

Integrated Pest Management Annual Report 2023



Black Diamond Mines Regional Preserve

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Preserving Open Space for the Future

The East Bay Regional Park District (Park District) manages a diverse landscape of approximately 125,000 acres in Alameda and Contra Costa counties. The Park District system comprises 73 parks, 1,333 miles of trails, and 55 miles of shoreline and serves 2.8 million East Bay residents with approximately 25 million visits per year. The Park District is the nation's largest regional park agency.

Managing the large expanse of open space requires strategic planning and effective policies. Governed by a seven-member elected Board of Directors that set policy for the implementation of the Park District Master Plan, the Park District's workforce of 1,000 employees across all professional sectors contributes to the management of the regional parks.

The Park District works with diligence and thoughtfulness to, protect our parklands; enhance natural and recreational resources; engage in Integrated Pest Management (IPM) training and assist with projects that improve habitat and recovery of sensitive species. We use an adaptive management approach to optimize our effectiveness

This annual report provides accurate and transparent information about the suite of pest control practices that comprise our IPM program. We prioritize the prevention and effective control of pests in a continuous, sustainable, and ecologically focused manner while using scientific and evidence-based best practices. The Park District's IPM program is an essential component of the ongoing support of healthy ecosystems that benefit the vitality of native plants and wildlife and the quality of park experiences for our visitors.

Commitment to Natural Resource Management

The Park District's mission statement continues to be an inspiration and an enduring testimonial to the Park District's commitment to protect open space resources and to provide environmentally responsible outdoor recreational opportunities for present and future generations.

“The East Bay Regional Park District preserves a rich heritage of natural and cultural resources and provides open space, parks, trails, safe and healthful recreation and environmental education. An environmental ethic guides the District in all of its activities.”

– East Bay Regional Park District Mission Statement

Consistent with this mission, the Park District's IPM policy fosters the protection of natural and recreational resources, while minimizing the use of chemicals.

“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.”

– Pest Management Policy and Practices, EBRPD, October 1987 Resolution #1987-11-325

Keystone Tenets of IPM:

- The Park District strives to manage pests in the most effective and safest manner for our park visitors and our employees by following an Integrated Pest Management (IPM) program.
- This IPM program is a multidisciplinary and cross-departmental effort that is based on an environmental ethos, accountability, and transparency.
- The management and operation of public parklands is rooted in key principles of honoring the land, its ecological systems and cultural heritage, as well as honoring our park visitors and the people who conduct sustainable park and landscaping operations, our employees.
- Prevention is the key to safe and effective pest management.
- Pest management actions are guided by best science, weight of evidence principles, best practices, and the Park District's environmental ethos.
- Control of invasive vegetation is an essential, adaptive management tool that helps our ecology be more resilient to drought, provides habitat benefits and reduces risks of wildfire.

Integrated Approaches in the Park District

What is Integrated Pest Management?

Integrated Pest Management (IPM) is a scientific approach to pest management. A pest is any organism that causes damage to human health, safety, recreation, or environmental function. In the Park District, the bulk of pests are nuisance weeds that limit public access to open spaces, pose a fire risk, and degrade recreational access. IPM effectively reduces pest populations while minimizing human health and environmental hazards.

Principle Goals of the IPM Program

These goals, listed below, help define the purpose behind IPM actions and facilitate the collection of data used to refine objectives and provide quantitative data for adaptive management. The IPM program helps support and enhance the diverse habitats through pest management of structural, recreational and, wildland pests.

Healthy Forests

District-wide efforts to reduce risk of catastrophic fire in the wildland and urban interface.

This program includes vegetation reduction to increase spacing between trees, remove ladder fuels, and maintain a healthy, shaded fuel break. This program targets weedy species from re-sprouting on cut trees and supports the recruitment and maintenance of native vegetation.

Public Health

The Park District recognizes that certain pests (e.g. ticks, E. coli, and harmful algal blooms) pose a threat to human health and safety. The Park District remediates these pests through active treatment and management of park lands for the protection of public health.

Ecological Function

Vegetation and pest management are essential activities to promote and maintain sensitive natural resources and increase biodiversity. Supporting ecological function includes implementation of habitat enhancement and ecological restoration projects. In addition, our IPM approach includes the development of environmental programs to educate park users about healthy ecosystems and training for Park staff and partner land management agencies to improve our effectiveness. These projects and programs are conducted by park staff and their contractors from many departments throughout the Park District and range in size from small scale to landscape scale with the shared goal of benefiting native wildlife populations, native plant communities and ecosystem functions.

Safe and Accessible Recreation

Vegetation management is needed to maintain and enhance recreational uses, including ensuring safe trail access and improving facilities' landscaping and gardens.

Fire Safety

Park staff are hard at work almost every day of the week managing vegetation to reduce the extent, density and structure of vegetation that is prone to ignition to help improve fire safety. These fire safety efforts focus on identifying potential ignition sources, maintaining building perimeters free of vegetation, and ensuring passable fire access in areas that are prone to ignition and/or are in fire prone areas. Such locations include trails, roads, barbecues and fire pits, campgrounds, high use picnic areas, parking lots, buildings, and infrastructure perimeters.

Foundations of IPM

At the Park District, IPM is a management practice based on an ecological framework that is used to identify, understand, and solve pest problems. Thoughtful design and prevention practices provide the foundation of the program. Science guides and provides the structure for an ecologically-sound IPM program.

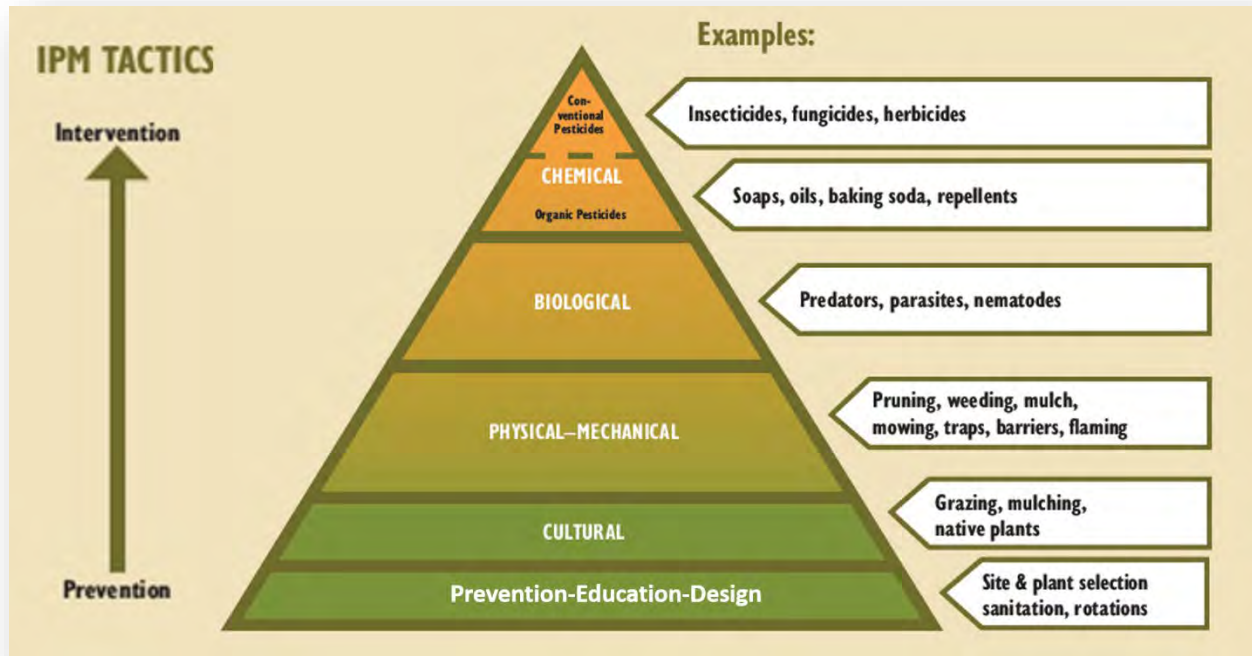


Figure 1: Integrated Pest Management hierarchy of methods

Since the inception of its Integrated Pest Management policy in 1984, the Park District’s management of pests has been based on regularly reviewed science standards, weight of evidence principles, and best industry practices guided by an environmental ethos. Research is used to identify safe, effective, and efficient management practices to ensure an enhanced park and trail environment for our park visitors, surrounding neighbors, and park employees.

IPM Methodology

IPM is not a single pest control method but, rather, a series of pest management evaluations, decisions, and integrated actions. It is a non-linear process that relies heavily on an adaptive management framework. The management and operation of public parklands are rooted in key principles of honoring the land, ecological systems and protecting the public and staff through safe, sustainable park operations.

Prevention, Monitoring, and Identification of Potential Pests

As a first line of pest control, the IPM program works to prevent the introduction and spread of pests. It monitors for pests and identify them accurately, so that appropriate control decisions can be determined and acted on early. Prevention is the foundation of all our methodologies and projects.

IPM methods of control fall under one of several categories: cultural, mechanical, biological, or chemical, and are listed in the order that indicates their importance and sustainability. Adaptive management provides feedback to this dynamic cycle of land management and ensures a resilient and sustainable program. The Park District prioritizes mechanical, cultural, and biological controls or a combination of these before considering chemical controls. To learn more about these methods, visit our website:

<https://www.ebparks.org/natural-resources/integrated-pest-management#IPM%20Methodology>

Preventing the Introduction and Spread of Pests

Training in Integrated Principles

Regular training is an essential part of a robust, adaptive management program. The IPM program has a dedicated team of ecologists that provide annual safety trainings and updates our best management practices on a continuous basis. We also identify specific topics that should be integrated into our trainings and collaborate with our partners on strategic projects; all of which enriches and refines the Park District's capacity to perform vegetation management and habitat enhancement.

In 2023, the IPM Department provided herbicide safety training for 156 park staff. This annual training is required for all staff that use chemical products and ensures that product use is performed in a safe and environmentally sound manner. Additionally, at this training, IPM staff trained field personnel in vector born disease such as Hanta Virus, West Nile Virus and tick born disease like, Lyme.

In 2023, the IPM program focused our training resources on prevention strategies to reduce the risk of soil-borne pathogens. First, IPM staff produced its first-ever training video that educates the public and park staff on how to reduce the risk of phytophthora, or soil pathogen introduction and spread while working and recreating in our parks. We partnered with the California Invasive Plant Council and the University of California Agriculture and Natural Resources to produce and distribute this video. You can learn more about soil born pathogens by watching this video here:

<https://www.cal-ipc.org/solutions/prevention/dontspoil/>

In 2023, the IPM program created a voluntary guidance manual that provides best management practices (BMPs) to reduce the introduction and spread of *Phytophthora*, a soil-borne pathogen that is often introduced through planting infected nursery stock into landscaped areas and adjacent parklands. Without BMPs, practices such as propagation, transplanting, potting, and holding container plants increases the risk that *Phytophthora* will be introduced into new areas and spread to our landscaped areas and restoration sites in the Park District. This manual is provided to all park staff and gives them the technical assistance needed to ensure staff can plant and propagate vegetation in a safe manner. You can find out more about soil borne pathogens on our website here: <https://www.ebparks.org/natural-resources/integrated-pest-management/plant-pathogen>



Figure 2: Don't spoil the soil! Soil-borne pathogen prevention video illustrates how best management practices are easy for everyone to do! Park staff and partners from California Invasive Plant Council explore the biology, introduction pathways and practices that reduce risk of infection in this educational video.



Figure 3. Staff illustrate nursery practices that anyone can use. Implementing these safe practices when propagating, storing, and growing up native plants will minimize the introduction and spread of plant disease that threaten our wildlands

Trends in Pesticide Use

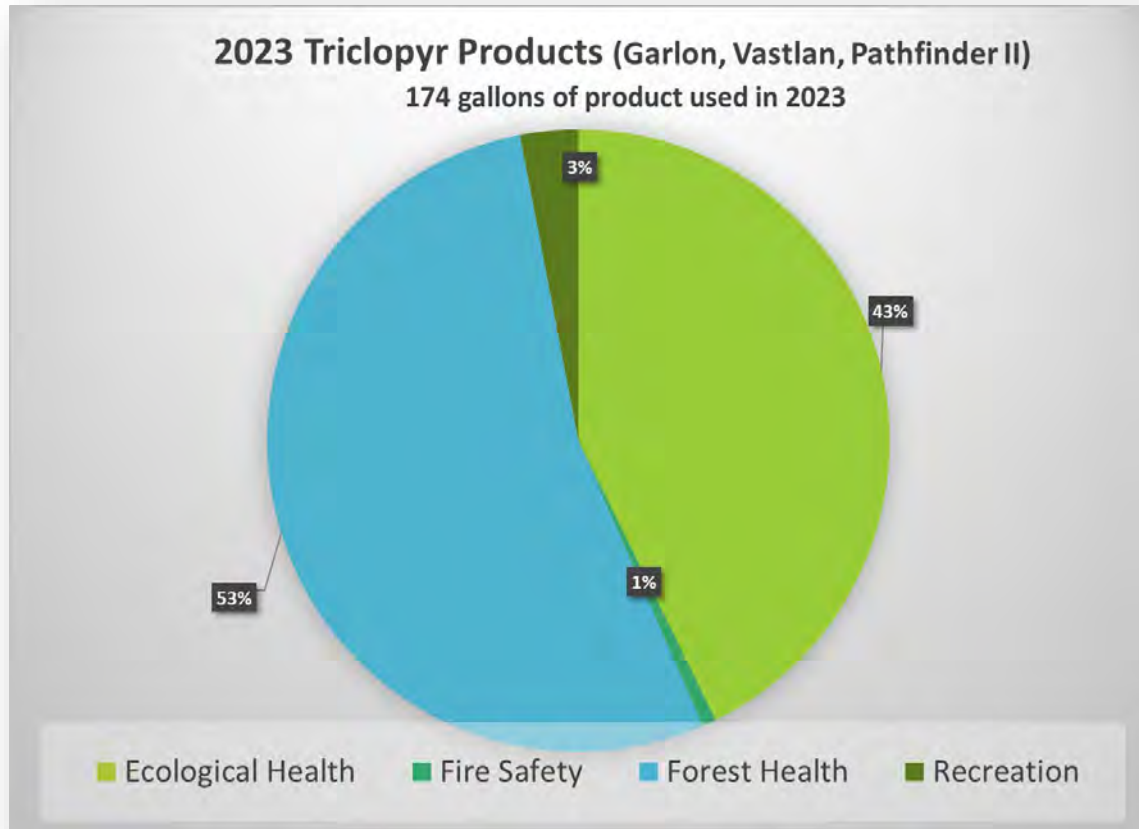


Figure 1: Triclopyr herbicide products (Garlon, Vastlan, Pathfinder II) use totaled 174 gallons in 2023, an increase of 76%. Triclopyr is a selective herbicide that is used for spot treatment to stop Eucalyptus trees from resprouting once cut. The District continues to thin overstocked eucalyptus plantations that have had substantial mortality and fuel build up since the dieback event of 2020. This unprecedented die off, of approximately 1000 acres of dense eucalypt plantations, poses a catastrophic fire risk. Thanks to the thinning and removal of these heavy fuels, the communities and infrastructure of the East Bay will be safer and less affected by future fires in this disease affected parks. This product is also a powerful tool in managing our grasslands and other plant communities for invasive weeds that lower biodiversity and threaten ecological functioning. The District has committed to help preserve, enhance, and manage 30% of the State of California by 2030. Using this herbicide that targets broad leaf plants, leaving grasses alone is an effective, efficient, and safe way to controlling invasive plants, giving native plants the opportunity to become more dominant.



Figure 2: Before (above) and after (below) photos of the second year of Tree Die Back thinning projects in Anthony Chabot where thinning of dense and diseased stands of red gum eucalyptus show thinning of overstory and understory species, leaving healthy individual eucalyptus, native coast live oak and bay trees. Eucalyptus trees vigorously resprout after cutting and require selective herbicide treatment to kill the root resources below ground. In 2023, a large proportion of fuel reduction work occurred in dense eucalypt plantations requiring more triclopyr products to stop resprouting than the previous year.

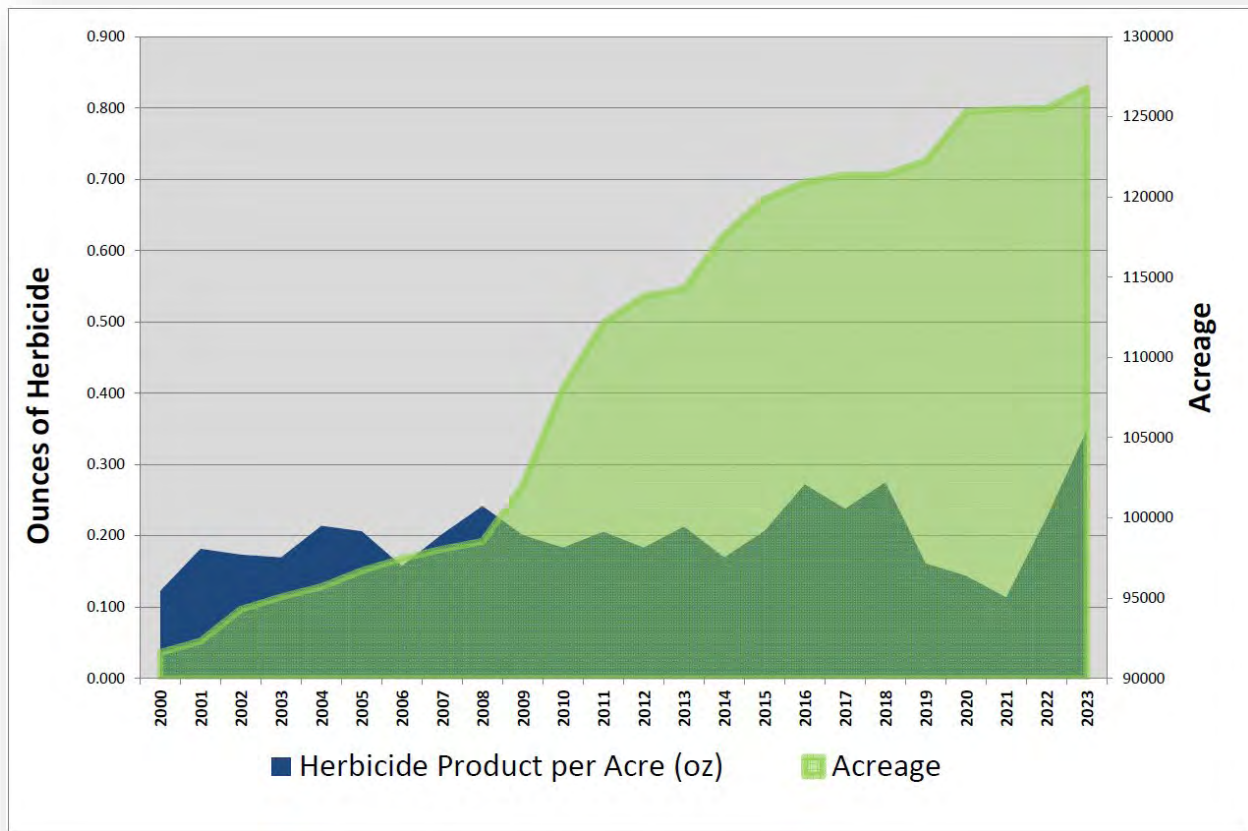


Figure 3: Long term trends illustrate the relatively small amount of chemical treatments the District uses to treat vegetation. This graph illustrate herbicide use has maintained a relatively constant ration of ounces per acre over 23 years, however herbicide use did increase from the previous 2 years. This rise in use is due largely to expanding fuels reduction and thinning of dense and dying eucalyptus plantations, large landscape scale restoration projects and management of newly acquired land with large populations of noxious weeds.

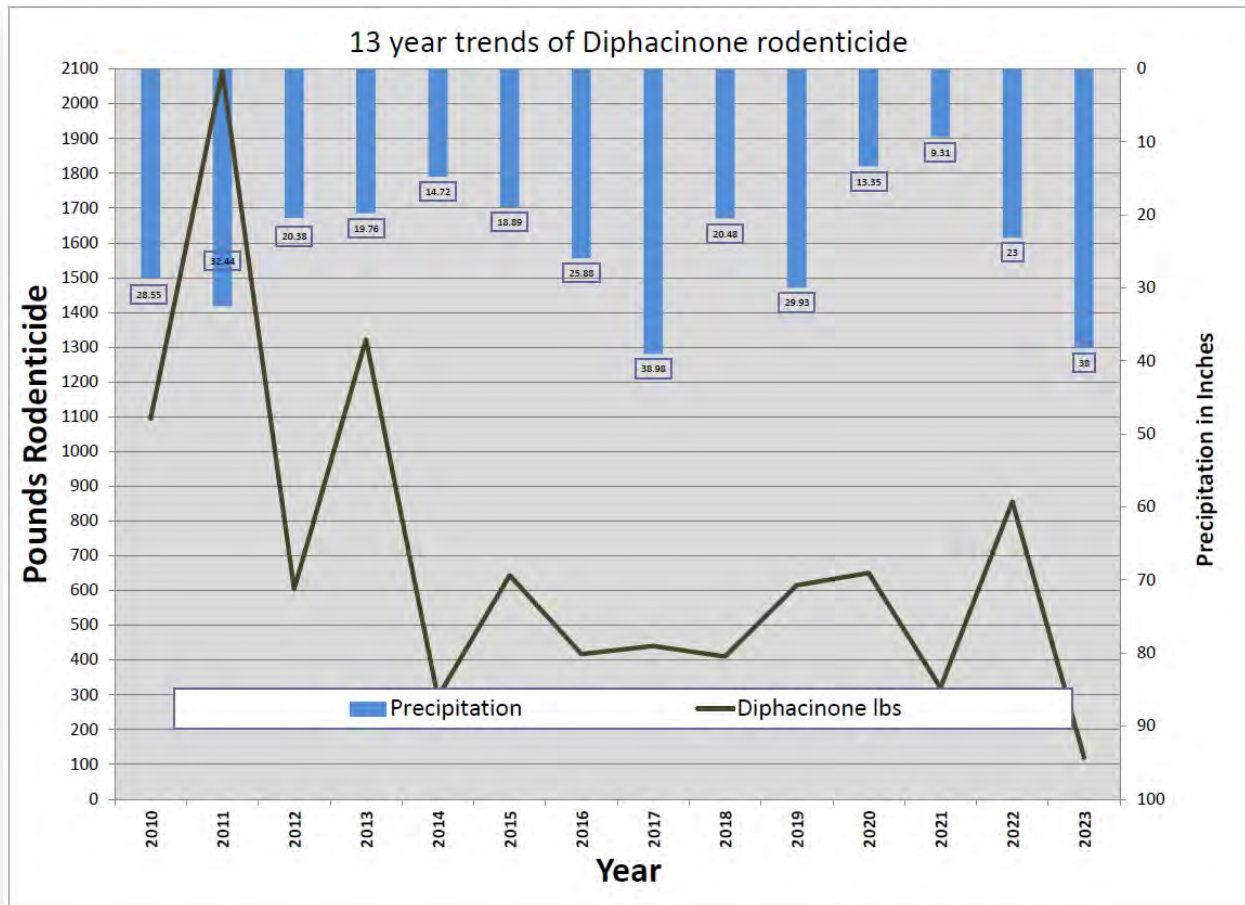


Figure 4: Diphacinone, a first generation anti-coagulant rodenticide, is used to control ground squirrel populations where they damage road, paved trails, levees, parking lots, etc. The District only controls ground squirrel populations where they damage infrastructure like foundations, paved trails, levees, utilities, equipment, etc. In parkland areas, ground squirrels proliferate due to year-round green vegetation and hardened surfaces that they prefer to burrow under. This requires yearly control efforts. Product use decreased in 2023 due to the increased use of asphyxiant tools. However, the use of asphyxiants is limited to certain parks due to endangered species protections. In our wildland areas, ground squirrels provide critical habitat and ecological functions, creating refuge and providing food for threatened and endangered species.

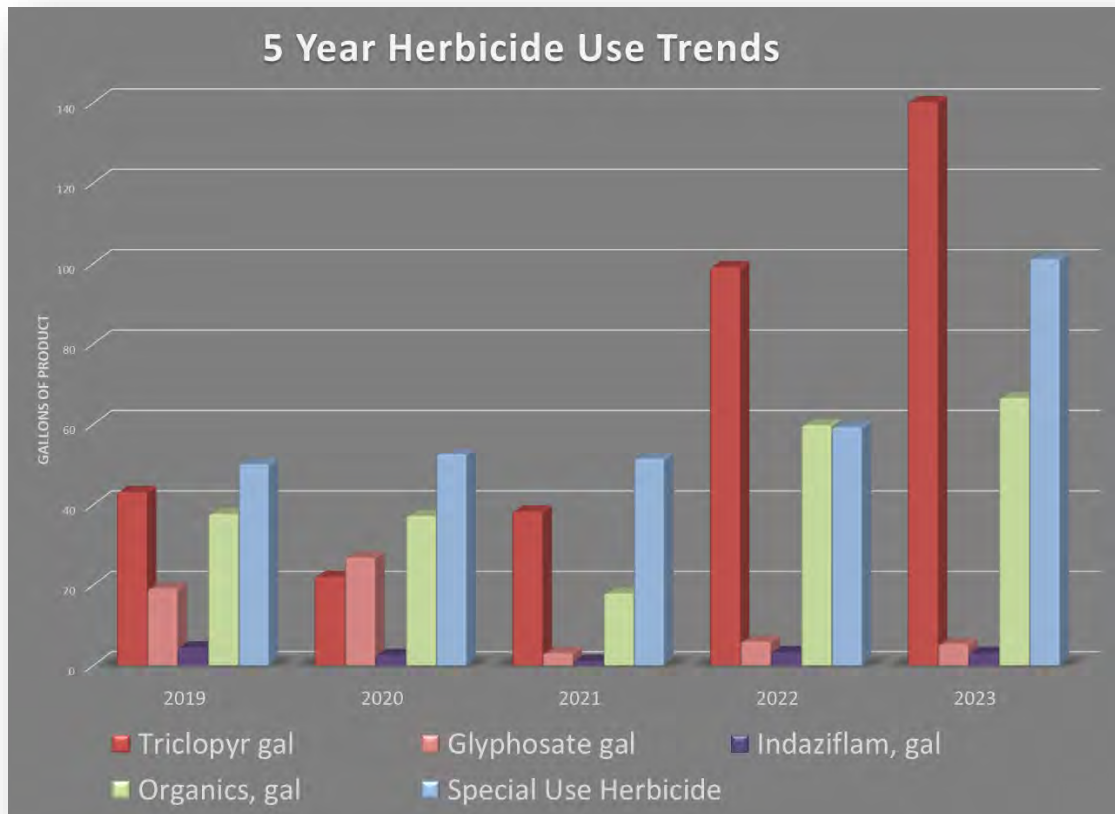


Figure 5: Five year herbicide use patterns show a significant but predicted increase in triclopyr products due to the increase in thinning of diseased and overstocked eucalyptus plantations, large scale restorations as well as permit mitigation requirements. Glyphosate use for ecological health projects remained stable, the pre-emergent indaziflam and organic categories remained relatively stable and there was an increase in special use products for ecological health objectives.

Principle Goals of the IPM Program: Case Studies

The principle IPM goals, listed below, define the purpose behind IPM actions and facilitate the collection of data used to refine objectives and provide quantitative data for adaptive management. Our IPM program is a key component within the Park District that helps support and enhance the diverse habitats through pest management of structural, recreational, and wildland pests.

1: Fire Safety

Founded in 1934, the Park District is the largest local park agency in the United States, managing over 125,000 acres. The Park District serves a population of approximately 2.9 million residents and receive over 25 million visits a year. These recreational resources include:

- 73 regional parks, recreation areas, shorelines, preserves, wilderness, and land bank areas
- 31 regional inter-park trails
- Over 1,330 miles of trails within parklands
- Eight freshwater lakes, 3 swim lagoons, 2 San Francisco Bay beaches, and 3 swimming pools
- 40 lake fishing docks, 3 Bay fishing piers
- 225 family campsites, 42 youth camping areas, 24 backpacking camps, and 7 equestrian centers
- Two golf courses, one disc-golf course
- 137 reservable group picnic sites
- 10 interpretive and education centers
- Two mobile education centers
- Ten children’s playgrounds
- 17 wedding, meeting, and banquet facilities

Fire safety at the Park District relies heavily on IPM tactics. The objectives of our fire safety programs include managing the vegetation around ignition sources and establishing and maintaining building perimeters. Areas like roadsides, unpaved parking areas, barbeques and fire pits are frequent ignition sources and prone to fire. Management of fine, flashy fuels in these areas is essential to preventing catastrophic wildfires in the parks.

Every day, rangers are out in our parks line trimming, mowing, and scraping to reduce the fine, continuous fuels around these potentially high ignition sources. An important component of bare ground vegetation management are herbicides that prevent the growth of newly emerged weeds. Additionally, maintaining defensible space around our structures, buildings and park developments is an essential part of our maintenance activities. Defensible space is the buffer that is created between a building and vegetation like grass, trees, shrubs that surround it. This space is needed to slow or stop the spread of wildfire and it helps protect residences from catching fire—either from embers, direct flame contact or radiant heat. Proper, defensible space also provides firefighters a safe area to work in during a wildland fire. Rangers keep vegetation controlled around staff buildings and residences so that, in the event of a wildfire, they are more resilient and easily protected.



Figure 9: Vegetation is controlled in high ignition areas such as parking lots, curb stops and road sides to prevent or slow the spread of fire in the event of an accidental spark or fire..

Case Study 2: Healthy Forests

The IPM program works with our Fire and Park Operations to reduce the risk of catastrophic fire in the wildland and urban interface. This work prioritizes:

- Vegetation reduction to increase spacing between trees,
- Control and removal of ladder fuels and resprouting woody, invasive vegetation
- Control and removal of invasive plants to maintain a healthy shaded fuel break.
- Support the recruitment and maintenance of native vegetation.

In 2023, the Park District implemented its second year of *Operation Broom Bust*, an innovative approach to control a widespread weed whose population explodes after healthy spacing in forests are re-established. Originally introduced as a landscape ornamental and erosion control plant French broom is an invasive, non-native plant in California's landscape. French broom grows rapidly and forms dense stands, outcompeting and displacing native forbs and grasses; and a mature plant can produce thousands of seeds per year. If uncontrolled, French broom quickly becomes dominant, creating a fire hazard risk in the wildland-urban interface. French broom increases the fuel load on the landscape with the accumulation of leaf litter, twigs, and branches, and standing vegetation. French broom can also easily become a fuel ladder, transporting flames from the ground floor into the canopy of our oak and bay woodlands.

Operation Broom Bust is an example of a weed control program that accomplishes multiple IPM goals: reducing ladder fuels for fire safety, enhancing plant diversity for healthier forests, and maintaining fire road and trail access for safe and accessible recreation. This program utilizes goat grazing, targeted herbicide application and mechanical hand pulling to control this introduced shrub across seven parks and 94 acres. These parks include Anthony Chabot, Claremont Canyon,

Leona Canyon, Miller Knox, Sibley, Tilden, and Wildcat Canyon. Treatment sites in 2023 were more dense and more complex than the previous year, requiring more time and herbicide for treatment. In many of these problem areas, the Park District used mechanical methods (cutting) to remove older and more woody portions of the broom plant. Cutting the plants, reduced the competition for sunlight. This encouraged seeds in the seed bank to germinate and older broom individuals to resprout. Resprouting broom and younger seedlings were then successfully treated with herbicide. This resulted in successful treatment of two generations of French broom and reduced the seed bank more quickly.



Figure 10: This picture shows a newly cut stand of French broom and the resprouts in Wildcat Canyon Park. Using mechanical methods first enabled the herbicides to target the younger resprouts and be more effective. Once broom was controlled, native grasses and forbs rebound and restore a more native and biologically diverse understory. Absent control, these tall shrubs, in the event of wildfire, can carry fire up into the canopy of trees and from there winds can transport embers much farther and faster than fire on the ground.

Case Study 3: Public Health

The IPM program controls pests that threaten the health of park staff and our visitors. Examples of public health threats include cyanobacteria that cause harmful algal blooms, ticks that carry Lyme disease, E. coli from waterfowl that creating unhealthy swimming conditions and rodents that are vectors of Hanta virus and other diseases.

If you have spent any time in our parks, you have probably noticed one of our seasonal pests, the yellow jacket (*Vespula pensylvanica*). A favorite visitor of picnic sites, trash cans and drinking fountains, these wasps can be a significant annoyance. For the very few of our park users that are allergic to wasps, their presence can be potentially life threatening. Our native Western yellow jacket makes its nest in the ground during the summer months, which is when these native wasps and our recreational aspirations come into conflict. In the peak of summer, are in full swing, foraging for sweets, proteins, and water to rear their annual brood. While they will naturally defend a ground nest if disturbed, they are most likely to sting, more than once sometimes, or bite if disturbed while foraging on your plate or in your soda can. To control these pests, we use mechanical traps with pheromone attractant every spring to capture the queens as they emerge from their overwintering sites and throughout the summer to capture foraging wasps. Park District staff place the yellow jacket traps strategically around high conflict areas to reduce the foraging pressure, but there will always be a few that survive and cause havoc. You can learn more about these ecologically important but recreationally undesirable insects and how to minimize their negative impacts while enjoying the outdoors here:

<https://ipm.ucanr.edu/PMG/PESTNOTES/pn7450.html>



Figure 11: When summer recreational activities are in full swing, you'll see yellow jacket traps around picnic areas and high use recreational areas to reduce these foraging native social wasps that otherwise provide important ecological functions such as pest control, pollination and delicious, nutritious food for some of our native mammals.

Case Study 4: Ecological Health

Vegetation management of noxious and invasive plants plays a critical role in protecting biodiversity and ecological functioning by promoting and maintaining sensitive natural resources. This broad category of ecological health includes:

- Habitat enhancement and restoration projects such as planting and maintaining pollinator gardens at our parks, removing monocultures of invasive plants.
- Endangered species recovery projects, such as creating and maintaining breeding shorebird islands.
- Landscape-scale invasive plant control that maintain grassland habitats for their forage resources, native wildlife, carbon sequestration and biological diversity.

The control of noxious rangeland weeds has been ongoing since the early 1980's. This program targets invasive species such as artichoke thistle and purple star thistle uses primarily herbicide treatments, as other methods have been shown to be ineffective. In 1982, an estimated 800 acres throughout Wildcat Regional Park were infested with artichoke thistle. Artichoke thistle populations were found throughout the two counties, but this park provided the perfect environmental conditions for this garden escapee to become a landscape transformer. These plants pose significant threats to the ecological functions of rangelands by outcompeting grasses and native vegetation, diminishing available forage for livestock, and threatening endangered species. Left unmanaged, these plants have been observed to form dense monocultures of up to 20,000 plants per acre.

Starting in 1997, the Park District began to collaborate with Alameda County and Contra Costa County Departments of Agriculture to address artichoke thistle and purple star thistle infestations in the Park District. This partnership is characterized by annual, systematic treatments, resulting in significant reductions of artichoke thistle populations at parks that historically have had the worst infestations such as Wildcat Cat Canyon Regional Park and Briones Regional Park. Sustaining this level of vegetation management requires targeting previously untreated areas and ensuring that previously treated continue to be surveilled and treated when necessary. Recent land acquisitions continue to reveal persistent, hard to reach populations of these spiny, inedible thistles and necessitate continuous treatment and management. Control of noxious weeds in our native grassland is an ongoing priority for our IPM program.



Figure 11. A dense stand of artichoke thistle in Wildcat Canyon Regional Park. Artichoke thistle is one of the biggest threats to grasslands and is a State listed noxious weed. A noxious weed is a plant that has been designated by the Federal, State or county government to be threatening to public health, agriculture, recreation, wildlife, or property

Case Study 5: Safe & Accessible Recreation

The Park District works diligently to design, build, and maintain park structures, picnic areas, trails and campgrounds using IPM techniques as a foundation. Park rangers primarily use mechanical vegetation management in recreational areas such as line trimming, rough mowing, hand pulling and mulching. Staff brush poison oak back from trail edges allowing for safe recreation along our trails and in our picnic areas. Park rangers mow, weed and trap moles, gophers, and voles in District turf to maintain suitable playing fields. Park rangers and naturalists install native pollinator gardens and other habitat plantings to attract and support wildlife as well as educate and inspire.

In 2023, the IPM Department partnered with Earth Team, an environmental high school youth based in the East Bay, for the ninth consecutive year. Teens from this program have been weeding, planting trees, nectar plants for monarch butterflies and picking up trash at Oyster Bay Regional Shoreline. In 2023, Earth Team students planted 80 native plants in the monarch overwintering nectar garden. These native plants flower during the fall and winter when monarchs need nectar to survive until their migration in spring. Students weeded the areas to prepare for planting and added biochar and compost to help retain soil moisture and add nutrients. At the disc golf course, students removed non-native vegetation around the trees to help maintain the health of the trees. Hand weeding is an essential maintenance task that helps reduce competition for water and soil nutrients and keeps the course accessible and walkable for disc golf players. In addition, Earth Team members pruned over 75 trees to encourage healthy growth. These trees not only provide structure and form to the disc golf course but also provide roosting habitat and wind attenuation for monarch overwintering areas.

This work that Earth Team volunteers offered to Oyster Bay illustrates the intersection of managing and enhancing habitat and providing safe, recreational resources for our visitors. With sufficient resources and public involvement, the Park District has been able to provide excellent recreational opportunities and protect our natural resources and the essential ecosystem services they provide!

To learn more about the important work the Earth Team does, visit them at:

<https://www.earthteam.net/>



Figure 12. An Earth Team volunteer, under the guidance of an arborist, prunes young Torrey pines at Oyster Bay Regional Shoreline so that they grow strong and remain healthy. These trees provide structure and organization to the disc golf course, reduce greenhouse gas emissions, and provide critical Monarch overwintering habitat.

Appendix B. Golf Course Products

Active ingredient	Amount
Azoxystrobin/Propiconazole, lbs	390
Chlorothalonil, gal	13.21
Chlorothalonil, lbs	180
Chlorothalonil/Propiconazole/Fludioxonil,	5
Clopyralid, oz	30
Ethephon, gal	10
Flumioxazin, gal	1
Penthiopyrad, gal	1.54
Propiconazole, gal	5
Tebuconazole, gal	4
Trinexapac-Ethyl, gal	0.56

Appendix C: Farming Products

Conventional Farming Products	Amount
Buccaneer Plus, gal	31.13
Cayuse Plus, gal	4.15
Crosshair, gal	2.59
Express herbicide, lbs	10
Miller Mist Control, gal	4.01
R-11, gal	2.83
Rhomene MCPA Broadleaf, gal	60

Appendix D: Structural Pest Control Products

Active Ingredient, oz	Total
Abamectin	0.48
Boric Acid	1285
Botanical oils	653
Bromethalin	834.66
Cholecalciferol	24
Clothianidin	0.18
Deltamethrin	125.21
Fipronil	6.62
Hydramethylnon	4
Indoxacarb	21.43
Non toxic detection bait	1151.5
Traps, rodent	315
Traps, insect	819

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More information may be found at ebparks.org/ipm and ipm.ucanr.edu.