

Integrated Pest Management Annual Report 2020



Photo: Deane Little



Photo: Erick Williams

About the East Bay Regional Park District

The East Bay Regional Park District (Park District) was formed in 1934 by visionaries who saw the need for land preservation and conservation in the San Francisco Bay Area. They shared the belief that connections with nature are critical for leading a healthy and balanced life and that these benefits should be available to everyone. Eighty-seven years later, this vision continues to drive the Park District's mission and its efforts to preserve the rich heritage of natural resources in the East Bay, while also providing opportunities for outdoor environmental education and safe and healthful recreation.

The Park District is the nation's largest regional park agency with 73 parks across 125,000 acres in Alameda and Contra Costa Counties. Annually, our parks receive more than 25 million visits, with visitors hiking the 1,333 miles of trail or enjoying the 55 miles of shoreline.

The Park District has established an extraordinary and well-managed park system that provides the opportunity for a growing and diverse community to experience nature nearby. We continue to manage, maintain, and restore the parklands to retain their scenic, natural, and cultural values. The Park District's Integrated Pest Management Program (IPM) plays an essential role in meeting this objective.



Park District biologist surveys native grasses.

Commitment to Natural Resource Management

Consistent with its mission, the Park District's Integrated Pest Management (IPM) policy states that *"In accordance with the accepted principles of ecology, the District will strive to implement an integrated pest management program which eliminates the use of chemicals as much as feasible whenever alternative methods are effective."*

Keystone Tenets of IPM:

- The Park District's priority is to manage pests effectively and safely.
- Prevention is the key to safe and effective pest management.
- IPM control methods and actions are supported by scientific research. The team conducts regular literature reviews to identify the industry's best practices.
- The IPM program is a multidisciplinary and cross-departmental effort based on accountability and transparency.
- Fundamental principles of managing parklands include honoring the land, its ecological systems, cultural heritage, park visitors, and the people who conduct sustainable park and landscaping operations.

"For more than 85 years, the Park District has showcased its leadership in stewardship by adhering to best practices in ecological health to protect parklands and provide a space for safe and healthy recreation.

The District is committed to continuing this legacy as shown by eliminating the use of glyphosate in developed areas within East Bay Regional Parks."

– Sabrina B. Landreth, General Manager

*Sunol Wilderness Regional
Preserve, Sunol*

Photo: Deane Little

Integrated Approaches in the Park District

What is Integrated Pest Management (IPM)?

Integrated Pest Management is a scientific approach to pest management. The Park District defines a pest as any organism that damages human health, safety, recreation, or environmental function. In the Regional Parks, most pests are nuisance weeds that limit public access to open spaces, pose a fire risk, or degrade recreational access. IPM also targets harmful weeds that threaten biological diversity and ecological function, and organisms such as ticks, yellow jackets, rattlesnakes, rats, and mice which pose significant public health threats.

Foundations of IPM

The Park District uses a multi-level framework to identify, understand, and solve pest problems. District staff regularly review science standards and consider the weight of evidence behind management principles and industry practices. These reviews help inform thoughtful, science-based design and prevention that is firmly rooted in an environmental philosophy. A philosophy that honors the land and ecological systems and protects the public and staff through safe and sustainable park operations.

IPM TACTICS FOR PLANTS

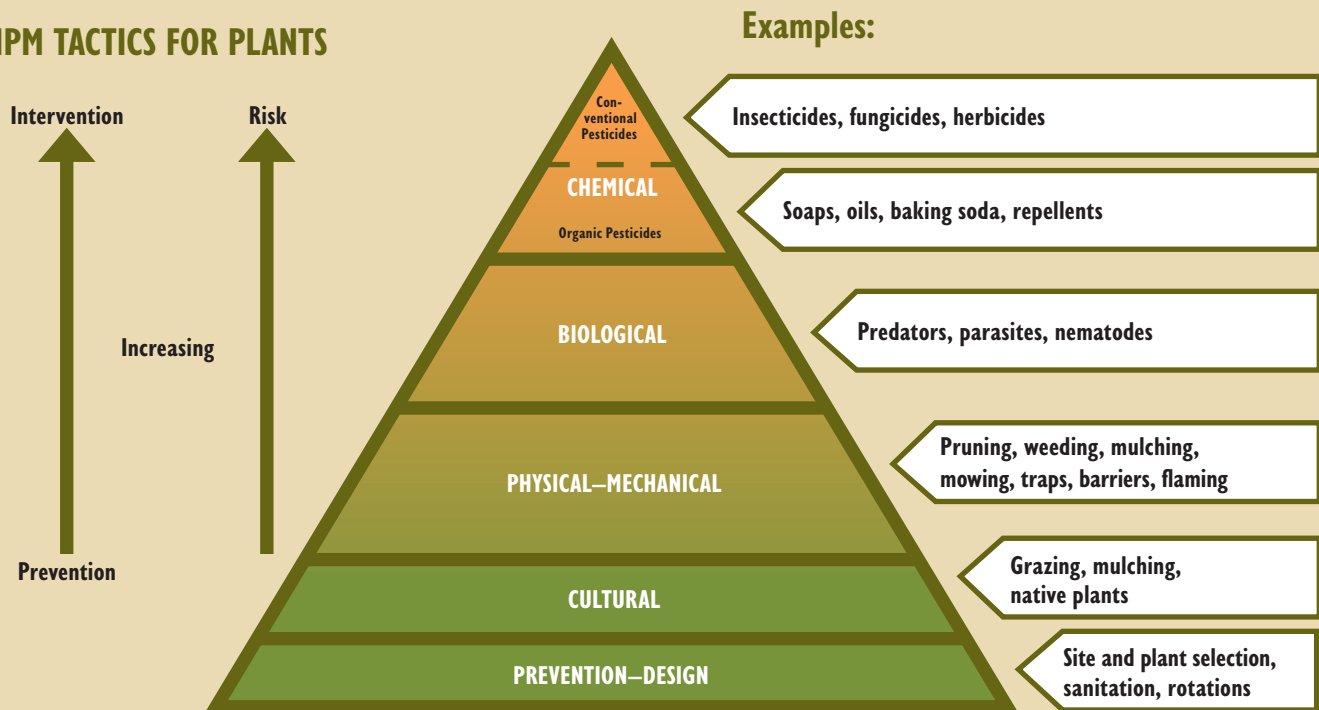


Figure 1: Integrated Pest Management hierarchy of methods

IPM Methodology

IPM is not a single pest control method but a complex system of pest management evaluations, decisions, and integrated actions. It is a non-linear process that relies heavily on an adaptive management framework.

The first line of defense is to prevent the introduction of pests. When a pest is found in the parks, the goal is to quickly identify it so IPM can act promptly to control its spread.



Pulling weeds by hand.

Methods

IPM control methods vary depending on the situation and type of pest. The most common include cultural, mechanical, biological, or chemical pest control. IPM combines these methods with adaptive management practices to create a dynamic cycle of land management. Integrating the approaches creates a resilient and sustainable program. Before considering chemical controls, the Park District prioritizes mechanical, cultural, and biological controls first, or a combination of the three methods.

- **Cultural controls** to reduce pests include mulching, grazing, and competitive planting with native plants. IPM uses these methods at single parks and on a larger landscape scale across multiple parks. For example, every year, the Park District conducts controlled burns at Point Pinole to enhance the coastal prairie habitat. In addition, we also use grazing to support ecological function across 70,000 acres of parklands.
- **Mechanical controls** include weeding, line trimming, mowing, hand pulling, and grubbing, to name a few. These mechanical methods are a fundamental tool to control vegetation along roads and trails to reduce fire risk. These methods also help maintain the parks. For example, most fire roads and trails are rough mowed or line trimmed. Much of the Park District's fencing is line trimmed, as are most group camps and other recreational areas. Sometimes the parks are so overgrown that park staff must mow the vegetation two or more times per growing season.
- **Biological controls** use natural or introduced enemies of the identified pest. For example, the Park District promotes biodiversity through invasive weed management and competitive native planting. This approach increases insect diversity, and the insects help provide natural biocontrol. IPM also collaborates with the US Department of Agriculture's Agricultural Research Service (USDA-ARS) in several parks. The mission of USDA-ARS is to deliver scientific solutions to national and global agricultural challenges.
- **Chemical controls** include organically registered and conventional products that control plants, insects, fungi, or other pests. IPM uses conventional and organic herbicides and pesticides when mechanical and cultural methods do not work. However, the Park District never uses conventional pesticides in or around play structures or drinking fountains and has eliminated the use of glyphosate in the Park District's developed areas.

Preserving Open Space for the Future

The Integrated Pest Management Program (IPM) is an essential part of maintaining healthy ecosystems that support wildlife and enhance the park user experience. Since the Park District manages so much land, it is an ongoing effort.

Principle Goals of the IPM Program

IPM is critical and its methodologies help support and enhance the Park District's diverse habitats by managing a wide variety of pests that occur in structural, recreational, and wildland environments. The following pages contain information about the **FIVE MAIN PEST MANAGEMENT GOALS** (*Fire Safety, Healthy Forests, Public Health, Ecological Health and Safe and Accessible Recreation*) and how the Park District is using these control methods in our parklands to protect biodiversity, ecological services and improve park user experience.

#1 FIRE SAFETY

Fire safety at the Park District relies heavily on IPM. Actions include managing the vegetation around ignition sources and establishing and maintaining building perimeters. IPM work also includes creating access for the Park District's Fire Department. Some areas like trails, roads, and fire pits are frequent ignition sources and prone to fire. Safe and easy access to these areas is essential to preventing catastrophic wildfires in the parks.

2020 CASE STUDY

Fire Safety and Invasive Weed Reduction through Targeted Grazing

The Park District lands border hundreds of miles of densely populated urban areas along the wildland-urban interface. Along these borders, the threat of catastrophic wildfires, growing with changing climate conditions presents significant risks to public health and safety, homes, and property. In these areas, the Park District uses targeted grazing to control fuel build-up in difficult-to-treat terrain and vegetation. Grazing areas are a mixture of grasslands and shrublands that require management to prevent the rapid spread of fire from breaching the wildland environment and spreading into adjacent populated communities. Grazing also helps maintain fuel breaks that protect park infrastructure. Such Grazing is especially effective in the popular hill parks of Richmond, Berkeley, Oakland, and Castro Valley where mixed herds of goats and sheep steward the parklands. They consume invasive weeds, poison oak, and other dense vegetation that would be impossible to control by mechanical means or hand crews alone.



Park District firefighters reduce fuel loads.



Grazing goats clear dense brush in the East Bay hills.

#2 HEALTHY FORESTS

IPM works with our Fire Department to reduce the risk of catastrophic fires where parks meet housing at the wildland-urban interface. Work includes:

- Reducing the vegetation at the interface to increase spacing between trees
- Removing ladder fuels
- Maintaining healthy shaded fuel breaks

The IPM effort focuses on weedy and invasive species and controls the ability for cut trees to re-sprout. This effort also helps improve native plant diversity as selectively treating invasive plants reduces the competition for water and light resources.

2020 CASE STUDY 2020 Tree Die Back

Late in 2020, reports emerged of a potential new pathogen that was causing Acacia trees to die. The news prompted field surveys that revealed a widespread, multiple species die back event in the Park District and much of the Bay Area. The Park District is working with regional scientists and researchers to gather samples and monitor the progression of the die back. The information is guiding IPM's response as they advise the operations and the fire departments of best practices to slow down and prevent the spread of disease. Currently, the scientific community agrees that this drought and prolonged heat events during the Fall of 2020 are the primary drivers of the die back. The stress from the drought increased the proliferation of secondary, opportunistic fungal and insect pests, resulting in striking areas of the leaf, twig, and branch mortality. The Park District continues to collaborate across multiple departments and with regional partners to monitor and assess the progress, recovery, and hazards associated with this die back event.



Drought stressed eucalyptus trees allow fungal pathogens to proliferate and cause die back (picture of die back at Anthony Chabot Regional Park).

#3 PUBLIC HEALTH

IPM remediates pests on parklands that threaten public health, such as ticks, E. coli, and harmful algal blooms.

2020 CASE STUDY Controlling Cyanobacteria Algae

- In 2020 the Park District's lakes exhibited an increasing trend of algal blooms requiring more complex management actions for Harmful Algal Blooms (HABs). Harmful algal blooms occur when cyanobacteria, naturally occurring photosynthetic bacteria, become dominant. Some of these species can release harmful toxins that impact recreational swimming and wildlife. Several factors contribute to this, including increased nutrient inputs, increased temperature and excess sedimentation.

Lake Temescal

Although the Park District has invested in previous phosphorous-binding treatments in Lake Temescal, the benefits were short-lived.

In 2020, the District partnered with Molear and Elimnology to use an innovative technological HAB treatment at Lake Temescal. Through the partnership, the Park District was able to test pilot the "nanobubbler" technology between August and December of 2020 and evaluate its effectiveness. The nanobubbler helps maintain higher oxygen levels in the deeper parts of the lake which improve water quality. Lower oxygen conditions (anoxia) allow the release of phosphorous from sediments built up since the damming of Temescal creek in the late 1800s. The pilot program showed promising results. The oxygen levels increased sooner than expected and the nanobubbler maintained these levels in the deeper parts of the lake where conditions are typically anoxic. "Free phosphorous" (phosphorus not bound to sediments) also decreased during the pilot. The Park District plans to continue the oxygenation of the lake with nano-bubbles in 2021.

While not expected to reverse the high nutrient levels at this urban lake completely, partners expect it will help reduce the nutrients that lead to HABs. The nanobubblers are an example of an important tool IPM uses to manage resources. The technology will help maintain the recreational resource until the Park District can dredge the lake, remove the excess sediment, and restore the lake to improve water quality.

***Note:** Due to COVID-19 restrictions, swimming was not permitted in any District lake for most of the year.



Increased dissolved oxygen (DO) helps maintain water clarity and reduce algal blooms and mats.

Preserving Open Space for the Future



Subtle bubbles can be seen rising from the diffusers that introduce oxygen to the deep, nutrient rich waters of Lake Anza.

Lake Anza

The Park District also installed a Hypolimnetic Oxygenation System (HOS) at Lake Anza in 2020 to help treat HABs. The system encourages oxygenation of the deep, nutrient-rich waters. It works with the natural layers of the deep lake, oxygenating the nutrient-laden sediments and binding phosphorous. Unfortunately, shortly after launching the system, weather events complicated the treatment causing earlier-than-normal mixing of the lake which reintroduced more nutrients into the water column. The Park District continues to monitor and adjust the HOS and expects that the lake will be less prone to algal blooms after a few years of consistent oxygenation.

#4 ECOLOGICAL HEALTH

Vegetation and pest management also play a critical role in promoting and maintaining sensitive natural resources that increase biodiversity. This broad category includes:

- Habitat enhancement and restoration projects such as:
 - Planting and maintaining pollinator gardens at our parks
 - Removing monocultures of invasive plants
- Preventive weed treatment at habitat restoration sites such as the Alder Creek restoration project

Preserving ecological function is a primary goal of the Park District and requires collaboration across many internal departments as well as partnerships with local environmental agencies.

Noxious Rangeland Weed Control District Wide

In 2020, the Park District continued our multi-year, multi-park commitment to control artichoke thistle in all parks, with an intense focus on areas within Wildcat Canyon Regional Park and its pervasive artichoke thistle populations. After 25 years, and over 95 percent reductions, biologists continue to seek out remnant populations and isolated plants over the entire extent of the project area with impressive recovery of native perennial grasses.



Native plants, such as milkweed, are essential for supporting pollinators.

Photo: Rodger Nyemaster

2020 CASE STUDY

Restoration projects include enhancing pollinator habitat, improving water quality, and erosion control. 2020 projects included maintaining and increasing biological diversity and ecological function in the parklands.

Promoting Plant and Pollinator Biodiversity

The Park District enhances pollinator habitat by selectively targeting invasive plants and promoting passive restoration of native plant communities. In heavily degraded areas without robust native seedbanks, competitive planting with native, pollinator plants complement removal efforts. To avoid any deleterious impacts to pollinators, herbicide applications are timed to avoid when insects may be foraging or dwelling in vegetation. The herbicides allowed are carefully selected to avoid risks to insects and other non-target species.

Riparian Enhancement in Leona Canyon

Biologists carried out their second cape ivy treatment at Leona Canyon in June and December of 2020. Cape ivy occurs in dense patches cover 12 acres of the park and forms a monoculture (a singular habitat) and smothers native plants. Removing cape ivy helps restore the canyon's diverse riparian habitat.

Cape ivy spreads readily as broken fragments of the plant can germinate, making mechanical removal impossible at such a large scale.

Using a selective chemical treatment at a low rate has proven effective at reducing cape ivy with little to no damage to the native plant species. Steep hillsides and thick understory make hand application extremely challenging. Still, the visible recovery of the native plant community makes the difficult application worthwhile. Between June and December of 2020, there was a 40 percent reduction in cape ivy cover in treated areas.



A selective herbicide that targets members of the aster family and leaves native plants such as blackberry unaffected. Note the clean line where treatment is visible by the change in dominant vegetation.

Preserving Open Space for the Future

Vegetation Management and Endangered Shorebirds

The Park District utilizes an integrated approach to foster the recovery of endangered species. Every spring, the staff coordinate the annual treatment of vegetation on the shorebird islands at Martin Luther King Jr. and Hayward Shorelines. These islands provide critical breeding habitat for shorebirds, such as the endangered California least tern, western snowy plover, and black skimmer. These shorebirds are very particular about where they nest and breed. They only nest in shoreline habitats that have sparse vegetation cover (less than 10 percent). Sites like this were once prevalent around the Bay Area. However, urban development and invasive plants have made them virtually non-existent, resulting in the decline of the shoreline bird species that rely on these sites as breeding and roosting grounds.

At these sites, the use of herbicides has been highly effective in preventing vegetative growth of invasive plants. The IPM team has a very narrow timeframe to treat the vegetation because the shorebirds arrive in the Bay Area early from their overwintering sites.

The least tern colony at Hayward Shoreline is home to one of the most productive least tern colonies in Northern California. Preliminary evidence is showing that 136 fledglings hatched at the colony in 2020. In addition, Park District staff observed three pairs of western snowy plovers also breeding at the site. 2020 marked the 13th consecutive year California least terns, and western snowy plovers have nested on the islands. In 2020, the colony also hosted 16 black skimmer nests. It marked the fifth time all three special status species nested at this site, thanks to timely and effective control of the unwanted vegetation!



Before remediation: California least tern nesting in invasive vegetative growth.



After remediation: California least terns nesting success.

Photo: Rick Lewis

#5 SAFE AND ACCESSIBLE RECREATION

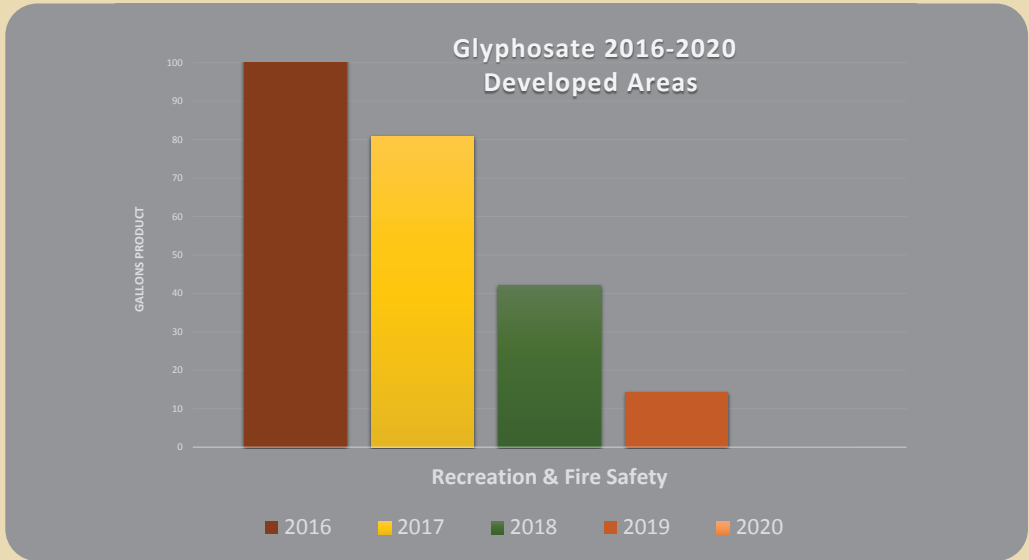
Vegetation management helps maintain a wide array of recreational infrastructure, like picnic tables, restrooms, irrigation, parking lots, paved trails, educational gardens, and others at the parks.

2020 CASE STUDY

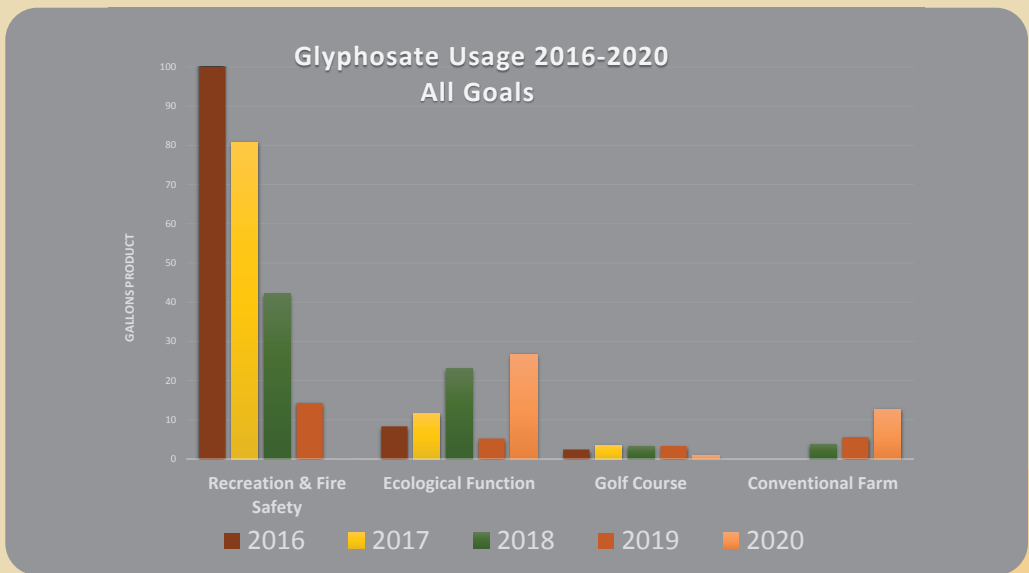
2020 Saw the Elimination of Glyphosate Use in Developed Areas

In 2020, the Park District phased out the use of glyphosate products (commonly referred to as Roundup) in developed park areas including recreational sites such as picnic areas, play areas, and water fountains.

Note: While glyphosate products were phased out in developed areas, they are still a necessary tool in IPM to support the goal of improving ecological function. They support landscape scale habitat enhancements, restoration, and mitigation projects. However, these recovery projects are in areas where there is no public access. Each exemption to the glyphosate restriction is carefully reviewed and vetted by multiple departments before application. Please see Appendices A-F for more information about herbicide use trends, approved general use products, and a list of products used in the Park District.



The use of glyphosate products in developed areas, for the goals of recreation and fire safety, was eliminated in 2020. Despite the new challenges that this year brought to staff and their vegetation management efforts, park staff maintained the commitment to eliminate the use of glyphosate products in developed areas where recreational activities occur. (Resolution No. 2019-07-187)



Five year glyphosate product use.

Preventing New Pest Threats – The Cornerstone of any Invasive Pest Management Program

Prevention is the cornerstone of any IPM program. The Park District trains its staff to map and monitor new threats to the wildlands and recreational activities every year.

Infection by *Phytophthora* species and microscopic water molds are emerging as significant threats to many plant species and special communities. Sudden Oak Death (SOD), caused by the airborne *Phytophthora ramorum* continues to negatively impact the East Bay's oak woodlands. The pathogen is changing the age structure of oak forests as younger oaks are less susceptible to this airborne water mold. Recent studies indicate that as many as 15-20 percent of oaks are resistant to the pathogen, recovering and persisting after infection (Conrad, A.O. et al., 2019). Management and training continue to emphasize the role of park hygiene and best practices to limit and slow the spread of this devastating disease and allow this essential plant community to survive and persist.

Management recommendations have expanded with new research that indicates that the Park District can slow SOD with selective bay tree removal around oaks. Staff has incorporated these recommendations along with supportive treatments with phosphite applications, a more proactive approach in oak management around important recreational sites.

Introductions of other virulent *Phytophthora* species have occurred in the Bay Area and in the East Bay Regional Parks through infected nursery stock as well as the use of dirty equipment. Training and surveillance continued throughout the Park District in 2020 to prevent the further spread of these potentially deadly pathogens. The Park District continues to increase its commitment to protecting wildlands by requiring new projects to utilize phytosanitary practices and clean nursery stock from approved nurseries.



Pulling weeds by hand.

Innovations in Training and Collaboration

Annual IPM Training

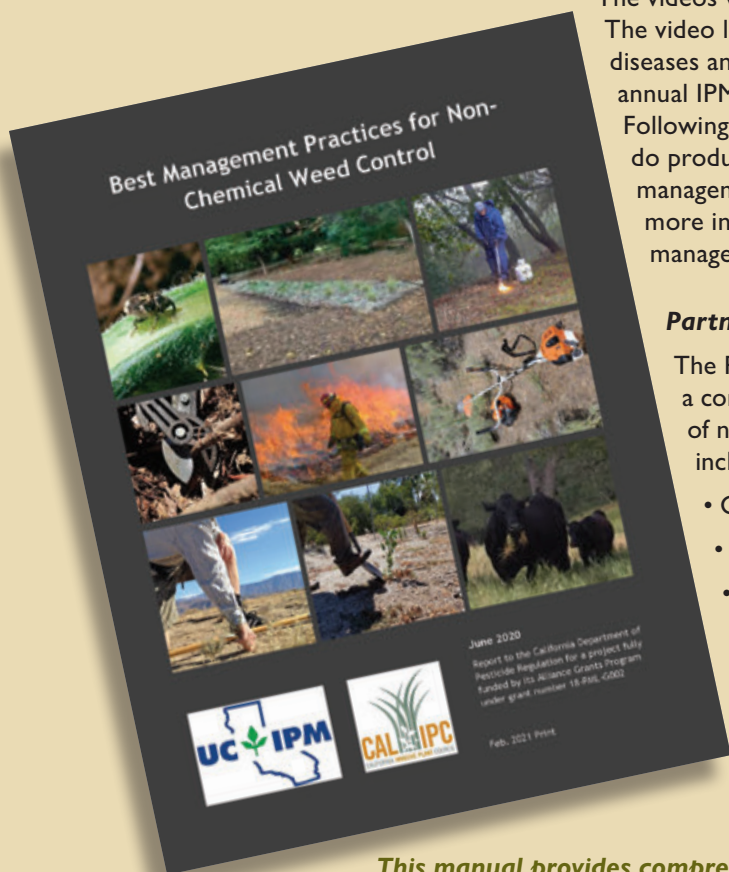
The Park District provided its IPM annual training in 2020 for over 200 field staff and supervisors. The training focused on the key principles of mechanical treatments such as timed mowing and weed ecology, including seed bank management and sampling. Due to the COVID-19 restrictions, the annual training was conducted through an online learning platform. The virtual format allowed staff to complete the training independently and monitored their completion with a graded quiz.

IPM developed the training curriculum around informed science, the evolving new methods of pest management and protocols, and industry best practices that ensure employee and public safety at all times. As the science and empirically-based evidence in this field evolves, so do the Park District's prevention and intervention methods.

The Fall 2020 training emphasized the importance of early-season weed management, especially as the Park District phased out glyphosate in developed areas. Topics included using organic products, rate reduction, and application footprint reduction of conventional products. The Park District also curated a list of educational videos from other agencies, such as the University of California – Agriculture and Natural Resources, IPM, and Master Gardener programs.

The videos were launched on the District's virtual learning platform.

The video library includes topics as diverse as tree care, turf care, plant diseases and pathogens, weed biology and ecology, etc. While most of the annual IPM training was virtual, IPM conducted some elements in person. Following COVID-19 safety guidelines, staff members met in person to do product safety training, spray equipment calibration, and vegetation management strategies. The park-specific training allowed staff to get more individualized help and advice tailored to their park's vegetation management needs.



Partners in Training: California Invasive Plant Council

The Park District continues to partner with scientists to produce a comprehensive manual on the Best Management Practices of non-chemical weed management techniques. Partners include scientists from:

- California Invasive Plant Council
- Other Bay Area land managers
- University of California Invasive Pest Management practitioners
- Department of Pesticide Regulation

This guidance manual is available to download from cal-ipc.org/resources/library/publications/non-chem/

This manual provides comprehensive descriptions of 21 commonly used non-chemical weed control techniques and of biological control agents for 18 weed species/species groups that will help you as a practitioner treat weeds more effectively. Authors of each chapter have compiled research and on-the-ground knowledge of subject experts on tools and methods of application, as well as on efficacy of techniques under various environmental conditions and across different classes of invasive plants. Environmental, cultural, and human safety risks are also highlighted to help support safe and effective use of techniques. This manual is designed to be a go-to resource for practitioners that are either complementing their weed control work with non-chemical techniques or are exclusively restricted to not using herbicides.

Innovations in Training and Collaboration

Partners in Training: Oyster Bay Regional Shoreline and Earth Team

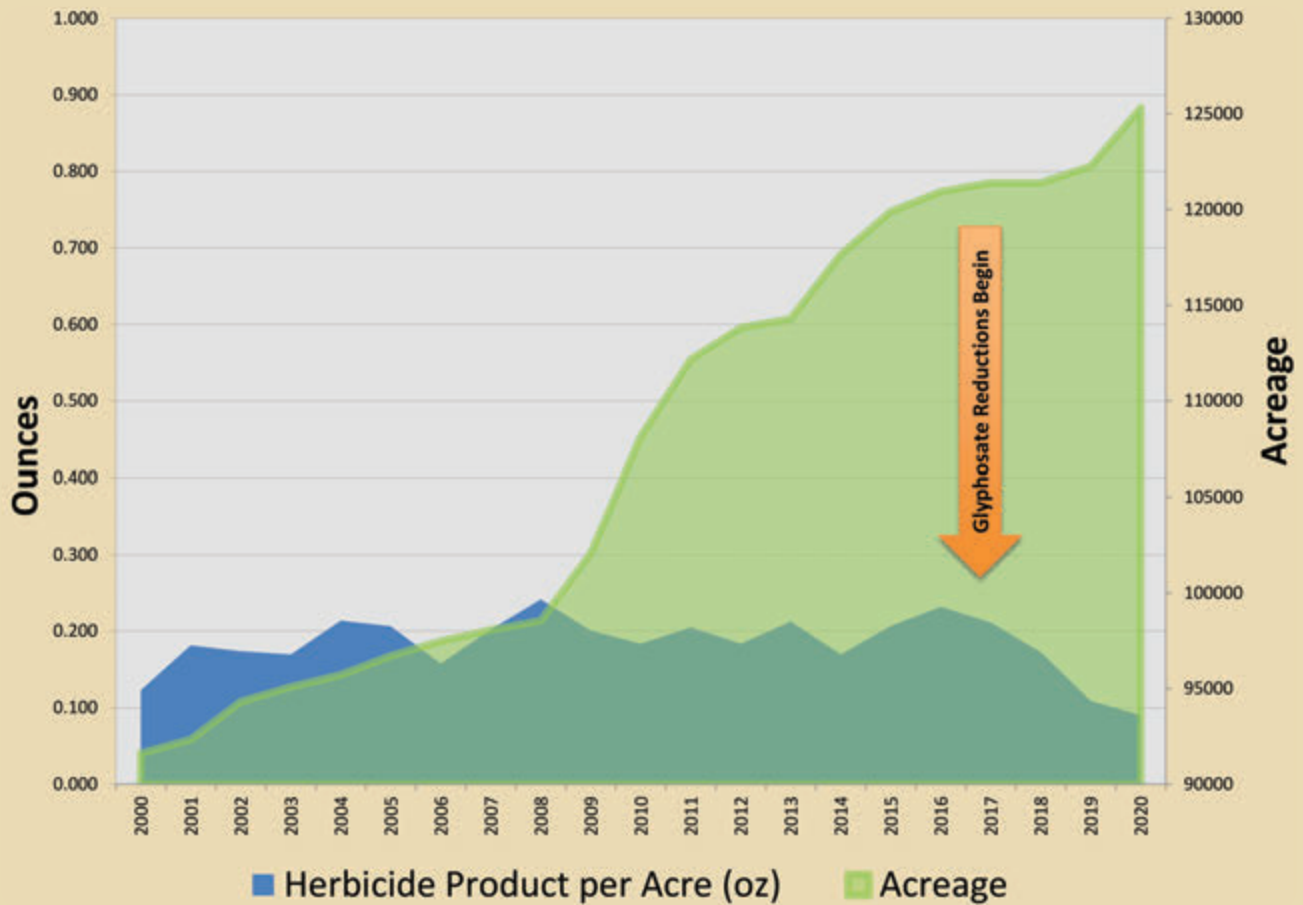
At Oyster Bay Regional Shoreline, the Park District has been collaborating with Earth Team for the past four years to provide educational and stewardship activities for students. Earth Team, a local non-profit, empowers urban youth to become lifelong environmental stewards through experiential education, skills development, and the building of community connections. In Spring 2020, Earth Team received a grant from the State (Cal Fire) to plant and maintain thirty coast live oaks. Since the Park District had to postpone volunteer events because of COVID-19, park staff planted and are caring for the trees until Earth Team can safely visit the park again. The trees were planted adjacent to existing coast sage scrub plantings. They will serve to enhance habitat continuity for wildlife, including overwintering monarch butterflies.



Coast live oak plantings at Oyster Bay Regional Shoreline.

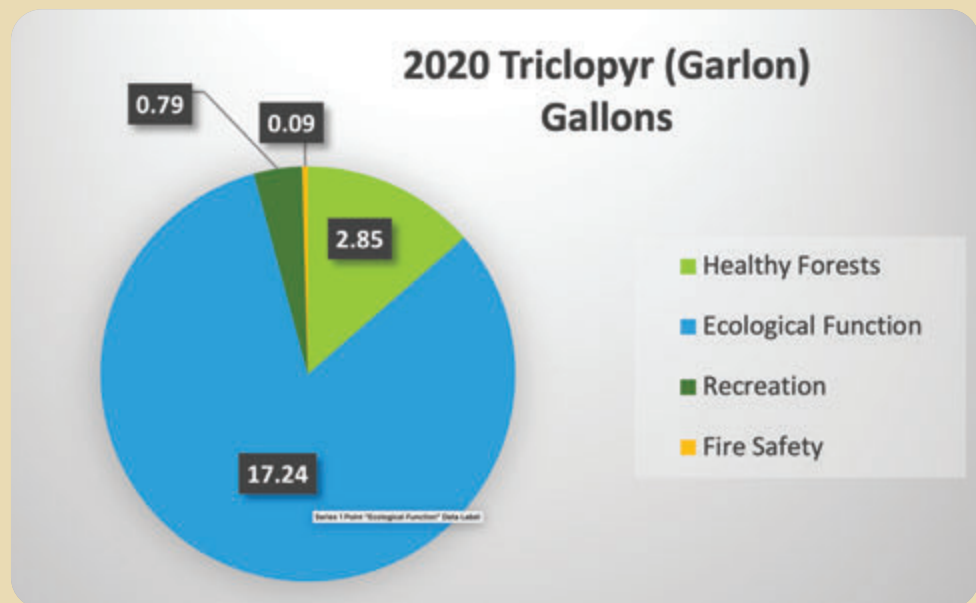
Appendix A: Conventional and Organic Product Trends

- ALL regional park play areas and water fountains are free from conventional pesticides.
- The Park District continues to increase its proficiency and use of organic herbicides to supplement its cultural and mechanical practices.
- Park staff report that the organic burndown herbicide is effective on very young annual weeds but is unsuccessful in controlling perennial plants. Timing is critical and staffing challenges made weed management in the Fire Safety category difficult in many parks.
- Park staff continued its use of pre-emergent and organic burndown hybrid treatments for all bare ground applications in the Fire Safety category, though timing was complicated by the Covid-19 crisis. Staff responded by increasing mechanical methods where feasible, though not all fire safety applications were completed in early winter, which is the most efficient and effective time to control vegetation.
- Based on findings of other land managers and researchers, the Park District continues to pilot new organic herbicides and ways to maximize the efficacy of the organics already used in the District. For example, the Park District used a combination of organic herbicide and tilling to control an especially noxious vine, bindweed.

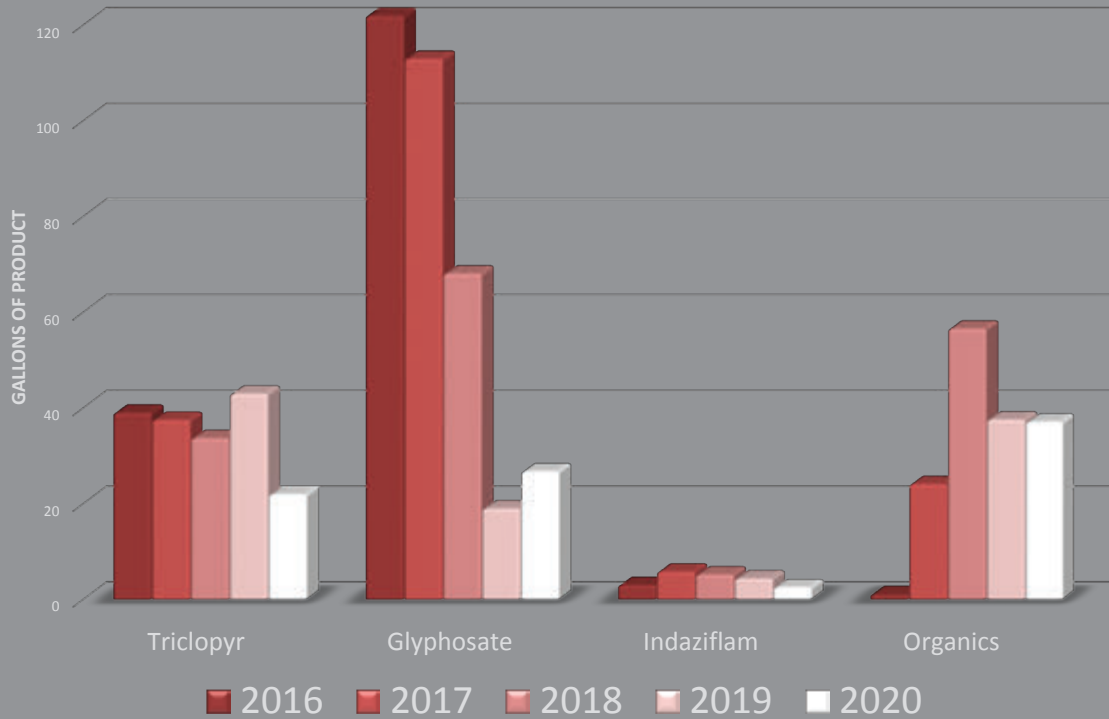


The Park District continues to obtain more land to manage. This graph demonstrates that the Park District continues to meet its commitment to reduce use of herbicides while still providing important recreational opportunities and managing essential habitat.

Triclopyr (Garlon) continues to be used primarily in the Ecological Function and Healthy Forests categories. This selective herbicide is used to control broadleaf weeds and woody resprouting species like poison oak, woody brush and eucalyptus.



5 Year Herbicide Use Trends



Five-year herbicide trends for the four main herbicide types used in the Park District. For a complete list of all products by park, see Appendix A. This graph shows an overall decrease in product use. Use of organic products has increased over the last few years. Note that the glyphosate increase in 2020 is entirely for the goal of promoting ecological function.

Appendix B: Approved General Use Products

Organic and Safer Products

Organic products continue to be an important part of the Park District's IPM tool box (see below). The IPM program continues to expand its product list with organically-derived pesticide products.

- **Civitas Turf Defense** is a mineral oil product (EPA Reg. No. 69526-17) that is used to protect golf course greens from insect and fungus damage.
- **Competitor** is a modified vegetable oil that does not contain nonylphenol ethoxylate, a suspected endocrine disruptor (CA Reg. No. 2935-50173). It is used as a surfactant and penetrant with triclopyr products.
- **Essentria IC3** is an essential oil-based broad spectrum insecticide with a caution signal word that is used around Park District buildings.
- **Fiesta** is a turf weed killer, caution signal word, with the active ingredient Iron HEDTA (EPA Reg. No. 67702-26-87865). It works as a burndown product, causing iron toxicity to broad-leaved weeds.
- **Green Clean Algaecide** is a hydrogen peroxide-based product with a danger signal word that is used by contractors to treat public health threats such as harmful algal blooms and E. coli outbreaks at swim beaches (EPA Reg. No. 70299-4).
- **Suppress EC** is an OMRI registered non-selective, foliar burndown herbicide (EPA Reg. No. 51517-9). This product contains 79 percent of the active ingredients caprylic and capric acids and has a warning signal word.
- **Terad3 Rodenticide** with the active ingredient Cholecalciferol, is an acute toxin that does not cause secondary poisoning. It is used around food service buildings in tamper-proof bait boxes.

Conventional Products

Conventional or synthetic pesticide use continues to decline. This is due in large part to the continued emphasis on mechanical and cultural methods that are the backbone of pest management at the Park District. Additional contributing factors include the focus on early weed control using organic products, rate reduction, and application foot print reduction of conventional products.

- **Bee Bopper** is a knockdown insecticide with the active ingredients of Tetramethrin and 3-Phenoxybenzyl, that is used on late season yellow jacket nests that are public health threat (EPA Reg. No. 7754-44).
- **Diphacinone** is an anticoagulant rodenticide dispensed in bait stations specifically for the control of ground squirrels and commensal rodents (rats and gophers). Products in this category include treated grain bait (0.001 percent active ingredient) manufactured by Alameda County Agricultural Department (CA Reg. No. 10965-50001). This product has a caution signal word.
- **Gas Cartridges** are an asphyxiant rodenticide is manufactured by the USDA with active ingredients of sodium nitrate and charcoal (EPA Reg. No. 56228-2). It has a warning signal word and is primarily used for gopher control in turf.
- **Indaziflam** is a broad spectrum pre-emergent herbicide used in landscape and right of ways. This product is sold as Specticle Flo (EPA Reg. No. 432-1518). It contains 7.4 percent of the active ingredient indaziflam and has no signal word.
- **Triclopyr** (i.e. Garlon) is a broadleaf, selective, post-emergent herbicide used principally for the control of resprouts from woody plant species such as eucalyptus, mayten, acacia and broom species. Products in this category include Garlon 4 Ultra (EPA Reg. No. 62719-527) with 60.45 percent active ingredient and a caution signal word and Pathfinder (EPA Reg. No. 62719-176) with 13.6 percent active ingredient and a caution signal word.

Appendix C

All products are listed by brand name and volume of product use.
Golf course, farming and structural uses are listed in a separate table.

All Products in All Regional Parks

Park	Goal	Applicator	Activator 90 surfactant, oz	Agri-fos, oz	Agri-Gold, oz	Bee Bopper, oz	Biolink Acidifier, oz	Biolink Antifoam, oz	Capstone, oz	Clearcast, oz	Competitor surfactant, gal	Dimension2EW, oz	Diphacinone, lbs	Garlon 3A, gal	Garlon 4 Ultra, gal	Hasten Surfactant, oz	Liberate, oz	Milestone, oz	Pentra-Bark, oz	Physan 20, oz	Polaris, gal	Pro-Iron surfactant, oz	Roundup Custom, gal	Roundup Pro Conc., gal	Roundup Pro Max, oz	Specticle Flo, oz	Suppress, gal	Syl-Coat surfactant, oz	Transline, oz	Vastlan, oz	VistaXRT, oz	Weed Slayer, oz	
Ardenwood Farms	Organic Farm	IPM		48	8						4.00																					24	
Anthony Chabot	Fire Safety	Contractor									0.09														68	12							
		Park Staff									0.03		0.05													0.1	0.25						
	Healthy Forests	Fire Staff									0.09			0.05																			
		IPM		12		1																	0.19						0.5	4			12
Public Health	Park Staff				56																												
	IPM		3		0.5						0.48														3.2		0.25	44.88	6.4			3	
Black Diamond Mines	Ecological Function	Contractor																				0.77											
		County Ag												5.98		114.34							146										
		IPM									4.48		1.63										0.40										
Botanic Garden	Nursery	Park Staff		9																													
	Safe, Accessible Recreation	IPM								0.02																					5		
Briones	Fire Safety	Park Staff												0.00												101.5							
	Ecological Function	County Ag												0.12		0.85							0.8										
IPM										0.10					0.50							0.25											
Carquinez Martinez Shoreline	Ecological Function	County Ag												0.58		11.12						14.86											

Continued on next page.

Appendix C, Continued

All products are listed by brand name and volume of product use.
Golf course, farming and structural uses are listed in a separate table.

All Products in All Regional Parks, Continued

Park	Goal	Applicator	Activator 90 surfactant, oz	Agri-fos, oz	Agri-Gold, oz	Bee Bopper, oz	Biolink Acidifier, oz	Biolink Antifoam, oz	Capstone, oz	Clearcast, oz	Competitor surfactant, gal	Dimension 2EW, oz	Diphacinone, lbs	Garlon 3A, gal	Garlon 4 Ultra, gal	Hasten Surfactant, oz	Liberate, oz	Milestone, oz	Pentra-Bark, oz	Physan 20, oz	Polaris, gal	Pro-Tron surfactant, oz	RoundUp Custom, gal	Roundup Pro Conc., gal	Roundup Pro Max, oz	Specicide Flo, oz	Suppress, gal	Syl-Coat surfactant, oz	Transline, oz	Vastlan, oz	Vista XRT, oz	Weed Slayer, oz		
Contra Costa Trails	Fire Safety	Park Staff									2.50														90									
	Fire Safety	Park Staff																							30									
Contra Loma	Safe, Accessible Recreation	Park Staff									1.87															5								
	Ecological Function	County Ag													0.02		0.50					0.5												
Coyote Hills	Ecological Function	Contractor																					22.30											
Cull Canyon	Fire Safety	Park Staff																								1.88								
	Public Health	Park Staff				7																												
Don Castro	Safe, Accessible Recreation	Park Staff									0.21				0.20	12																		
	Ecological Function	County Ag														32	7.00																	
Del Valle	Fire Safety	Park Staff																							8	0.47								
	Safe, Accessible Recreation	Park Staff											250																					
District Buildings	Landscaping	Contractor																																
District Wide	Safe, Accessible Recreation	County Ag											400																					
East County Trails	Ecological Function	Contractor						1							78								0.68	0.70										
	Safe, Accessible Recreation	Park Staff									0.05				0.06	12																		
Garin Dry Creek	Ecological Function	County Ag	49														112	64.50																
Hayward Shoreline	Ecological Function	IPM									6.33	19					8.50			16.73		0.24												
Lake Chabot	Ecological Function	Park Staff									1.41			0.81		8.50																		
	Ecological Function	IPM									0.28		0.25								0.06													
Las Trampas	Fire Safety	Park Staff									0.94														10	2.88								
	Safe, Accessible Recreation	Park Staff									0.28			0.19																				
MLK Jr.	Ecological Function	County Ag																																
	Ecological Function	IPM		12							0.50				0.25																			
Miller/Knox & MESSP	Safe, Accessible Recreation	Park Staff									8.97	20					9.00			24.69		0.45						4	16	12				
	Ecological Function	IPM									0.03				0.02																			
Pleasanton Ridge	Ecological Function	IPM									0.08										0.23													
Point Pinole	Ecological Function	Contractor									0.76		0.76																			0.64		
	Ecological Function	Park Staff									0.01		0.01		3.14													261						
	Ecological Function	IPM									0.06											0.39												
	Fire Safety	Park Staff									0.29				0.09																			
	Public Health	Park Staff				14																												
Reinhardt Redwood	Safe, Accessible Recreation	Park Staff									0.19			0.09																				
Shadow Cliffs	Healthy Forests	Contractor													0.06																			
	Fire Safety	Park Staff									1.17														12.5	7.63								
Sibley	Safe, Accessible Recreation	Park Staff									0.09															0.25								
	Ecological Function	IPM		18		4																											18	
Sunol/Mission Peak/Vargas	Design & Construction	Contractor									1.37				0.96								1.92											
	Design & Construction	IPM									0.03												0.02	3.2										
	Healthy Forests	Contractor													0.10																			
	Healthy Forests	IPM									0.11				0.06						0.06													
Tilden	Ecological Function	County Ag													0.25		2.00				7													
	Ecological Function	Park Staff									0.02						1.00																	
Tilden	Fire Safety	Park Staff									0.75					357	391								4	1.00								
	Healthy Forests	Fire Staff									0.92			0.31																				
Temescal	Healthy Forests	IPM									3.54			1.20													0.25		32		3			
	Safe, Accessible Recreation	IPM							15.4				0.01			9.7																		
Vasco Hills Corridor	Safe, Accessible Recreation	Park Staff									0.09				0.06																			
	Ecological Function	County Ag													0.55		11.05					12.5												
Wildcat Canyon	Healthy Forests	Fire Staff									0.07				0.02																			
	Healthy Forests	IPM						8			3.43		0.04	1.00							0.28					2.00		3.2	8					
	Safe, Accessible Recreation	Park Staff	64																64															
Wildcat Canyon	Ecological Function	County Ag													1.44		29.00																	
	Ecological Function	IPM									1.23				0.62		8.00																	

Appendix D

Golf Course Products

Redwood Canyon	Tielden	Product Name	Active Ingredient
	17.1	Agri-Mek, oz	abamectin
1.56		Banner Maxx II, gal	propiconazole
	144	Civitas, gal	mineral oil
2		Brandt Defoamer, oz	adjuvant
15.9		Daconil Weather Stick, gal	chlorothalonil
70		Fore 80WP, oz	mancozeb
7.5		Instrata, gal	chlorothalonil/propiconazole/fludioxonil
4.4		Mirage Stressguard, gal	tebuconazole
	3.8	Podium, gal	trinexapac-ethyl
	0.83	Primo Maxx, gal	trinexapac-ethyl
	10	Proxy, gal	ethephon
0.84		Ranger Pro, gal	glyphosate
	1.5	Secure, gal	fluazinam
	10	Torque, gal	tebuconazole

Appendix E

Conventional Farming Products

Product Name	Active Ingredient	Amount
Aqua Buff, oz	seed oil	28.09
Chateau, oz	flumioxazin	1.14
Contain, oz	modified seed oil	82.56
Crosshair, gal	modified vegetable oil	5
Dimethoate 400EC, gal	dimethoate	2.4
Express with Total Sol, oz	tribenuron	5
Intrepid, oz	methoxyfenozide	28
R-11, gal	alkyl phenol ethoxylate	4
Rhomene MCPA Broadleaf, gal	MCPA	30
Roundup PowerMAX, gal	glyphosate	12.7
Warrior II, oz	lambda-cyhalothrin	20.43

Appendix F

Structural Pest Control Products

Product	Active Ingredient	Amount
Advion Cockroach Gel Bait, oz	indoxacarb	0.25
Altriset, oz	cholrantraniliprole	1916
Arilon, oz	indoxacarb	2.212
Bifen I/T, oz	bifenthrin	6.2
CB-80, oz	pyrethrin	0.015
Conrac All Weather Blox, oz	bromadiolone	15.84
Essentria, oz	botanical oils	271.17
Fastrac, oz	bromethalin	5344.66
Fastrac Place Pac, oz	bromethalin	2.5
Lambda, oz	lambda cyhalothrin	0.09
Onslaught, oz	cyano-methyl-chloro-alpha-benzeneacetate	3.7
ProFoam Platinum, oz	sodium decyl sulfate	1
Sluggo, oz	Iron phosphate	2
Suspend SC, oz	deltamethrin	0.1
TakeDown, oz	bromethalin	308.44
Terad3 AG Blox, oz	cholecalciferol	3.23



Cultural amendments for planted trees.

Integrated Pest Management Annual Report 2020



Healthy Parks Healthy People

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Biological diversity