION Rate: 3.6 to 4.8 oz/acre Timing: Before or just after weeds germinate in the fall or spring. Cost to apply (includes material cost): $95/acre Herbicide Resistance Management Group: 2 On Ground Water Protection list (b): potential to contaminate ground water, but not yet found in groundwater **CONCLUSIONS: When the IPM process calls for the use of herbicides, the products described above are used where most suitable considering cost, efficacy, the environment, human communities, and resistance management.**
Which herbicide application methods are available for these chemicals?	The Department's current equipment allows for 3 methods of application: • broadcast application or spot treatment from a boom attached to a truck • spot treatment from a handgun attached to a hose connected to a truck-mounted tank • and spot treatment with a backpack. Factors considered in choosing the method of application: 1. The size of the area to be treated a. If the area is large and requires a large quantity of herbicide, the large truck is used because it can hold more material b. If the area is small, and requires a small quantity of herbicide, the small truck may be used. c. If the weeds are limited and close to the road edge, the handgun may be used to spot spray from the cab of the truck.

	d. If a median island is being treated, a backpack sprayer would be used. 2. The amount of weed growth to be treated a. If weed growth is abundant, more herbicide will be needed and the larger truck would be used. b. If weed growth is less abundant, the smaller truck may be used. 3. The characteristics of the weeds/sites to be treated a. If cut stumps are to be treated, the squirt bottle would be used b. If a stand of poison oak 100 ft. from the road edge is being treated, the handgun and hose would be dragged to the poison oak. c. As noted above, if weed growth is limited and near the edge of the road, the handgun may be used. d. If large swaths of contiguous weed growth are to be treated, a truck, large or small, would be used. 4. The distance from a site where the truck can be reloaded a. There are a number of sites in the County where a Public Works truck could reload herbicide: Byron Airport; Brentwood, Martinez, and Richmond Corp. Yards; and fire stations. b. The distance of the work site from one of the reloading sites is taken into consideration when choosing the application method. c. It takes time and burns more fuel to drive back and forth to reload in the field d. The crew must carry undiluted product, which is more dangerous if there is an accident. 5. Safety a. The large truck is safer in the event of an accident. b. Not having to reload in the field is safer, since undiluted product is not being carried in the truck. c. Using a backpack on a median island is safer than dragging hose across the road. 6. Cost effectiveness a. For environmental reasons and for cost effectiveness, the minimum amount of pesticide needed to do the job should always be used. Therefore the application method should be carefully matched to the job. b. Driving back and forth multiple times to treat a site wastes time, money and fuel and should be avoided. **CONCLUSIONS: The terrain, proximity to water, potential human or non-target exposure, kind of weed species, and goal of the treatment dictate the application method.**
What weather concerns must be checked prior to application?	The Vegetation Management Supervisor takes into consideration the pesticide label and all site specific factors. Each day, the Vegetation Manager checks the weather when he/she arrives at work at 6:00 AM. Rain can prevent application of some herbicides because of the danger of runoff. For most pre-emergent herbicides, rain is needed after application in order for the herbicide to be effective. The Vegetation Manager must also consider wind speed (generally it should be <7 mph) and possible temperature inversions to avoid herbicide drift. Crews carry wind meters in their trucks. Crews measure and record weather factors prior to and during application. Excessive heat or cold makes plants shut down, and herbicide applications at that time could be ineffective. The Vegetation Manager uses these factors to write Pest Control recommendations for the crew to follow on the days that spraying takes place.
Cost Comparisons for various mgmt methods on both roadsides and flood control channels	See Table 1, below.
Changes in management methods since the previous iteration of this document	Since FY 12-13, the Department (as of 2018): • Decreased acres of roadsides treated with chemicals by 61% • Increased acres mowed on flood control channels by 25% • Decreased acres of access road shoulder and fenceline treatments by 37% • Decreased acres treated with chemicals on flood control banks by 92% • Increased acres grazed by goats by 151% • Decreased acres of aquatic chemical treatments by 31%
Recommendations from the IPM Advisory Committee	• Continue to review all vegetation management methods available for roadside rights-of-way considering efficacy, cost, impacts to the environment, and to the human community. • Encourage investigation into, and experimentation with, new methods. • Review this document every 3 years.

Table 1. Methods, Acres Treated, and Cost* for Vegetation Management along Contra Costa Roadsides and Flood Control Channels, Averaged over Two Years (2016-2018)[§]

Vegetation Management Method	Avg # of Acres Treated	% of Total Acres Treated	Avg. Total Cost for all acres treated	Avg Cost/Ac	% of Total Cost for all acres treated	% Change in Total Acres Treated from FY 12-13
Chemical Treatment - Roads	714.5	48%	$137,896	$193	18%	-61%
Right of Way Mowing (mainly flood control facilities)	318	22%	$348,856	$1097	47%	25%
Chemical Treatment – Flood Control Access Roads	144.5	10%	$50,065	$346	7%	-37%
Chemical Treatment – Flood Control Banks	14.5	1%	$7,467	$515	1%	-92%
Grazing (flood control facilities)	240.7	16%	$158,355	$658	21%	+151%
Chemical Treatment - Aquatic Applications	41	3%	$37,686	$919	5%	-31%
Mulching (flood control fence-lines and access road shoulders)	0.65	0.04%	$6,642	$10,218	1%	-89%
Totals	1473.75		$746,967			-31%

*Table lists the most accurate costs available and is not necessarily specific to roadsides. The cost figures above for each method include labor, materials, equipment costs, contract costs (for grazing), and overhead (includes training, permit costs, and habitat assessment costs). Licensing costs for staff members are paid by the individual and not by the County. The cost of the Vegetation Management Supervisor when he supervises work is not included in any of the figures but is comparable among the various methods.

[§]Table is updated each year in the IPM Annual Report. See cchealth.org/ipm.

ATTACHMENT H

Proposed Integrated Pest Management Policy

Attachment H

Proposed Integrated Pest Management (IPM) Policy

I. Introduction

The City of Watsonville is committed to protecting the safe use of City facilities and infrastructure from the impacts of pests and their damage through the development of an Integrated Pest Management (IPM) program.

This policy has been developed and is consistent with the following definitions provided by the University of California Statewide IPM Program:

*"**IPM** is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment."*

"***Pests** are organisms that damage or interfere with desirable plants in our fields and orchards, landscapes, or wildlands, or damage homes or other structures. Pests also include organisms that impact human or animal health. Pests may transmit disease or may be just a nuisance. A pest can be a plant (weed), vertebrate (bird, rodent, or other mammal), invertebrate (insect, tick, mite, or snail), nematode, pathogen (bacteria, virus, or fungus) that causes disease, or other unwanted organism that may harm water quality, animal life, or other parts of the ecosystem."*

The goal of the City's IPM policy is to minimize risks to human and environmental health and safety that result from pest establishment or damage. To accomplish this goal, the following objectives have been established:

1. Require coordination, consistency, and continued development of the IPM program by all City Departments responsible for performing pest management
2. Provide procedural guidelines for IPM implementation that serve to protect public safety, environmental health, and non-target species

II. IPM Committee

The IPM Committee is composed of staff from the three primary City Departments responsible for pest management: Parks and Community Services Department, Public Works & Utilities Department, and Municipal Airport. The IPM Committee's primary purpose is to develop standardized policies and practices for safe and effective pest management that prioritize human and environmental health on City properties. In addition, the IPM Committee shall:

A. Coordinate with staff to address ongoing pest control issues

B. Establish the framework for and require that all City IPM activities, including activities performed by contractors, adhere to this policy as well as local, county, state, and federal regulations

C. Spearhead efforts to evaluate the effectiveness of the IPM program

D. Update IPM policies and practices/guidance documents periodically or as needed to address changes in pest problems, site conditions, availability of treatment techniques and technology, regulations, available resources, staff and community feedback, etc.

E. Assist with staff training needs

F. Utilize, as needed, pest control researchers, academics, or other knowledgeable resources as advisers or subject matter experts

One or more members of the IPM Committee shall be trained on the principles of IPM, the safe and effective use of pesticides (preferably by way of California Department of Pesticide Regulation (DPR) Pest Control Adviser (PCA) or Qualified Applicator licensure or certification), and alternative control methods.

Recommended modifications to this policy may be submitted to the IPM Committee for consideration. The IPM Committee shall meet at least once per year to evaluate and advise on the City's IPM program and policy.

III. IPM Guidelines

To support and implement pest management activities, the City of Watsonville shall:

A. Perform all pest management activities in compliance with local, state, and federal regulations.

B. Perform thorough in-field assessments to identify pests, determine pest life cycles and disruptive potential, and record site conditions that may influence the implementation, effectiveness, or feasibility of control activities. As appropriate, consult the University of California Cooperative Extension (UCCE), County Agricultural Department, licensed pest control professionals, or other knowledgeable resource to assist in pest identification efforts.

C. Develop specific pest tolerance objectives for each type of site managed as well as pest management strategies that support site objectives.

D. Establish site scouting programs and specific action thresholds to aid in determining when pest control activities are necessary to reduce or prevent unacceptable health, safety, economic, and functional damage.

E. Adopt an integrated, sustainable approach to pest management by utilizing a combination of physical/mechanical, cultural, biological, and chemical controls.

F. Consider site- and pest-specific factors to select management approaches and treatment timing that are efficacious as well as sustainable in terms of cost effectiveness, feasibility, and ability to minimize unintended non-target impacts.

G. Where monitoring and evaluation of alternative control techniques shows that the use of pesticides is necessary, read and follow the product label and take necessary measures needed to protect the health and safety of humans, wildlife, and the environment. Pesticides shall only be applied by adequately trained individuals under the written recommendation from a licensed PCA.

H. Monitor treatment results and modify management approaches as needed to achieve acceptable levels of control and reduce non-target impacts.

I. Maintain Pest Management Logs and a record-keeping system to catalogue the following:

1. Target pest
2. Geographic distribution of the pest infestation
3. Control methods used, including quantities of materials, location, treatment date(s), personnel, and any application difficulties
4. Cost effectiveness metrics, including treatment area size, labor hours required, and estimated material and equipment costs
5. Follow-up monitoring events, including monitoring date(s), notes on treatment efficacy, and notes on observable non-target impacts, if any
6. Comments from residents

J. Make Pest Management Logs and pesticide use records readily available to the IPM Committee for the purpose of obtaining information to aide in the development and ongoing improvement of the IPM Program

IV. Notification of Pesticide Use

City Departments applying, or managing contractors applying pesticides shall comply with the following notification procedures:

A. Signs shall be posted the day before the application of the pesticide and will remain posted at least 2 days after the application of the pesticide.

B. Posting shall only be required in areas where the public can reasonably be expected to frequent and as near as possible to the site of the application.

C. Signs shall be posted at every public entry point where the pesticide is applied, such as in a park, and in highly visible locations around the perimeter of the area where the pesticide is applied if the pesticide is applied in an open area.

D. Signs shall conform to the template distributed by the IPM Committee that is easily recognizable to the public and workers and posted on barricades or existing signposts.

E. After signs are posted, an email shall be sent to customerservice@cityofwatsonville.org with the following information: Date of Application, Pesticide Name, Target Pest.

F. Signs shall contain the name and active ingredient of the pesticide, EPA Registration #, Operator ID, target pest, date of pesticide use, signal word, date or time of permitted re-entry if required, and name and contact number of the City Department responsible for the application.

G. City Departments shall not be required to post signs in right-of-way locations that the general public does not use for recreation purposes, such as median islands and areas without an adjacent sidewalk. Where right-of-way locations abut sidewalks, trails, and alleys used by the public, signs shall be posted near the application site or at minimum at 500-foot intervals facing the pedestrian walk.

H. City Departments using rodenticide baits shall not be required to post notification signs. However, each Department using rodenticide baits in areas regularly accessed by the public shall post one permanent sign at the facility where the baits are used. The sign shall indicate the type of bait used in the area, target pest(s), area(s) where the baits are commonly placed, and contact number of the Department responsible for the bait application.

I. City Departments using tree injections shall not be required to post notification signs.

V. Training

Per state regulation, any person applying pesticides must have pesticide safety training prior to handling each pesticide. Pesticide safety training requirements may be satisfied by way of DPR Qualified Applicator licensure/certification (QAL/QAC) in the appropriate category or by completing annual handler training in compliance with 3 CCR § 6724. Applicators who do not hold a QAL or QAC must work under the direct supervision of an individual who has a QAL or QAC.

In addition to training mandated by State and Federal regulations, City Departments shall provide training in the following areas to staff who have pest management responsibilities, particularly those who are responsible for applying pesticides or who supervise staff who apply pesticides:

A. Principles of IPM, including how to communicate IPM to the public
B. Relevant local, state, and federal laws and regulations
C. Evaluation and selection of pest management approaches
D. Sensitive site characteristics and protective measures
E. Pest identification and identification of beneficial, desirable, and protected species

ATTACHMENT I

Cal-IPC Fact Sheet and Position Statement on Glyphosate

Cal-IPC POSITION STATEMENT updated 2019.05.20

The Use of Glyphosate for Invasive Plant Management

Cal-IPC Position

Cal-IPC promotes science-based invasive plant management as a vital part of protecting California's biodiversity.

Cal-IPC has a policy stating that herbicides are an important and appropriate tool in the Integrated Pest Management (IPM) toolbox for managing invasive plants. When herbicides are used for strategic invasive plant management in a wildland setting, the applications are typically small and of limited duration. Strategic efforts remove invasive plants that would otherwise spread and require more extensive intervention in the future. Cal-IPC does not take a position on larger-scale ongoing application of herbicides for other uses such as agriculture and landscaping.

Cal-IPC follows the precautionary principle, which applies to both invasive plants and to chemicals introduced into the environment. Our judgment is that applications of approved herbicides for controlling invasive plants pose a significantly lower risk to the wildland environment and people than do the invasive plants, which can severely impact wildlife habitat, fire and flood patterns, and water use.

The best-available scientific information at this time says that the herbicide active ingredient glyphosate, when used for invasive plant management projects in accordance with its label and with appropriate personal protective equipment and best practices, is low-risk for wildlife, applicators and the public.

Some land managers may not be allowed to use glyphosate. We caution that removing tools from the IPM toolbox will result in decreased effectiveness and increased costs, which in turn will result in less conservation unless expenditures are increased.

Background

[See references section at the end of this document for links to key resources mentioned here.]

In 2015, the World Health Organization's International Agency for Research on Cancer (IARC) classified glyphosate, the active ingredient in RoundUp herbicide, as "probably carcinogenic to humans." This category is used when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals. This category includes a range of substances and activities, including red meat and working the night shift.

IARC classification designates a substance's carcinogenic potential without considering real-world exposure potential. The World Health Organization and the United Nation's Food and Agriculture Organization, in a joint meeting in 2016, concluded that "long-term dietary exposure [to glyphosate]… is unlikely to present a public health concern" and "short-term dietary exposure to glyphosate residues is unlikely to present a risk to consumers."

Other agencies have reached different conclusions from IARC, including the US Environmental Protection Agency (EPA) and the European Food Safety Authority. In its 2016 Issue Paper on glyphosate,

the US EPA concluded that the best descriptor based on the science is that glyphosate is "not likely to be carcinogenic to humans" at doses relevant to human health risk. The September 2016 issue of the journal *Critical Reviews in Toxicology* published comprehensive reviews by expert panels, concluding that glyphosate is "unlikely to pose a carcinogenic risk to humans."

In December 2016, experts convened by the US EPA as a Scientific Advisory Panel to review EPA's earlier Issue Paper were split in their opinion. Some agreed with the US EPA Issue Paper's conclusion that glyphosate is not likely to be carcinogenic to humans, especially at reasonably foreseeable dose-rates, while other panel members thought it would be more accurate to say that there is "suggestive evidence of carcinogenic potential." Panelists noted that crucial data were equivocal, and that additional data on cancer morbidity and/or mortality from studies of glyphosate-exposed workers would be desirable.

In California, the IARC classification triggered the California Office of Environmental Health & Hazard Assessment (OEHHA) to mandate that products containing glyphosate receive a Prop. 65 warning label as a "known carcinogen." This went into effect in 2017. OEHHA has established a "no significant risk level" (NSRL) for glyphosate of 1.1 mg/day based on lifetime dietary exposure tests with rodents, with the results scaled up for humans.

To correlate this NSRL to a typical exposure scenario for a land manager applying glyphosate we can use the US Forest Service's risk assessments and worksheets on pesticide use. For direct foliar spray of glyphosate they estimate a typical exposure of 0.003 mg/day per kg of body weight when using a concentration of 1 lb active ingredient/acre (a standard rate). Using these figures, a 70-kg (155-lb) applicator would be exposed to 0.2 mg/day.

In April 2019, the US EPA proposed an interim registration review decision for glyphosate. They concluded that there is no risk to human health at allowable exposure rates and request public comment.

References

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Cal-IPC Policy on Integrated Weed Management: http://www.cal-ipc.org/wp-content/uploads/2017/10/Cal-IPC-Policy-on-IWM.pdf

Cal-IPC Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management: http://www.cal-ipc.org/resources/library/bmp-wildland-stewardship/

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US EPA, Glyphosate webpage: https://www.epa.gov/ingredients-used-pesticide-products/glyphosate

US EPA, Proposed Interim Registration Decision for Glyphosate Review, April, 2019: https://www.epa.gov/newsreleases/epa-takes-next-step-review-process-herbicide-glyphosate-reaffirms-no-risk-public-health, https://www.epa.gov/ingredients-used-pesticide-products/proposed-interim-registration-review-decision-and-responses-0

US Forest Service, Pesticide-Use Risk Assessment Documents and Worksheets: https://www.fs.fed.us/foresthealth/protecting-forest/integrated-pest-management/pesticide-management/pesticide-risk-assessments.shtml

ATTACHMENT J

Cal-IPC Letter to the County of Los Angeles on Herbicide Use

CAL-IPC
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August 3, 2019

Board of Supervisors
County of Los Angeles
Kenneth Hahn Hall of Administration
500 West Temple St. Ste 383
Los Angeles, CA 90012

Dear Supervisors,

I am writing on behalf of the California Invasive Plant Council to comment on the use of herbicides to control invasive plants in natural areas. This is in response to recent action taken by the County of Los Angeles to suspend use of glyphosate. As some communities reevaluate herbicide use due to concerns over environmental impact, public health and liability given recent court rulings on glyphosate (the active ingredient in Roundup herbicide), Cal-IPC's mission compels us to provide our perspective based on the best available science.

Invasive plants have significant impact on California, as they do across the globe. In the largely urban County of Los Angeles there are important natural areas to be stewarded for current and future generations as a restorative resource for residents. The state's Biodiversity Initiative and Wildlife Action Plan both spell out the impacts of invasive plants to our unique natural heritage and urge action to reduce these impacts. Recent catastrophic wildfires highlight the role of invasive plants as fuels that increase risk. Damage to agriculture (including grazing and timber lands), recreation, and water resources is also of major concern. And interactions with climate change are making matters worse.

Cal-IPC is a nonprofit organization formed in 1992 to protect the state's environment and economy from invasive plants. We maintain a statewide list of invasive plants and the online CalWeedMapper database. We have produced reference volumes including *Invasive Plants of California's Wildlands* (2000, UC Press) and the *Wildland Weed Worker's Handbook* (2004) and we distribute more recent publications such as *Weed Control in Natural Areas in the Western United* States (2013, UC Dept. of Agriculture and Natural Resources). Our work is funded by public agencies including the California Wildlife Conservation Board, the National Fish & Wildlife Foundation, the US Fish & Wildlife Service, the US Forest Service, as well as by private conservation foundations.

Cal-IPC promotes Integrated Pest Management (IPM) as a holistic approach to controlling invasive plants. (The California Dept. of Pesticide Regulation presented Cal-IPC with an "IPM Achievement" Award in 2015.) An IPM approach uses the full range of strategies, including prevention (preventing pests from being introduced in the first place) and early detection (so that management actions can be taken before a pest is widespread). An IPM approach also uses a range of tools for managing pests, including physical tools (like mowing), biological tools (like grazing), cultural tools (like fire), and chemical tools (herbicides). For any given

management situation, these tools are used in combination as determined to be most effective and safe. We support herbicides as one of the important tools in the IPM toolbox.

We are currently working with the University of California to develop best practices for controlling invasive plants using non-chemical methods. This aims to help land managers and decision makers assess all management options, choosing appropriate non-chemical approaches where they will be effective and safe (and affordable), while recognizing that not all invasive plant projects can be implemented effectively with a non-chemical approach.

Each tool used to control invasive plants has advantages and disadvantages. Herbicides have unique advantages in many situations and are used responsibly as part of an IPM approach by many land management agencies. The preponderance of agencies and land managers—knowledgeable professionals dedicating their careers to environmental protection—have determined that the judicious use of herbicides for restoration is low-risk and effective and in fact are the least environmentally harmful method of controlling invasive plants in many situations.

It is important to recognize that applications of herbicides to control invasive plants in natural areas are (1) very small in scale relative to use on agricultural crops and landscaping, (2) performed by trained applicators under direction of supervisors who are professionally licensed by the state's Dept. of Pesticide Regulation, part of the California Environmental Protection Agency, and (3) chiefly conducted away from areas the public frequents.

As to glyphosate in particular, regulatory agencies continue to register it for use because extensive research has not shown significant health risk. Given the current climate of public concern and institutional liability, responsible entities such as the Los Angeles Board of Supervisors want to take action. We believe that there can be meaningful action to reduce public exposure to glyphosate while maintaining land managers' access to an important tool for protecting our natural areas and communities from the impacts of invasive plants.

Given the importance of addressing invasive plants and the unique role that herbicides play in this effort, we recommend that all jurisdictions retain the option of using registered herbicides—including glyphosate—for sites and situations where professional land manager evaluation determines them to be an appropriate part of an integrated management strategy.

Please contact me if you have any questions or comments. Thank you for your consideration of our perspective on this important topic.

Sincerely,

Doug Johnson
Executive Director