

Stewardship Department
2017 INTEGRATED PEST MANAGEMENT
REPORT



Presented to
Natural/Cultural Resources Committee
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2017 Integrated Pest Management Report

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EXECUTIVE SUMMARY

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 its activities, including the Integrated Pest Management Program where nature and people intersect. The management and operation of public land is rooted by key principles of honoring the land, its ecological systems and the wildlife; and honoring our park visitors, and our people who conduct sustainable park and landscaping operations.

The East Bay Regional Park District's (Park District) Integrated Pest Management (IPM) Program manages pests in the most effective and safest manner for our park visitors, our employees, and nature to optimize public access and recreational experiences while protecting ecological systems on public parklands and open spaces. We believe that prevention is the secret to safe and effective pest management; followed by actions based on science standards, weight of evidence principles, best practices and the Park District's environmental ethos.

The 2017 Annual Integrated Pest Management Report (2017 Report) provides a summary of all methods and techniques utilized in the course of one year of stewarding 121,000 acres of public lands with over 25 million visits. The 2017 Report describes in detail the conventional and organic methods used to control pest organisms. In addition, the 2017 Report illustrates accomplishments and highlights the Park District's leadership in the remediation of blue-green algae and its steps towards sustainable landscape practices while incorporating performance standards.

Why Do We Manage Pests?

A pest is defined as any organism that is injurious to recreational activities, public health, or functioning of ecological systems that contribute to the quality of life across 33 cities in Alameda and Contra Costa counties through our regional system of public parks and open spaces. In the Park District, the bulk of pests are nuisance weeds that limit public access to open spaces and degrade recreational enjoyment; and noxious plants that decrease biological diversity and ecological functioning. IPM contributes to ensuring biodiversity in plant communities; the conservation of habitat for wildlife and the protection of endangered or threatened species. Equally as important, IPM is a keystone tool for maintaining safe and healthy forests, which is fundamental for wildfire prevention.

Additionally, the IPM program addresses commensal organisms, or animals that threaten the health of our park visitors and employees. These pests thrive in and adjacent to human

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activity, like mice and rats; certain insects such as wasps and ticks; and organisms that facilitate the spread of vector borne diseases.

The techniques utilized in the East Bay parks to reduce pests include mechanical, cultural, biological, and chemical controls, which are used only as a last resort. The Park District prioritizes mechanical, cultural, and biological controls or a combination of these before considering the application of organic herbicides- or as an absolute last resort, the use of synthetic herbicides. The primary mechanical controls used are weeding, line trimming, flaming, and mowing. Cultural controls applied to reduce pests are mulching, grazing, and competitive planting with native plants. Biological controls utilize natural or introduced enemies of the identified pest. Chemical controls include the use of organically registered products or conventional pesticides to control plants, insects, fungi, or other pests.

IPM Program Oversight

IPM is one of many tools utilized in the management of natural resources. For example, the Stewardship Department guides and provides oversight of IPMits activities and District-wide services, which includes:

- Formulate and convey recommendations to Park District employees on the optimal IPM approach - using best available science and safe practices;
- Build organizational capacity by extending regular in-house trainings on IPM methods to ensure legal, safe, effective, and sustainable practices for pest management;
- Identify and prioritize organic chemical controls;
- Track and report on the amount of chemical products applied in the Park District including products used by Park District employees, lease-holders, and contractors;
- Plan and implement targeted projects for habitat restoration including enhancement of habitat for listed species and directing volunteer-based restoration projects.

IPM Program Implementation

At the Park District, IPM is a coordinated effort by multiple Divisions through multiple professional disciplines across departments such as Stewardship, Fire, and Operations. It is a collaborative effort based on an environmental ethos within a framework of values, including accountability and transparency. The Park District's IPM program targets the following areas:

- **Healthy and Safe Forests:** Park District wide efforts to reduce risk of catastrophic fire in the wildland and urban interface.
- **Public Health:** Remediation of pests that pose a threat to public health such as treatments for tick control, E. coli and harmful algal blooms.

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- **Ecological Functions:** Includes vegetation management to promote and maintain sensitive natural resources, including *habitat enhancement, ecological restoration projects, and environmental programs.*
- **Design and Construction:** New development projects including construction of staging areas, bridges, and regional trails.
- **Roads and Trails:** Vegetation management activities to ensure access along fire roads, paved, and narrow trails.
- **Park Maintenance:** Management of vegetation to maintain recreational use and and/or public safety, including campgrounds, high use picnic areas, parking lots, buildings, and infrastructure perimeters.
- **Hazardous trees:** Control re-sprouting of trees mechanically removed for public safety.

IPM Program Summary - 2017

19% Reduction in Usage of Conventional Pesticides: In 2017, the Park District decreased the amount of conventional herbicide used by 19% to maintain its 121,000 acres including wildland, leased areas, paved trails, and high use areas.

In addition, the Park District's habitat enhancement efforts focused on helping the recovery of several federally-listed species, the California least tern, an endangered shorebird, and two sensitive plant species, the Santa Cruz tar plant and soft-bird's beak.

It should be noted that almost one-third of the conventional pesticides used in 2017 were for the enhancement of ecological functions and protection of habitat quality including targeting two highly invasive grasses: barb goatgrass and medusahead. If left unchecked, these invasive grasses would have created a monoculture that is extremely detrimental to grassland habitat and function.

Intentional Emphasis on Mechanical and Cultural Methods:

The Park District manages 70,000 acres of public land for ecological functions through grazing (a cultural method). The Park District continues to prioritize the use of mechanical methods as its fundamental tool to control vegetation along roads and trails, to reduce fire risk while providing park maintenance.

In 2017, the Park District relied heavily on timed mowing, line trimming, flaming, mulching and grubbing to maintain the areas around gates, sign posts, tables, and fence lines. Most importantly, the Park District continues to protect park visitors and wildlife by enforcing its policy of prohibiting the use of conventional chemical application in all play structures, drinking fountains, endangered species habitat and waterways.

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It should be noted that most recreational facilities throughout the Park District are maintained entirely through mechanical means. However, substantial infrastructure and high use areas require herbicide treatment, organic or conventional, to supplement the mechanical controls such as rough mowing and line trimming, which, in 2017, amounted to 28% of all herbicide use on public lands.

7% Reduction of Glyphosate (Round-up) Application in Roads & Paved Trails:

In 2017, the Park District decreased the amount of Glyphosate (Round Up) by 7% to maintain over 150 linear miles of trails that require right-of-way clearance for access, fire safety, and intensive recreational uses. The maintenance of multi-use trails is primarily done through mechanical controls such as rough mowing, while trail edges may require chemical treatment. The safety of park visitors during the recreational use of these trails is affected by noxious weeds that puncture tires and create trip and fall hazards. Mechanical methods such as mowing are limited by the trail boundaries and have shown poor results in mitigating problem weeds as the sole method of control. In 2017, 40% of herbicide use was for right-of-way clearance, as a complement to mechanical controls.

Delivering on Our Commitments:

To move forward its mission, the East Bay Regional Park District continues to look for the most sustainable methods to control pests, protect public safety, and improve the health of our parks. To identify the most comprehensive approach to pest management, each location is individually evaluated and treatment choices are based on the level of public health and environmental risk; severity of the problem; timing for optimal control; effectiveness of available methods; available resources; and budgetary considerations. Multiple methods are often employed, and new technologies are examined regularly.

We are also committed to a culture of continuous learning and improvement of our procedures and practices. In 2017, we benefited from additional significant outcomes, including:

- *50% reduction of conventional pesticide application rate for the control of stump re-sprouting.*
- *Eliminated the use of anti-coagulants baits for rodents in structures.*
- *Testing new mechanical methods through a pilot program for rodent control.*

The Park District continues to collaborate with other land managers, government agencies and practitioners to identify new alternatives to further reduce conventional pesticide application.

Community Partnerships: In 2017, over 34,000 hours of sweat equity were invested by community volunteers Park District-wide to map the location and engage in the removal of invasive plants like French broom, yellow star thistle, and pampas grass.

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IPM Program Highlights & Accomplishments

Leader in Public Health Protection: This year, the Park District's IPM Program focused on the remediation of blue-green algae (cyanobacteria), a natural organism which can release toxins harmful to our park visitors and their canine companions. Due to increased nutrients and warmer temperatures, these blooms are becoming more frequent; posing a public health threat and limiting recreational use during toxin producing blooms. In 2017, the Park District used a combination of techniques including mechanical removal of algae, adding inert coagulants to bind the nutrients, and organic natural materials to reduce the surface blooms. The body of work accomplished in this important 2017 endeavor will bear fruit in 2018 with fewer beach closures due to blue-green algae blooms during the swim season.

Implementation of Performance Standards: 2017 marks a significant change in practice for the application of conventional herbicides in public parklands managed by the Park District through the implementation of performance standards and building capacity of its Park Rangers by extending a comprehensive training program on sustainable and healthy vegetation management.

The new Performance Standards govern all applications of chemical products on East Bay parks, which includes a posting requirement of 24-hours before and after for use of chemical controls, organic or conventional; a maximum vegetation management area of 12 inches has been designated for spraying on posts, fences, and gates; and, a 12-24 inch perimeter has been designated for benches and other park infrastructure. These standards will help our employees to continue to implement best practices for vegetation management while minimizing the application of herbicides.

Future Trends in IPM Program

Increased Use of Organics: As the Park District finds more opportunities to utilize and prioritize the use of organic controls, the volume of organic pesticides used will increase. Organic products require a significantly higher application rate (both in volume and frequency) than conventional herbicide products. The long-term strategy for high use areas like picnic tables and campgrounds requires vegetation to be kept below six inches and mechanical methods supplemented with organic products to ensure full use of these high-use recreational areas.

Increased Focus on Wildfire Prevention: The use of Triclopyr (Garlon) is expected to increase in 2018 due to a significant increase in fuel vegetation management led collaboratively by the Fire Department and the Stewardship Department. Triclopyr, a conventional systemic herbicide, is applied directly to woody stumps to prevent

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resprouting. It is used on species such as eucalyptus trees and poison oak which pose a high risk of fire by adding to the volume of ladder fuels.

Pilot Effort - Setting IPM Priorities for Each Park: The Park District will start setting priorities for habitat enhancement and pest management in each of our parks. This year, in the first step toward that goal, Lake Chabot initiated the development of a pilot plan for vegetation management. The pilot will identify a five-year strategy for enhancing the native grassland habitat and develop a coordinated approach for the on-going maintenance of park facilities for recreational use. Use of mechanical methods and organic products will be emphasized. Equipment and resources needed to achieve the performance goals in the strategy will be identified.

Design & Cultural Shifts: The Park District will be incorporating Bay Friendly landscaping techniques and practices into project designs. The goal of this approach will be to improve climate resiliency by creating landscapes that require fewer resources (such as water), less maintenance, and provide expanded habitat for native plants and pollinators.

Ongoing Evaluation and Transparency: The Park District will continue to evaluate its pest control methods and annually report on pesticide use through the Integrated Pest Management Annual Report. This report will be made available on the Park District website. Additionally, the Report including trends and findings will be presented at a public meeting of the Board of Director's Natural and Cultural Resources Committee.

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Figure 1. A great blue heron performs mechanical control of gophers at the Brazil building lawn in Tilden Regional Park

Integrated Pest Control by Park or Program

The bulk of the Park District's pest control efforts focus on an adaptive management approach to vegetation management. Mechanical and Cultural methods are difficult to quantify but comprise the majority of Park District vegetation management activities.

Mechanical methods used in the Park District include: propane torching of seedlings, mechanical brush removal (pulling and grubbing), mechanical mowing, line trimmers, scythes, and weed whips. Most fire roads and trails are rough mowed or line trimmed and much of the Park District's fencing is line trimmed, as are most if not all group camps and other recreational areas. Often vegetative growth is sufficient to warrant two or more mowings.

Cultural methods are frequently used on a park- and landscape-level throughout the Park District. Annual resource burns are performed at Point Pinole to enhance the coastal prairie. 70,000 acres of park lands are grazed yearly. On a park scale, rangers frequently employ mulching and sheet mulching to reduce weed pressure, maintain soil moisture,

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support native plantings, etc. Many parks also include competitive planting of native species in their maintenance and weed programs.

Chemical methods are used around critical infrastructure (Examples: pumps stations, overflow preventers, and fencing). Chemicals are used when it is difficult or excessive to treat with other methods. Figure 2 illustrates a common strategy of trailside vegetation management: integrating rough mowing and line trimming with herbicide application around more difficult to maintain structures.

Herbicide treatment of “difficult to mow” areas allows Park District staff to perform more frequent trail side mowing while protecting wood and metal fencing from incidental trimming that reduces its life and requires more maintenance. Warmer and drier parks often require wider vegetative buffers from park infrastructure due to higher incidence of wildfire ignitions and wildlife conflicts.

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Figure 2. An example of typical rough mowing that Park District staff do adjacent to trails, parking lots, etc.

The following narrative includes descriptions of mechanical, cultural, and chemical methods as reported by Park District staff in 20 parks. Products and amounts are listed by park in Table 7.

Anthony Chabot

- Staff continued to use gas cartridges and traps to control gophers in campground turf.
- Several hazardous eucalyptus trees were removed from the campgrounds. 24 stumps were treated chemically.
- Staff assisted the fire department with the chemical treatment of eucalyptus resprouts in 26 acres surrounding campgrounds.
- In 2017, staff was unable to follow up euphorbia treatment begun in 2015 due to staffing constraints.
- Park staff contracted with Alameda County Department of Agriculture to continue to control the spread of a noxious plant, Stinkwort (*Dittrichia graveolens*) along roads and the campground chemically. Park staff followed up with hand pulling.

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- Staff line trimmed and rough mowed approximately 90 acres along trails, roads, around gates, sign posts, tables, barbeques and fence lines throughout the park and campgrounds at least twice to control nuisance vegetation, provide fire breaks, keep ticks away from trail users, etc.
- The USDA-ARS released biocontrols for cape ivy in Leona Canyon. Results are inconclusive because the release cage was vandalized. The USDA has determined that at this time, this site is not suitable for release.
- Rangers report that after multiple mechanical and cultural methods tested, hand pulling is the most effective but not very efficient in poison hemlock control.

Botanical Garden

- The Botanical Garden staff control nuisance and competitive weeds almost exclusively through hand pulling and mulching over 10 acres.
- Staff gardeners used very small amounts of herbicide to control woody perennial weeds and tree sprouts such as Himalayan black berry and poison oak. Several stump-sprouting hazardous trees were removed and treated with herbicide.
- High density plantings require many hours of gopher trapping over the year.

Contra Loma

- Staff applied pre- and post-emergent herbicides for park maintenance and right of way around buildings, along trails and in picnic areas.
- Rangers rough mowed approximately 20 acres several times this season.
- Park staff box scraped to augment weed control in 2 acres of overflow, gravel parking lots.
- Park staff line trimmed around gates, sign posts, tables and fence lines throughout the park for a total of 5 acres, several times for the growing season.

Cull Canyon

- Staff line trimmed around gates, sign posts, tables and fence lines throughout the park and rough mowed trails and other recreational areas.
- Staff use wood chips yearly to mulch around park elements to reduce the need for chemical and mechanical controls. Park Staff used chemical control to treat nuisance weeds around picnic table posts, around curb stops in overflow parking lots, around buildings, fences, etc.
- Poison oak was controlled through a combination of chemical and mechanical methods along single track trails.
- Rodents were controlled by trapping in over one acre of turf.

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Diablo Foothills

- Mapped and chemically treated all populations of artichoke thistle.
- Line trimmed and mowed a total of 8.1 acres. Treated areas include fire trails, gates, sign posts, tables and fence lines throughout the park.
- Rangers mulched in and around a quarter acre of landscaping and grubbed and hand pulled weeds.
- Spot sprayed difficult and noxious weeds in recreational area, trail sides and continued its treatment of yellow star thistle in a number of pocket meadows.
- Volunteer projects for total of 102 volunteer hours grubbing noxious weeds in recreational and wildland areas.
- Rangers trapped for gophers in turf areas and trapped for mice in office/shop areas.
- Rangers used line trimmers and timed mowing techniques to reduce the cover of medusa head grasses, yellow star thistle, bull thistle and horehound in its native grasslands.
- Employed hotwire fence area for intensive cattle grazing targeting medusa head grasses; treating roughly 4.5 acres.

East Contra Costa County Trails

- Rangers mow a minimum of 7' along all trails for a total of 32 acres; a 1' edge along trails is sprayed for a total of 8 acres.
- Rangers line trim around posts, buildings, parking lots and fence lines.

Golf Courses

The golf courses are run by concessionaires and are required to report their chemical pesticide uses. They regularly utilize integrated practices; however, they operate independently from the IPM department.

- *Redwood Canyon Golf Course*

Redwood Canyon Golf Course (RCGC) utilized very low amounts of pesticide for course management. RCGC reported chemical control for the months of February, April and May. Relatively low volumes of fungicides and herbicides and no rodenticides were reported. RCGC treated its irrigation pond/driving range for aquatic vegetation in order to facilitate the retrieval of balls.

- *Tilden Park Golf Course (TGC)*

TGC only treats its greens with fungicide and has instituted several no spray zones. TGC exclusively trapped gophers and moles rather than utilizing rodenticides. TGC staff also work diligently to control invasive species like French broom; attacking new areas each year.

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Hayward Shoreline

- Line trimmed approximately 0.12 acres around gates, sign posts, tables and fence lines throughout the park.
- Rough mowed approximately 27 acres along levee trails and access roadways. Less than one-half acre of the bay trail required follow up spot spray with herbicide for nuisance weeds.
- IPM and Wildlife Departments continued their annual chemical treatment of the California Least Tern Island to control nuisance weeds to maintain breeding habitat for this endangered species.
- IPM and the Invasive Spartina Project continued to treat this invasive wetland grass throughout Park District properties.

Martin Luther King, Jr. Shoreline/Oyster Bay

- IPM and the Invasive Spartina Project continue to treat this invasive wetland grass throughout Park District properties.
- Mowed and hand pulled stinkwort along trails.
- Mowed and line trimmed five acres up to six times a year along trails, around gates, sign posts, tables, benches and fence lines throughout the park. Additionally, less than one acre of this area is subject to spot spray for follow up nuisance weed control up to two times a year.
- Continued treatment of noxious weeds like pampas grass, French broom, and castor bean at Oyster Bay Regional Park in collaboration with the Design and Construction department for the development of new recreational opportunities. IPM led volunteers in competitive planting for monarch butterfly habitat enhancement and weed suppression. Additionally, 28 acres of the park were drill seeded with competitive native perennial grasses.
- Rangers maintained 0.18 acres of landscaping areas with hand pulling, grubbing, and line trimming.
- Martin Luther King Jr. Shoreline hosts a robust volunteer program led by Save the Bay and the Golden Gate Audubon Society that includes transplanting natives in the nursery, pulling invasive species, mulching, competitive planting, and removing trash. More detailed information on this effort is in the Volunteer Programs annual report.
- Alameda County Department of Agriculture controlled for ground squirrels with a rodenticide (i.e. diphacinone-treated grain bait) around critical shoreline and landfill maintenance infrastructure at Oyster Bay.
- IPM & Design and Construction staff collaborated on the Oyster Bay recreational development to provide weed control (including masticating acres of pampas grass and mustard) combined with using local volunteers to plant native trees and shrubs. This early effort of weed control and planting of native vegetation helps reduce future needs for pest management and makes area more climate resilient.

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- Employing cultural methods, IPM staff utilized drill seeding to introduce native perennial grasses in new recreational developments (Figure 3).



Figure 3. Competitive planting of native grasses at Oyster Bay.

Mission Peak Regional Preserve

- Applied post-emergent chemicals on 2.0 acres to control undesirable vegetation along trails, fence lines, outbuildings, picnic tables, and campground (e.g., Himalayan blackberry, horehound, stinkwort, milk thistle, Italian thistle).
- Applied pre-emergent chemicals on 0.5 acres to control undesirable vegetation along trails, fence lines, picnic tables, and campground.
- Line trimmed approximately 2.0 acres of trail as well as around picnic tables, benches, cattle guard, and sign posts.
- Rough mowed approximately 4.5 acres campground and Park entrance ways plus 6.0 linear miles of trail.

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- Used a scythe to cut down invasive weeds as they bolted, but before flowering to reduce seed propagation – 50 individual applications were applied (e.g., poison hemlock, milk thistle, bull thistle).
- Pulled/grubbed invasive weeds before flowering to reduce seed spread (e.g., stinkwort, French broom, horehound, artichoke thistle, purple star thistle, Himalayan blackberry, black mustard, and shiny cocklebur). Volunteers (4 volunteers; total 12 hours) assisted staff with pulling/cutting/grubbing blackberry. Other volunteers (4 volunteers; total 20 hours) assisted staff with pulling/grubbing French broom and horehound.
- Partnered with USDA-ARS, released biocontrol for Cape Ivy along Mill Creek Road. First release unsuccessful. A second release was completed.
- Led a volunteer effort to (17 volunteers; 44 hours) spread woodchip mulch to reduce need for chemical and mechanical control at staging area (0.1 acre).

Point Pinole

- Rough mowed and line trimmed 55 acres of trail sides, fence lines, posts, etc. up to 3 to 6 times a year (Figure 2).
- Additionally, picnic areas, some fence lines were treated with pre-emergent herbicide.
- Rodent control in turf areas, controlled with traps and gas cartridges.
- Hosted volunteer events and devoted time to Coastal Prairie enhancement; which included control of several noxious weeds including stinkwort, fennel, teasel, and broom. Staff utilized an integrated approach of grubbing and timed mowing, followed by spot spraying.
- Expansion of eucalyptus plantations are kept in check by staff and volunteers who pull thousands of seedlings out every year.

Redwood

- Rough mowed and line trimmed 14 acres of group camp sites and picnic areas 3 to 6 times a year.
- Mowed, line trimmed and brushed 5.6 acres of fire trails and single-track trails up to two times a year
- Hand scraped vegetation around 65 picnic tables twice a year.
- Hosted 24 volunteer invasive weed pull parties. Over the last 15 years, this program has helped maintain 1-2 acre areas per year, treating primarily for French broom.
- Hand pulled and grubbed one-third of an acre of landscaping.
- Line-trimmed approximately 1.6 acres of fence lines 2 times a year.

Roberts

- Park rangers mow and line trim 1 acre of fire road and trail sides.

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- Picnic areas are line trimmed where necessary. Fence lines, posts and benches are maintained by line trimming.
- Staff spot-sprayed poison oak throughout the archery range.
- 4 acres of parking lot are line trimmed around.

Sibley/Huckleberry/Claremont/McCosker

- Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Rangers maintained right of way along roads and trails and group campsites by rough mowing and line trimming, treating over 57 acres for nuisance weeds, providing fire breaks and keeping ticks off of trail edges.
- Contra Costa County Department of Agriculture continued spot treatment of noxious rangeland weeds that include artichoke and purple star thistles with herbicide.
- Rangers supported a robust volunteer program; providing invasive species control at Huckleberry Botanical Preserve.

Sunol Regional Wilderness

- Park staff used post-emergent chemicals to control undesirable vegetation along trails, road ways, fence lines, outbuildings, picnic tables, and campground.
- Park staff line trimmed approximately 3.0 acres of trail as well as around picnic tables, barbecues, benches, and sign posts.
- Park staff rough mowed approximately 4.0 acres of picnic areas, campground, and Park entrance plus 1.5 linear miles of main looped roadway on 6 separate occasions and 5.0 linear miles of trail.
- Park staff pulled/grubbed invasive weeds before flowering to reduce seed spread (e.g., tarweed, thistle). Volunteers working with Naturalists to pull orchard grass from areas near Visitor Center.
- Park staff spread woodchip mulch to reduce need for chemical and mechanical control near shop area (0.1 acre).

Tilden

- Staff line trimmed around gates, sign posts, tables and fence lines throughout the park.
- Rangers maintained all right of way along roads and trails and group campsites by rough mowing and line trimming and hand pruning.
- Staff continued is treatment of oblong spurge by hand pulling seedlings and spot treating adults with herbicide.
- Rangers continued removal of hazardous eucalyptus by mechanical removal and herbicide stump treatment.
- Staff experimented with stinkwort treatment using the organic burn down herbicide and selective herbicide spot treatment.

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- Tilden rangers utilized a variety of mechanical methods including hand pulling, grubbing, flaming, hoeing, line trimming, weed wrenches, etc. in landscaping areas as well as noxious weeds in wildlands.
- Rangers assisted monthly volunteers in Tilden targeting broom, cape ivy, and other harmful invasive plants.

Wildcat Canyon

- Contra Costa County Department of Agriculture continued the spot treatment of noxious rangeland weeds including control of artichoke and purple star thistles with herbicide.
- IPM staff and its contractors continued backcountry treatment of dense infestations of artichoke thistle using spot herbicide treatment. Ongoing efforts by park staff and county biologists have reduced the original infestation of 452 acres in 1989 to 13 acres in 2014, a 97% reduction.
- Staff sheet mulched, scraped and line trimmed in picnic areas over approximately one-quarter acre.
- Rangers treated several acres by hand pulling and grub throughout the park every year. Species targeted included French broom, artichoke seedlings, cotoneaster, eucalyptus and Monterey pine seedlings, young teasel, mustard, poison hemlock and various thistle species.
- Staff rough mowed 6 acres, twice annually. Additionally, rangers maintained right of way along roads and trails and other recreational areas by rough mowing and line trimming approximately 37 acres.
- Park rangers line trimmed along fence lines, buildings benches, etc. for approximately one-half acre.
- Staff hand weeded approximately 0.14 acres of landscaping.
- Staff controlled rodents in turf by trapping.

Vargas Plateau Regional Preserve

- Park staff used post-emergent chemicals on 0.8 linear miles of trail.
- Park staff line trimmed approximately 0.5 acres of trail and staging area on 3 separate occasions.
- Park staff rough mowed approximately 1.0 acres at staging area and Park entrances on 3 separate occasions plus 6.0 linear miles of public trail and 2 linear miles of landbank trail.
- Park staff used a scythe to cut down invasive weeds as they bolted, but before flowering to reduce seed propagation – 10 individual applications were applied (e.g., poison hemlock, bull thistle).
- Park staff spread woodchip mulch to reduce the need for chemical and mechanical control at staging area (0.1 acre).

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PARK DISTRICT PESTICIDE USE

Which Pesticides Does the Park District Use?

General Park Use List

All pesticide use in the Park District is tracked. For management purposes, comprehensive analysis is performed on the products included in the General Park Use list- this list includes the most common products utilized in park operations. These products are chosen and approved for their efficacy and safety for the applicator, environment and the public. Adjuvants, like surfactants and penetrants, are recorded but not included in this analysis.

Glyphosate products (i.e. Round-Up, a non-selective, broad spectrum herbicide) constitute the bulk of herbicide use in the Park District for this reporting year. Total use of glyphosate products for the Park District in 2017 decreased by 7% from the previous year. This decrease is due in part to the lack of large Capital projects needing vegetation management. In addition, the Park District is taking steps to reduce glyphosate use by encouraging the introduction organic herbicide products (i.e. Suppress EC, an Organic Materials Review Institute, OMRI, registered herbicide). This requires that staff apply the organic Suppress when weeds are under 6" high.

Capric Acids (i.e. Suppress EC, a contact, post-emergent, non-selective herbicide that is OMRI registered). Use of this burn down acid product for weed control was introduced to the Park District in 2015. Use of Suppress EC increased substantially in 2017 comprising 12% of total general park use herbicide.

Oryzalin (e.g. Surflan A.S. a pre-emergent, non-selective herbicide), was phased out by mid-2017 for the more effective and safer product SPECTICLE FLO. This product will no longer be used on Park District properties.

Indaziflam (i.e. SPECTICLE FLO, pre-emergent, non-selective herbicide) has replaced Surflan A.S. Its use increased in 2017 as reported in Table 7 and Figure 5. Staff report good results with this bare ground product in areas that are not treatable with mechanical and cultural methods.

Triclopyr (i.e. Garlon, a post-emergent, selective herbicide) experienced a decrease of 4% in 2017 from the previous year. It comprises the second largest volume of general park use herbicide with 19% for this reporting year. It is used primarily for treating woody vegetation like poison oak, eucalyptus, tree of heaven, etc. to prevent resprouting after cutting.

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Diphacinone-treated bait, a rodenticide, increased in use by only 5% from the previous year, despite reasonable production in annual grass and forbs, their primary food stock. (Figure 6). Diphacinone is most commonly used in high frequency parks that contain many acres of turf that provides year-round green vegetation, the preferred food source of ground squirrels. This creates a robust pest population which leads to action thresholds for these parks each year. The burrowing caused by excessive populations undermines Park District facilities and degrades investments including paved trails, foundations, bridge abutments, recreational structures, etc.

Why Does the Park District Use Pesticides?

IPM staff collects data on why pesticides are used and are categorized by objective of use. They are defined as follows:

- **Healthy and Safe Forests:** Park District wide efforts to reduce risk of catastrophic fire in the wildland and urban interface.
- **Public Health:** Remediation of pests that pose a threat to public health such as treatments for tick control, E. coli and harmful algal blooms.
- **Ecological Functions:** Includes vegetation management to promote and maintain sensitive natural resources, including *habitat enhancement*, *ecological restoration projects*, and *environmental programs*.
- **Design and Construction:** New development projects including construction of staging areas, bridges, and regional trails.
- **Roads and Trails:** Vegetation management activities to ensure access along fire roads, paved, and narrow trails.
- **Park Maintenance:** Management of vegetation to maintain recreational use and and/or public safety, including campgrounds, high use picnic areas, parking lots, buildings, and infrastructure perimeters.
- **Hazardous trees:** Control re-sprouting of trees mechanically removed for public safety.

Pesticide Use Analysis

General Park Use Pesticides

Products from the General Park Use list comprise the bulk (89% in 2017) of herbicide products used on Park District lands and are described in the general park use herbicide list in Appendix A. Rodenticides are analyzed in Figure 6 following herbicide trends. Table 1 reports totals of each General Park Use product in 2016 and 2017. Standard deviations are reported to indicate the degree of variability of use.

The remaining pesticide use (primarily herbicide) for 2017 was for public health response and ecological functions (noxious weed control, endangered species recovery, and

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mitigation and restoration projects). The amount of these special use products vary according to annual conditions and circumstances that include blue green algae blooms, landscape scale restoration projects. Special use products are reported in Table 2.

New OMRI registered burn down herbicide, Suppress, was utilized more by park staff. A total of 24 gallons were applied. Crews report that burn down appears moderately effective at large doses with thorough coverage on older plants. On recently emerged weeds, Suppress was very effective. Conventional herbicide requires less product and less application coverage to provide effective control. In order to achieve comparable results, a higher rate and more frequent use is required of OMRI products. As use of OMRI products increase, overall volume will increase in annual reports.

The Park District is also intent on tracking the mechanical and cultural methods used by Park staff. A tracking sheet was developed and Park staff are encouraged to enter their activities

	Diphacinone Grain Bait (lbs.)	Triclopyr, i.e. Garlon (gal)	Glyphosate, i.e. Round UP (gal)	Oryzalin, i.e. Surflan (gal)	Indaziflam, i.e. SPECTICLE FLO (gal)	Organic, Capric acid, i.e. SUPPRESS (gal)
2000-17 Average	1030	26	85	45		
Standard Deviation	539	15	21	10		
2016	417	39	122	54	3	1
2017	440	37.5	113	20	5.8	24.1

Table 1. General park use pesticide totals for 2016-17 with long-term means and standard deviations (2000-2017).

Reporting Statistics

In 2017, 29 out of 65 parks used chemical (both organic and conventional pesticide) treatments that require the submission of a Pesticide Use Reports (PURs). Approximately 137 PURs were submitted by operations staff and 16 PURs were submitted by IPM staff for ecological function enhancement projects. Several programs in the Park District contract out pest control services and, contingent to their contracts, must submit their PUR to IPM for annual reporting. In 2017, the fuels program submitted a total of 3 PURs for contractor applied herbicide in Wildcat and Sibley. Park and IPM staff provided chemical control in Anthony Chabot and Tilden parks respectively for the Fuels program. Environmental Programs submitted 5 PURs for resource projects at Point Pinole and Pleasanton Ridge. Contractors hired by operations submitted 8 PURs for projects that include Roads and Trails (right of way) (2), park maintenance (5) and habitat enhancement (5).

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Pesticide	Active Ingredient	Applicator	Type	Signal Word	Pest	Parks	Purpose	2011	2012	2013	2014	2015	2016	2017	
Aluminum phosphide		Counties	Rodenticide	Danger	Gophers	Quarry Lakes	Safety	7 lbs	17 lbs	11 lbs	9.66 lbs	6.39 lbs	4.6 lbs	Phased Out	
Dimension 40WP	dithiopyr	Stewardship	Herbicide	Caution	Mayweed	Least Tern Island	Endangered species recovery		15 oz	24 oz	15 oz	10 oz	13 oz	.22 gal	
Milestone	aminopyralid	Stewardship Counties	Herbicide	Caution	YST, AT, PST, Teasel, thistles	District Wide	Habitat Enhancement	2.4 gal	2.8 gal	3.4 gal	15.06 gal	26.6 gal	2.5 gal	2.5 gal	
Transline	clopyralid	Staff contractors	Herbicide	Caution	YST	Lake Chabot, Sunol, Del Valle	Habitat Enhancement	1.8 gal	0.4 gal	1.4 gal	47 oz	56 oz	50 oz	.5 gal	
Polaris	Imazapyr	Staff contractors	Herbicide	Caution	Non-native spartina	MLK, Hayward Shoreline, Point Pinole, ESSP	Habitat Enhancement	35 gal	44 gal	32 gal	24 gal	21.3 gal	21.5 gal	20.8 gal	
Vanquish/Clarity	dicamba	Counties	Herbicide	Caution	AT, PST	District Wide	Habitat Enhancement	7.1 gal	6.36 gal	10.03 ga	8.19 gal	7.3 gal	1.33 oz	Phased Out	
Garlon 4 Ultra	triclopyr	Counties	Herbicide	Caution	AT, PST	District Wide	Habitat Enhancement						6.2 gal	11.5 gal	
Garlon 3A & 4 Ultra	triclopyr	Stewardship Contractors	Herbicide	Caution/Warning	Dittrichia	Lake Chabot	Habitat Enhancement				5.2 gal	7.4 gal	15.4 gal		
Polaris	Imazapyr	Staff & IPM	Herbicide	Caution	Pampas grass, dittrichia	MLK, Lake Chabot	Habitat Enhancement				1.2 gal	10.9 gal	25 oz		
Telar	Chlorsulfuron	IPM & Contractors	Herbicide	Caution	Pernial Pepperweed	Point Pinole	Species Recovery							4.5 oz	
Pak 27, Phycomycin, Green Clean	Sodium Carbonate Peroxyhydrate	IPM & Contractors	Algaecide	Danger	E. coli, Blue green algae	Temescal, Shadow Cliffs, Lake Chabot	Public Safety				3750 lbs.	50 lbs.	6230 lbs	150 lbs & 50 gal	
Glyphosate		IPM & Contractors	Herbicide	Caution	Medusahead, barb goatgrass, LT Island, dittrichia	Round Valley, Morgan Territory, Hayward Shoreline	Endangered species, habitat enhancement						3.1 gal	8.1 gal	8.84 gal

Table 2. Pesticide use for special needs, habitat enhancement and resource projects 2009-17.

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Precipitation

The Briones RAWS (BNE) weather station (37.934, -122.118; elevation 1450') experienced a substantial down town during which data was not recorded. As a result, Oakland South (OSO) weather station (37.881, -122.1436; elevation 1000 ft.) was chosen as it closely approximates the average between the wettest and driest parts of the Park District. Precipitation totals for water year 2016/17 (September 2015-August 2016) at OSO was 38.98 inches. All regions of the Park District received substantial rains in this record year. This report presents *water year* data in long term pesticide analysis as this more accurately reflects one of the primary controls on vegetative growth. The degree and extent of this primary production determines the amount and type of vegetation management that is required in recreational areas.

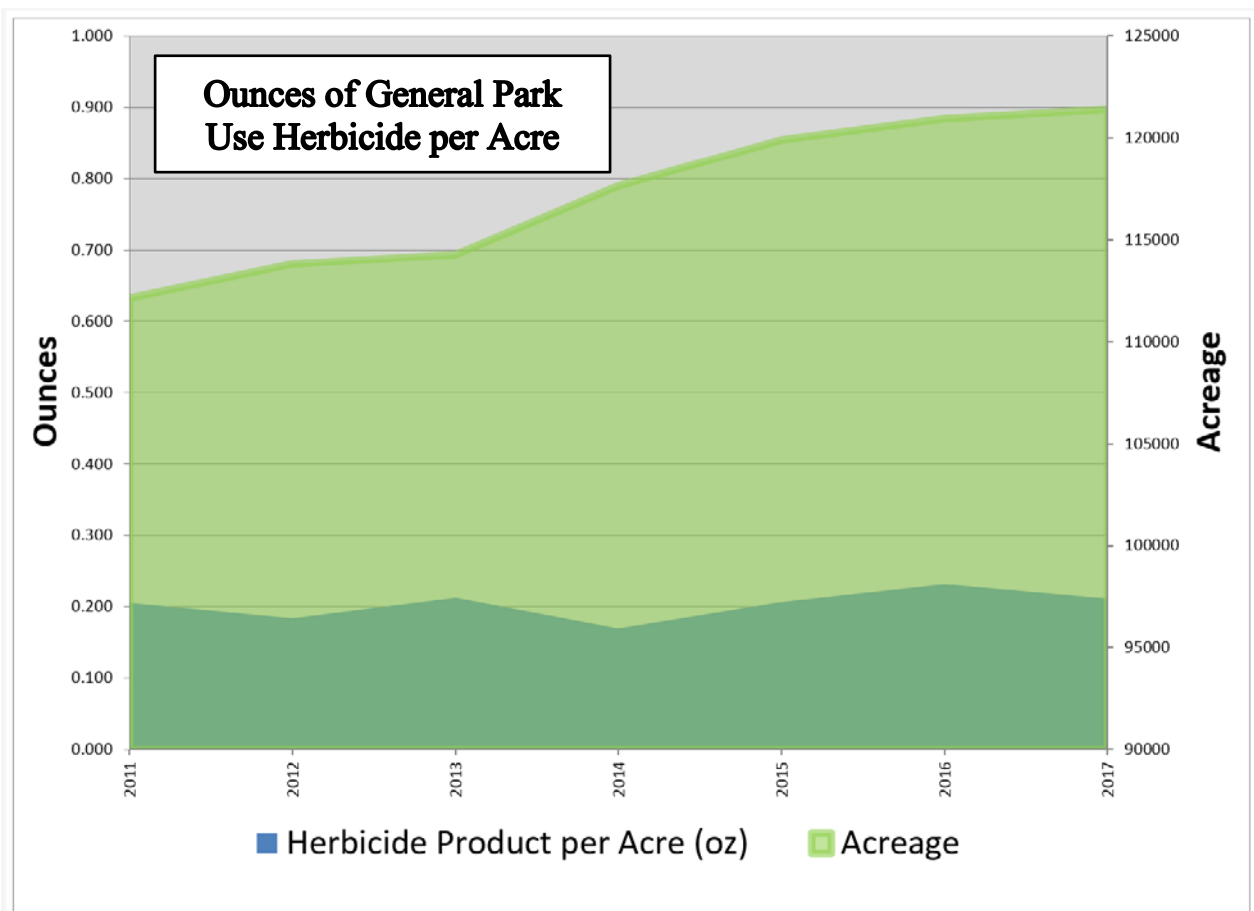


Figure 4. Park District acreage increase from 2000 through 2017 with respect to General Park Use herbicide usage. Charted in blue is the amount of product in ounces of product per acre plotted with the Park Districts growth in acreage in green.

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Acreage

The Park District has continued to grow significantly. In 2017, EBRPD increased by 466 acres to its current size of 121,398 acres. From 2000 to present, the Park District has increased an average of 1,752 acres annually with the largest increases in the years 2009-2011. Despite this growth, per acre usage of general park use herbicides has remained between 0.1 and 0.3 ounces per acre. 2017 shows a decrease in use per acre from 2016. Staff regularly integrate control methods, leaning heavily on mechanical methods such as rough mowing, line trimming and scraping. Figure 4 plots growth in acreage with herbicide product per acre and illustrates stable herbicide use throughout this exponential growth.

Pest management needs will vary with the magnitude of the pest problem. In particular, vegetation and control of noxious and invasive plants will vary with environmental factors including precipitation and temperature. Figure 5 shows the general use pesticides and how the use has varied with precipitation.

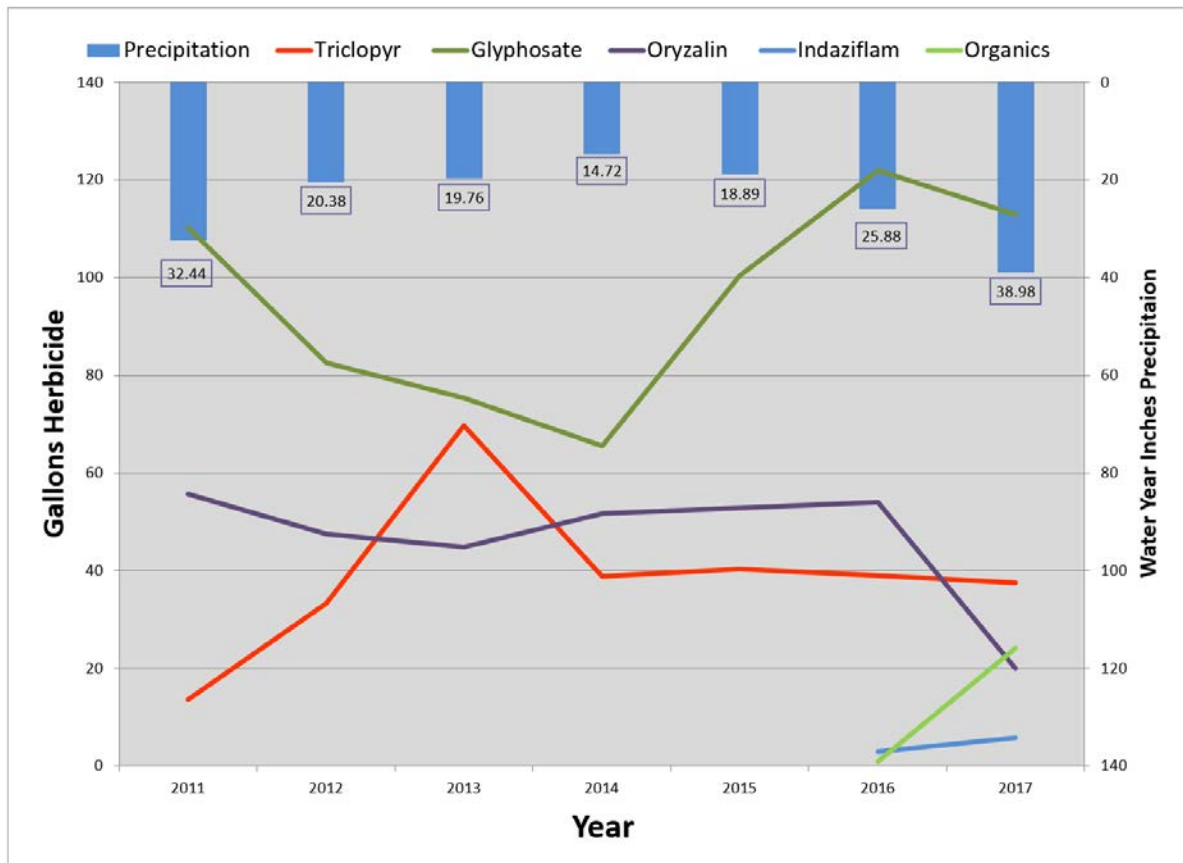


Figure 5. General park use herbicide trends and their long term averages from 2011-2017. Also, graphed is the precipitation totals for the water year, i.e., September of the previous year through August of the reporting year.

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In 2017, the Park District introduced use of a GopherX machine which uses carbon monoxide. Rodenticide use was up slightly from 2016. Park staff reported that the GopherX machine was effective at rodent control in irrigated turf. This machine will not completely replace rodenticides due to possible non-target asphyxiation of listed species that may use burrows in critical habitat. Gopher X complements our trapping programs, providing a more efficient method of control in many turf areas. Rodenticide use (Diphacinone) for the control of ground squirrels in 2017 was up slightly from 2016 but down substantially from previous years (Figure 6). Park staff continue to utilize habitat modification until ground squirrel levels reach damage thresholds that require rodenticide treatment.

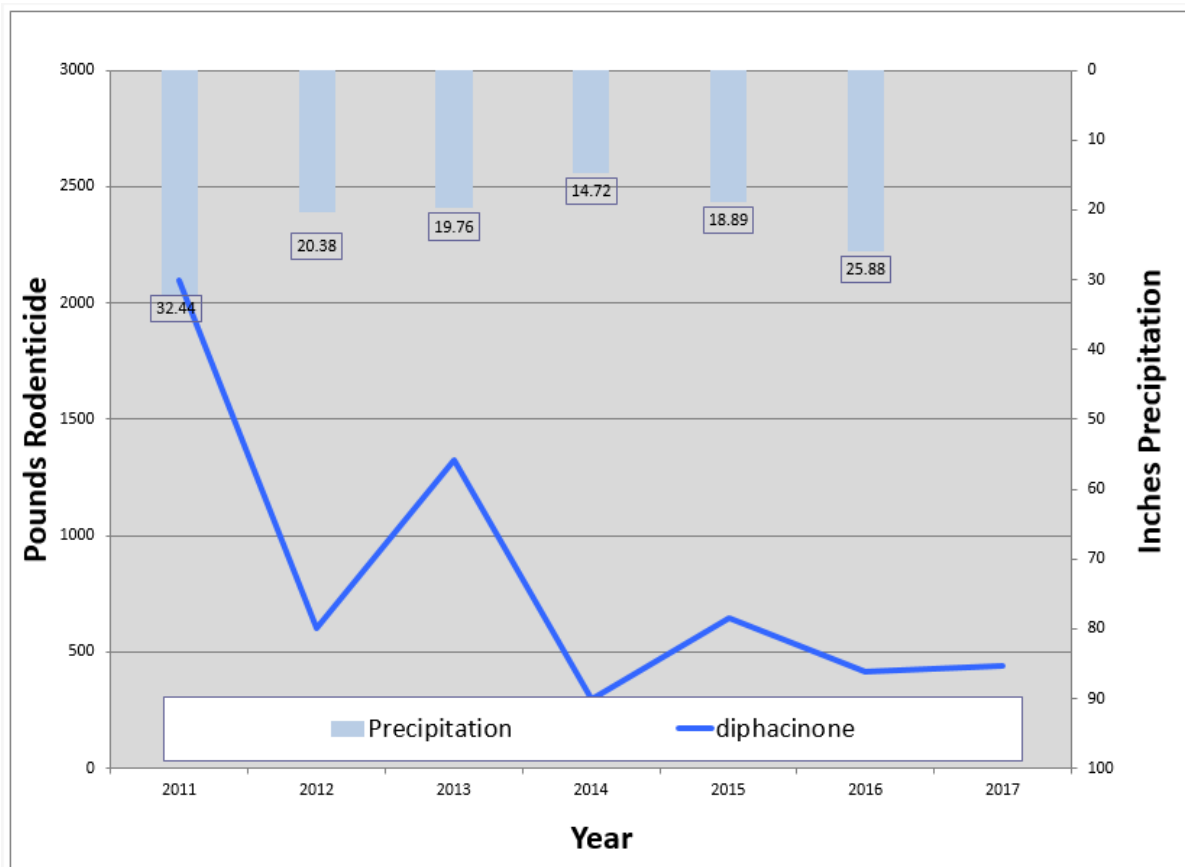


Figure 6. Rodenticide use trends and its long-term average from 2011-2017.

Analysis of all herbicide use by objective for all park properties (Figure 7 and Figure 7a) reveals that roads and trails (right of way) continues to require the bulk of herbicide use. Roads and Paved Trails applications, comprising 38% of all herbicide product used, decreased from 2016 to 2017. Park maintenance applications constitute the next largest

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category of herbicide use in all park properties. Conventional and organics used for park maintenance and hazardous trees in 2017 totaled 26% of all herbicide use.

Fire Safety activities used less Garlon products (active ingredient triclopyr) in 2017 than 2016 for a 7 percent of total herbicide product used. However, over recent years triclopyr use has increased slightly concurrent with an increase in fuels management work. Fuels reduction mitigates future catastrophic wildfires that may result from the warm, drying Diablo winds such as those that drove the devastating 1991 Oakland Hills Firestorm. It is anticipated that with the ongoing drought and pending federal grant funding, this herbicide use will remain at this level for the next few years. Reduced application rates of Garlon have been reported to be effective on stump cut treatment. As a result, IPM implemented a 50% reduction in application rate

Ecological Functions uses include habitat enhancement projects performed by Operations staff, resource projects managed by the Stewardship department and restoration projects managed by Environmental Programs. Conventional and organic herbicide use for this category of work comprised 29% of total use. Herbicide use for resource projects District-wide decreased slightly in 2017 while Habitat Enhancement use increased slightly. Park operations and other Park District departments often use herbicides for habitat enhancement and resource projects. Triclopyr, a selective broad leaf herbicide, is a key component in restoration projects as it allows the control of noxious thistles, mustards and others while maintaining grassland cover, forage and habitat.

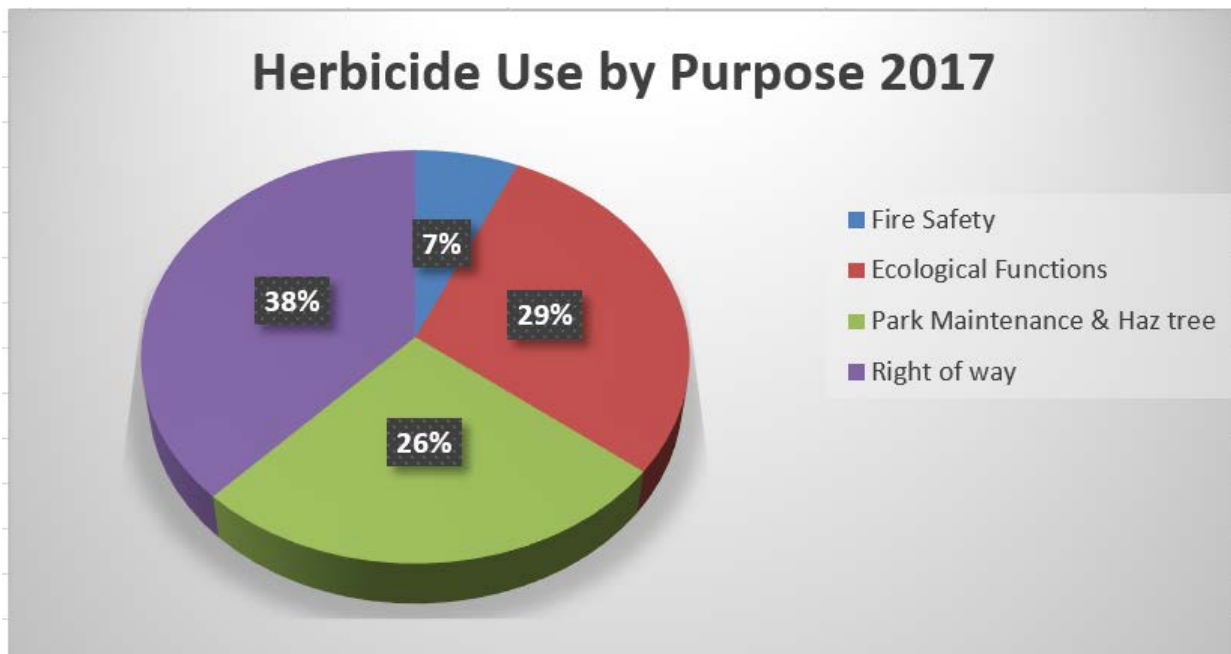


Figure 7. Herbicide Use of Objective.

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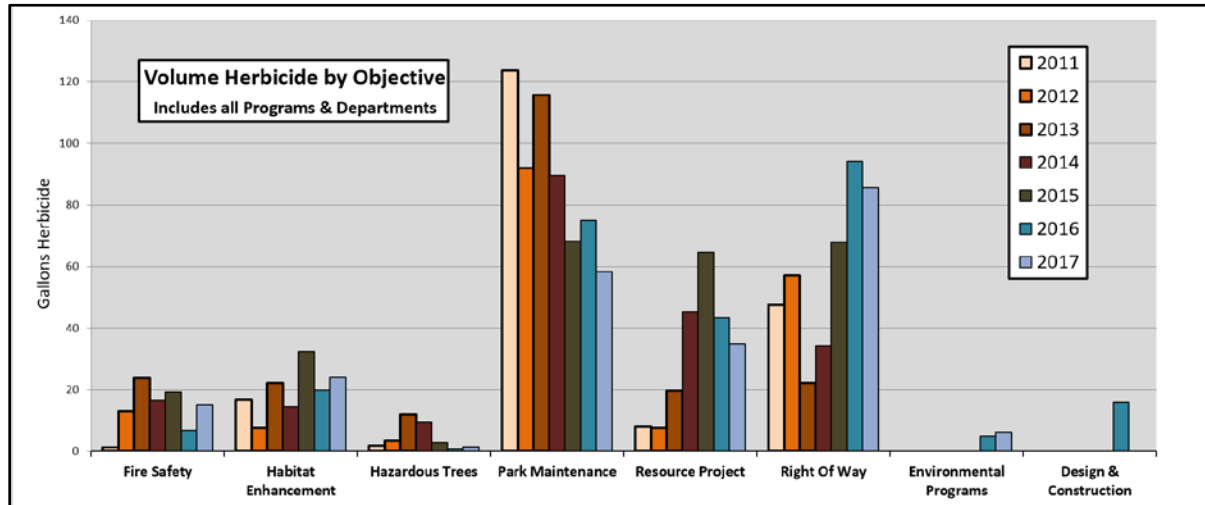


Figure 7a. Total herbicide product used by purpose from 2011-2017. This chart does not include structural, golf course or organic farming data, each of which follows separately.

Where Does the Park District Use Herbicides?

The majority of the pesticide use in the Park District is herbicide, products used for vegetation management, and include products only from the General Park Use list.

In general, parks in the Park District are divided into units that reflect recreational focus and geographic relationship. Figure 7 illustrates the total herbicide (conventional and organic) use by organization unit. This includes products used by operations for park maintenance and right of way as well as other District departments. This graph does not incorporate golf course, organic and conventional farming. The comparative volume of herbicide use (2011-17) by organizational unit indicates that Trails/Delta unit continues to require the most herbicide use to support its mowing strategies. In 2017, Shoreline, Trails, Parkland and Interpretive Farm units saw a slight increase in herbicide use (Figure 8).

The top three units: Trails, Shoreline and Lakes, provide the highest density of recreational areas and require intensive vegetation. Trails/Delta unit has over 150 linear miles of trails that requires right of way clearance along multi-use trails for safety, fuel reduction and recreational enjoyment. Most vegetation management along trails is done mechanically by rough and brush mowing several times per year. However, chemical means of control is necessary to control weeds around infrastructure like fence lines, gates, trash cans, etc. along the Park District’s extensive trail system. These areas are difficult to treat mechanically and can result in damage to structures and equipment. The Shoreline and Lakes units also have many miles of multi-use trails and hundreds of high use picnic areas,

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campgrounds and essential infrastructure that require vegetation management. Recreation, Interpretive Parkland and Interpretive Farm Units all have relatively steady use of herbicide in their vegetation management due to the limited areas of recreational use.

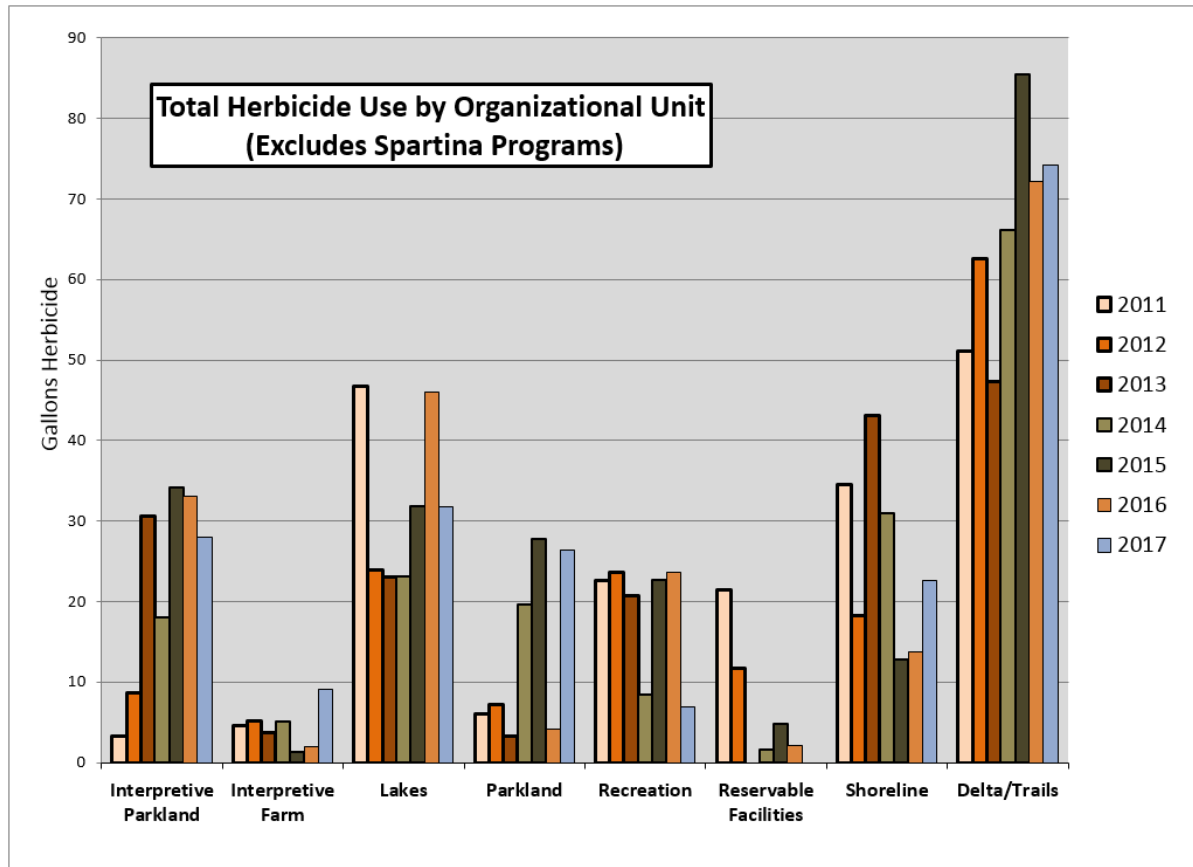


Figure 8. Volume of herbicide (conventional and organic) used by organizational unit, 2011-2017, including park operations, fuels and resource projects. This chart excludes Invasive Spartina Program.

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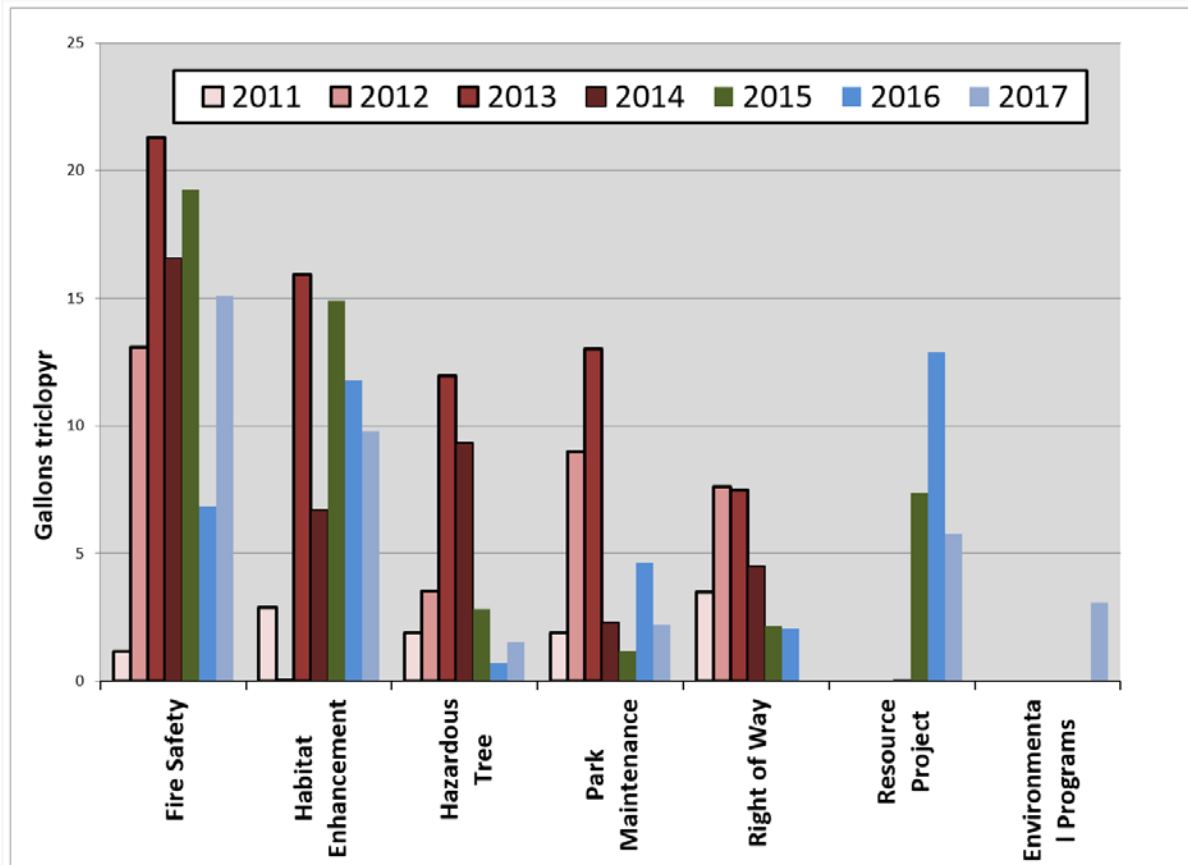


Figure 9. Comparative triclopyr (i.e. Garlon) use by objective 2011-2017.

Which Herbicides are Used and Where?

Figure 10 and 11 illustrate General Park herbicide use by organizational unit *and* objective. In general, parks in the District are divided into units that reflect recreational focus and geographic relationship. These graphs also incorporate special use products for habitat enhancement, endangered species recovery and resource projects.

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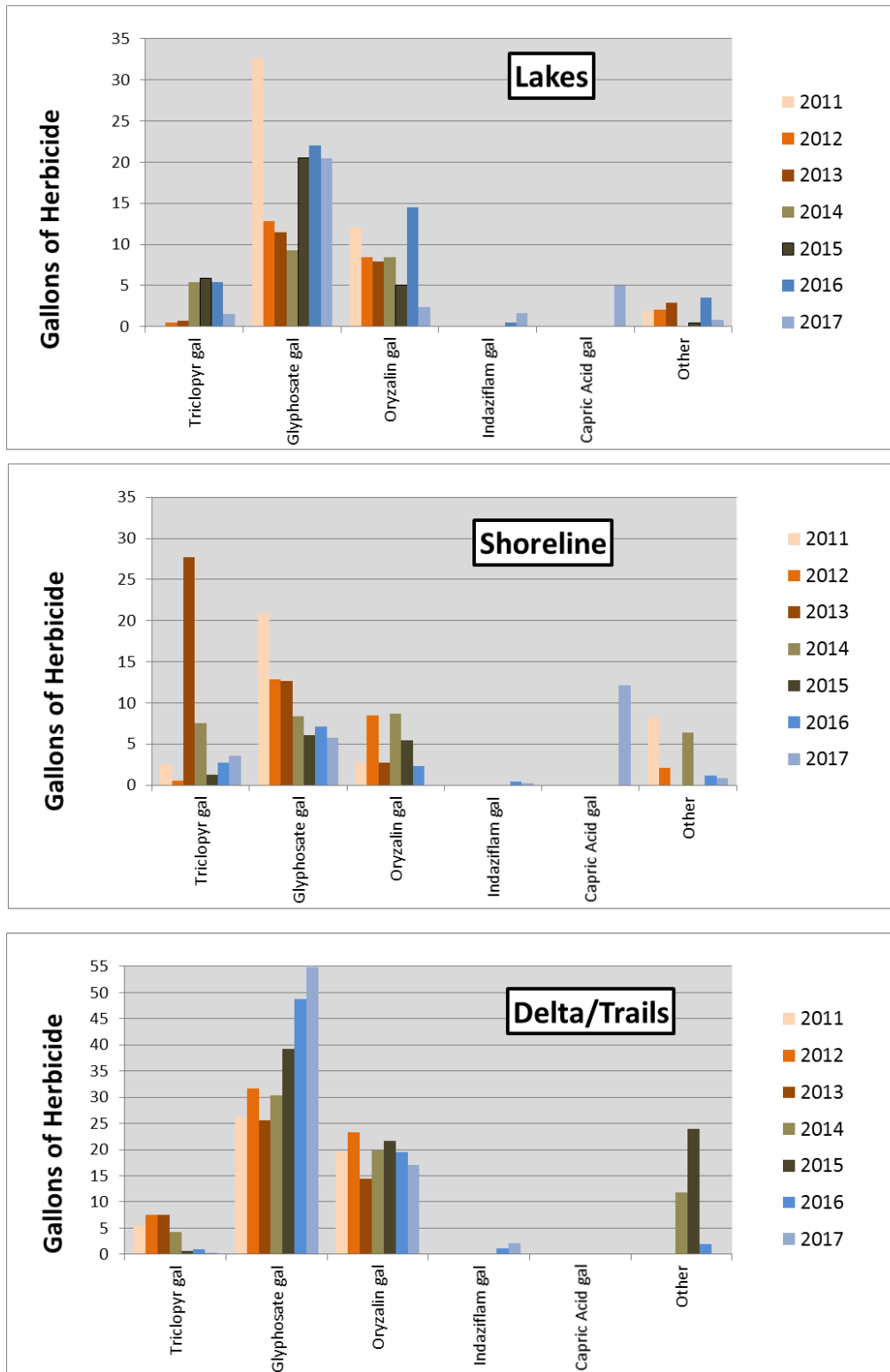


Figure 10. Specific pesticide products and amounts in high use organizational units.

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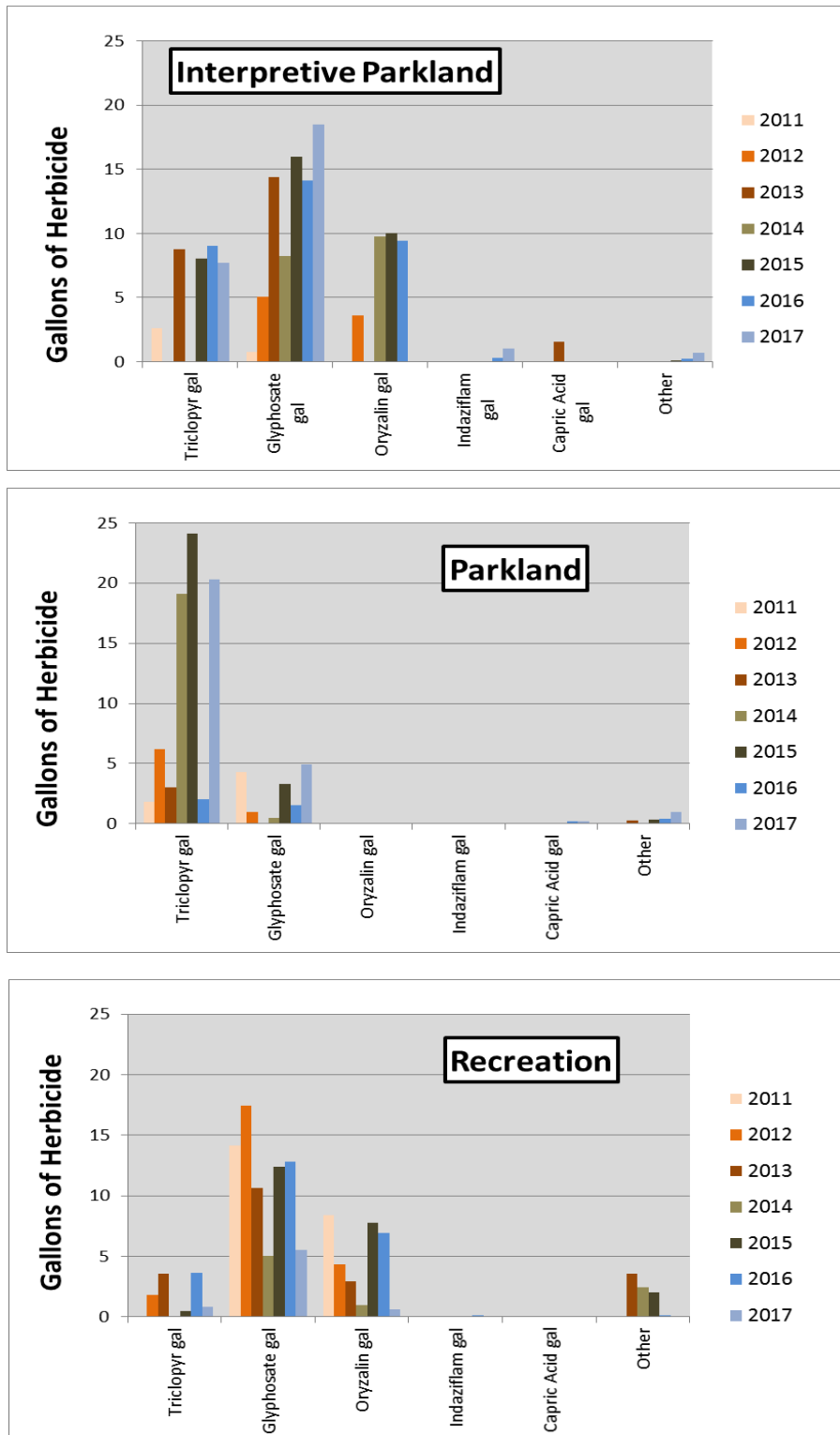


Figure 11. Specific pesticide products and amounts in low use organizational units.

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Resource Projects

Operations Habitat Enhancement Projects

Park staff continue to utilize an integrated and adaptive management approach to weed management with minimal pesticide use. The integrated methods used included propane torching of seedlings, mechanical brush removal (pulling and grubbing) and mechanical mowing with line trimmers, scythes and weed whips. Mechanical and Cultural methods are difficult to quantify and are not currently tracked but are estimated to comprise the majority of vegetation management performed by staff.

Park operations continues to implement several habitat enhancement projects on a park scale that target invasive, non-natives. Examples include perennial pepper weed, yellow star thistle, pampas grass, eucalyptus, acacia, puncture vine, tree of heaven, fennel, stinkwort, medusa head, barbed goat grass, etc. These non-native exotics substantially reduce habitat, forage, groundwater availability and recreational opportunities in rangelands, wetlands, parklands and trails.

Over 34,000 hours of sweat equity were contributed by volunteers District-wide for invasive plant removal projects in 2017. Park staff, volunteers and park users report substantial improvement in recreational enjoyment and desirable species coverage in areas that were mechanically treated. Most importantly, volunteers led by park staff continue to maintain these areas with mechanical control until weed seed banks are depleted and a more sustainable vegetation composition is achieved.

Stewardship Programs

IPM Volunteers

In 2017, IPM department staffed and supervised 8 programs of volunteer and school groups, totaling 439 hours of volunteer service by 179 volunteers. Projects include mapping invasive noxious plants through CalFlora, hand removal of French broom, stinkwort, yellow star thistle, forget-me-nots, pampas grass and fennel, mulching as well as native planting and seeding.

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Figure 12. Head Royce 7th graders clear broom and count Johnny Jump Ups in Redwood Park.

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Figure 13. California State University East Bay students help clear an inundated trail of French broom.



Figure 14. Earth Team teen volunteers completed their second year of stewardship at Oyster Bay planting trees, removing invasive plants and trash.

IPM staff lead a robust intern program that focuses on water quality in high use watersheds and mapping of invasive species. Furthermore, interns experience a diverse palette of stewardship opportunities from sampling rare plants, competitive planting of native species and electrofishing the Park District's recreational fisheries (Figure 15).

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Figure 15. IPM interns map invasive plants throughout the Park District and pull weeds around these endangered manzanitas.

IPM Resource Project Programs

The IPM team continues to lead and support many special resource projects with the intent of eradicating exotic invasive plants that degrade the quality of habitat in the Park District parklands and helps facilitate endangered species recovery. Often, habit enhancement projects are purely mechanical- employing timed mowing, sheet mulching, torching etc. In some circumstances, staff utilizes general park use herbicides for high density infestations so that mechanical methods can be more effective. The Park District’s IPM policy allows the use of pesticide products outside of the approved general park use list with the approval of the IPM Specialist for special projects and needs.

Least Tern Island Vegetation Management

Since 2008, the IPM program has assisted with habitat enhancement on the Least Tern Island in Hayward Shoreline Regional Park. IPM has developed a management plan for various weedy species, most notably chamomile mayweed on Least Tern Island. Exotic weeds reduce the nesting area available for the California least tern (*Sternula antillarum*

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browni) on a man-made island in the brackish water marsh complex in the Hayward Marsh. Application of pre- and post-emergent products helped maintain the low vegetative cover that this federally endangered species requires for successful nesting. Results in the 2017 breeding season were successful with increasing nesting success due to the cooperative benefits of vegetation management and predator reduction.

Additionally, the wildlife department and IPM program collaborated to treat vegetation on an island in the New Marsh at Martin Luther King, Jr. Regional Shoreline to increase nesting habitat for shoreline birds.

Barb Goatgrass and Medusahead

Barb goatgrass and medusahead threaten to reduce forage, native grass and forb diversity and ecological functions in grasslands. As a result, IPM staff prioritized control of these noxious grasses and completed its first treatment season in 2015. The primary goal was to develop an integrated and flexible approach that would be effective and rapidly deployable by park staff on geographic outliers, spreading edges (such as along roads and trails), and areas with special-status native plant species. Barb goatgrass is known to infest approximately 110 acres in four parks in eastern Contra Costa and Alameda Counties. It is anticipated to be elsewhere. It is commonly found along fire roads and all populations are located in grazing units. Considerable effort was put into mapping the locations by academic interns over the last two years.

Treatment efforts in 2017 focused on Round Valley, Morgan Territory Regional Preserve and the Galvin land bank in eastern Contra Costa County. Contractors, supervised by IPM, line trimmed and mowed barb goatgrass and medusahead populations at the flowering stage. In sensitive areas where significant native grasses or around a vernal pool, hand pulling was employed. After hand pulling, staff followed up with mowing and line trimming the areas approximately 3-4 weeks after initial treatment. In plots that had experienced substantial reduction in noxious grass cover, spot spray treatment was utilized to eliminate seed production. Likewise, spot spray treatment of resprouting occurred as in previous treatment seasons (Figure 16).

Elsewhere in the Park District park rangers employed timed line trimming and hand pulling for barb goatgrass and medusahead in Lake Chabot, Diablo Foothills, and Black Diamond Mines.

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Figure 16. Left, IPM spot sprays late season noxious barb goatgrass. Right, park staff employ timed mowing with a line to reduce barb goatgrass cover at Morgan Territory.

Invasive Spartina

The Invasive Spartina Project (ISP) completed its 15th consecutive season of treatment at Martin Luther King, Jr. Shoreline, Point Pinole and Hayward Regional Shoreline. A total of 11.3 acres were treated, up from the previous year again. Biologists noted that Bay Area wide, the hybrid spartina populations increased substantially in 2017, likely due to the generous rains. Consecutive treatment, guided by the ISP, has resulted in an impressive reduction of spartina coverage accomplishing the goal of recovery of valuable open mudflat marsh habitat for foraging shoreline birds and maintaining critical, open channel foraging habitat for endangered Ridgway's rail (formerly California Clapper rail). However, federally mandated no-treat zones for Ridgway's rail will continue to supply seed to adjacent areas until rail populations have reached mandated levels. This means that the magnitude and cost of work on hybrid spartina will continue at this level. While there are fewer populations and individuals to treat, the same amount of acreage must be surveyed each year. Most of the remaining invasive spartina is in or adjacent to Park District property and all the no-treat zones are on Park District property. By the end of 2014, we were at a 29 net acre infestation bay wide, down from 805 acres in 2005, an amazing accomplishment.

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Pampas Grass and Stinkwort

IPM and park staff at Lake Chabot worked cooperatively on their fourth season of pampas grass and stinkwort control. In the 2017 treatment season, the entire infestation around the perimeter of the lake was treated by hand pulling only. Lake Chabot park rangers and IPM staff and interns committed substantial hours to treating the perimeter of the lake twice (Figure 17).

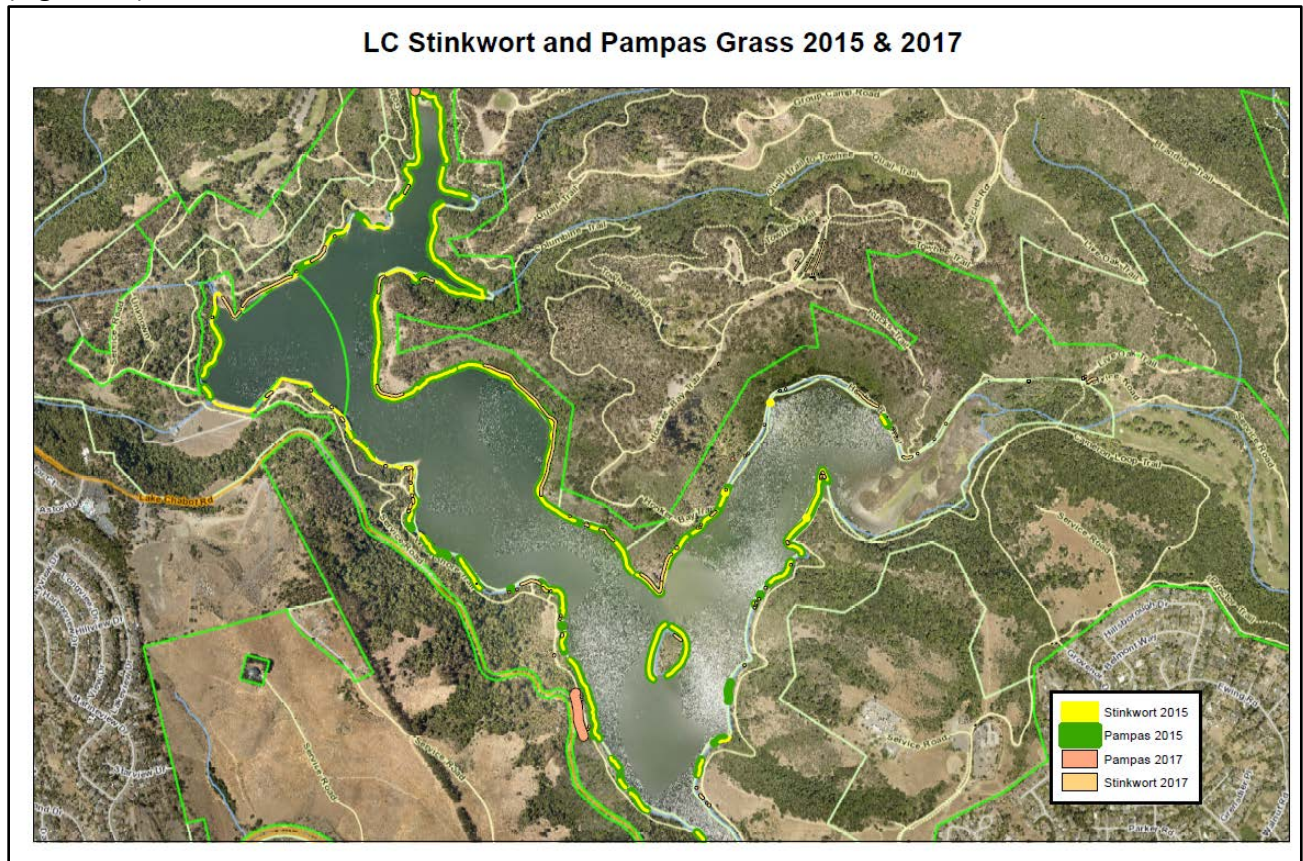


Figure 17. Initial infestation of stinkwort and pampas grass around the perimeter of the lake in 2015 and the current distribution in 2017.

Yellow Star Thistle

IPM and operations continued to target the state-listed noxious yellow star thistle in a number of areas for habitat enhancement, right of way and recreational area maintenance on a park by park basis. These parks include Del Valle, Sunol, Crown Beach, Lake Chabot, Shadow Cliffs, East Contra Costa County Trails, Miller Knox, Black Diamond, Diablo Foothills and Point Pinole. Staff utilize chemical treatment and hand pulling.

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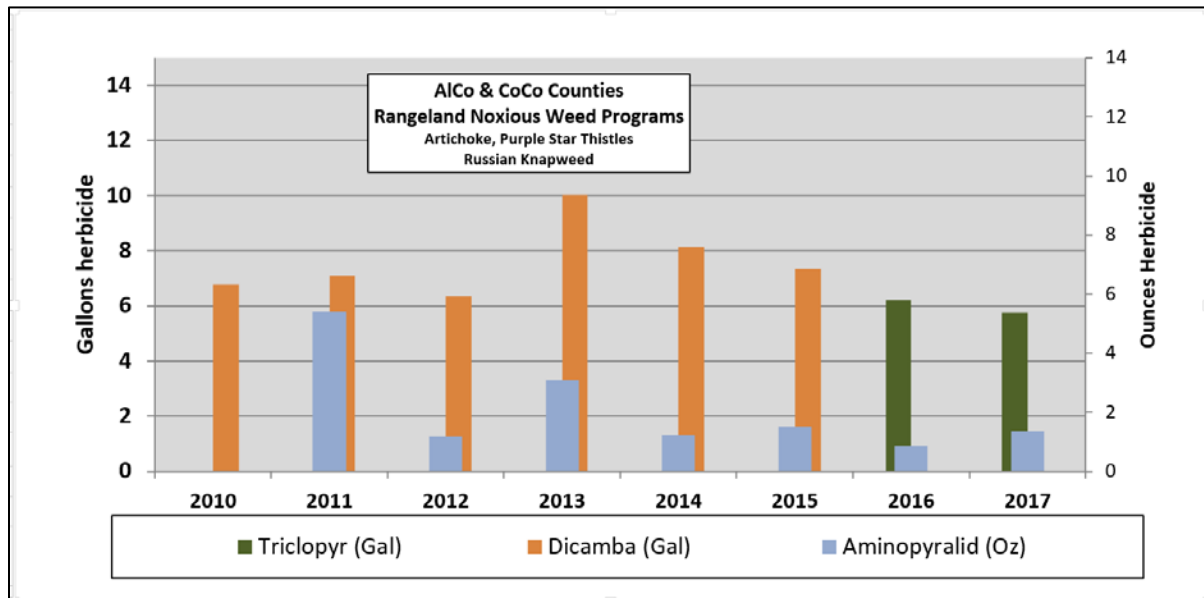


Figure 17. Priority resource management project for rangeland noxious weeds: artichoke, purple star thistles, perennial pepperweed, hoary cress, Russian knap weed, etc.

Noxious Rangeland Weeds & Santa Cruz Tarplant Recovery

The IPM department continues to work closely with the Agriculture Departments in Contra Costa and Alameda counties on the eradication of several noxious rangeland weeds: artichoke and purple star thistles, perennial pepperweed, hoary cress and Russian knapweed (Table 2 and Figure 17). This program is ongoing and continues to make progress in reduction of older established populations and eradication of smaller populations in newly acquired parklands. Treatment of artichoke thistle in these areas benefits and protects the federally listed Santa Cruz Tar plant (*Holocarpa macradenia*) as well as many other non-listed native plants and grasses. More than 168 acres were surveyed and treated in both counties for these priority noxious rangeland weeds. Total treatment areas continue to increase due to continued acquisition of properties. Point Pinole and Lake Chabot continued its comprehensive attack on Teasel in coastal prairies using mechanical and chemical methods.

The IPM team, its contractors and park staff have continued its treatment of the most interior of populations of artichoke thistle in Wildcat Canyon Park for the third consecutive year. In 2017 crews spot treated 19.6 gross acres with a mix of 1% triclopyr and .03% aminopyralid. Staff have observed substantial reduction of extensive populations and recruitment of native perennial grasses in treatment areas.

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Figure 18. Left, in 2015, near 100% coverage of artichoke thistle. Right, full grassland recovery in 2017, requiring only spot treatment of artichoke thistle.

Harmful Algal Blooms (HABs)

IPM and Water Management staff cooperated to tackle continued levels of microcystin in Lake Temescal that precipitated the lake's closure during the 2017 summer swim season. Staff applied a late season application of Alum, a coagulant that binds phosphorous in the water column and sediments. Staff augmented this longer-term treatment with Green Clean, a hydrogen peroxide derived algaecide product to treat acute outbreaks of algae growth. Cyanobacteria blooms continued throughout the Park District; some of which produced levels of toxins that required posting and/or closure.

An interdisciplinary work group formed within the Park District to address the complex variables contributing to HABs. In 2017, the HABs working group expanded its long-term planning to other Park District water bodies. Additional monitoring and water quality monitoring loggers were deployed to collect valuable, long-term data to inform future management actions.

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Structural Pesticide Use

Three contractors applied pest control products to control nuisance rodents and insects to several Park District offices, buildings and residences in 2017. The bulk of pesticides used were insecticides for ant and termite control. Table 3 compiles these products and amounts by active ingredient. The Park District’s structural contracts are limited use which means they utilize the most environmentally safe products.

Pesticide	Active Ingredient	Amount	Unit
Vikane	sulfuryl flouride	70	Pounds
Essentria	rosemary, geraniol, peppermint oils	11	Pounds
Eco Exempt	2-Phenethyl Propionate, Eugenol	5	Ounces
Terad 3	Cholecalciferol	202	Ounces
fastrac	bromethalin	140	Ounces
Arilon	indoxacarb	20.95	Ounces

Table 3. Structural pest control products listed by product and active ingredient that were used on Park District buildings in 2017.

Farming

J.E. Perry Farms has operated an organic farm at Ardenwood Historic Farm since 1990. Perry farms now operates on 92 acres that include wheat, ornamental and popcorn fields. Squash bug is their primary and most costly insect pest, followed by worms in the corn and aphids on all crops. Table 4 compiles the insecticides and fungicides utilized by Perry farms in 2017.

Additionally, the Park District has acquired farm land in recent years that remains in land bank and continues to operate leases for conventional farming. Conventional farming use is reported in Table 5.

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iron phosphate (lbs)	Pyrethrins (oz)	Potassium salts of fatty acids (oz)	alcohol ethoxylate (oz)	Organo-Silicone wetting agent (oz)	Silica Polydimethylsiloxane (oz)	bacillus thuringiensis (oz)	azadirachtin (oz)
10	50	896	36	76	8	4	8

Table 4. 2017 Organic farming pesticide use at Perry Farms, Ardenwood Historic Farm, Newark, CA.

	Product	Active Ingredient	Amount
Nunn Property	Bifen 2 AG Gold	Bifenthrin	15.6 oz
	Direx 4L	Diuron	4 gal
	Shark EW	carfentrazone	1.5 oz
	Outlook	Dimehenamide-P	14 oz
	Bravo Weather Stik	Chlorothalonil	96 oz
	Warrior II	Lambda-Cyhalothrin	5.7 oz
	Venom	Dinotefuran	9 oz
	Roundup Custom, PowerMAXX	glyphosate	10.8 gal
	Medal EC	S-Metachlor	102 oz
	Admire Pro	Imidacloprid	31.5 oz
	Intrepid Edge	Methoxyfenozide	36 oz
	Goal 2XL	Oxyfluorfen	16 oz
	Prowl	pendimethalin	74 oz
	Quadris	azoxystrobin	24 oz
	Quilt Xcel	azoxystrobin	56 z
	IAP Dusting Sulfur	sulfur	20 lbs
	Toledo	tebuconazole	9 oz
	Triclopyr 3A	triclopyr	1.75 gal
Orowood Property	Roundup Power Max	glyphosate	80 oz
	Pursuit	imazethapyr	5 oz
	Steward	Indoxacarb	6.4 oz
	Intrepid 2F	Methoxyfenozide	8 oz
	Clethodim	Clethodim	8 oz

Table 5. Conventional farming pesticide use in recent land bank acquisitions in 2017.

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Golf Courses

Golf Courses

The golf courses are run by concessionaires and are required to report their chemical pesticide uses. They regularly utilize integrated practices; however, they operate independently from the IPM department. Tables 6 and 7 list the all fungicides, herbicides, plant growth regulators and rodenticides reported by both golf courses from 2011-2017.

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Course	Year	Fungicides																		
		Chlorothalonil (gal)	Chlorothalonil/Propiconazole (gal)	Chlorothalonil/Azoxystrobin (gal)	Propiconazole (gal)	Chlorothalonil (lbs)	Iprodione (gal)	Metenoxam (gal)	penthiopyrad (gal)	Tebuconazole (gal)	Thiophanate-methyl (gal)	Triticonazole (gal)	PCNB	Aluminum Tris (lbs)	Mancozeb lbs	azoxystrobin lbs	Metaconazole lbs	potassium phosphite (gal)	Mineral Oil (gal)	
WPGC	2011	9	1												96					
	2012	30		1.64											120					
	2013		1.25	0.38											72					
	2014		10.43		5										120					
RCGC	2015		2.11												32					
	2016				4.70	1			3.28											
	2017	5			5.00				4.50											
TGC	2011	45	16			1				10		5		63	146	30	3			
	2012	44	2			2				4	4	5		48	132		1			
	2013	20	2	5	10	4				10	4	13		66	192					
	2014	16.5	4	5	8	8				8	2	13		66	36		6			
	2015	45	7		15	8				2	11			66	186	35				
	2016	32.5	4		25	25				2.75	1			66	48	10				
	2017	10	3	10	13	676	13		0.3	1.41				66		390			12	94

Table 6. Willow Park Golf Course (WPGC) changed to Redwood Canyon Golf Course (RCGC) in 2015. Tilden Golf Course (TGC) remains under the same management. Comparative pesticide use at District Golf Courses 2011-17.

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Course	Year	Growth Regulators		Herbicide gallons						
		Ethephon (gal)	Trinexapac-Ethyl (gal)	Clopyralid (gal)	Powerzone (gal)	Sodium carbonate peroxyhydrate lbs	Glyphosate (gal)	Penoxsulam (gal)	Triclopyr (gal)	Fluridone (lbs)
WPGC	2011									
	2012			0.05						
	2013									
	2014			0.05						
RCGC	2015									
	2016							0.08		20
	2017					400	2.5			
TGC	2011	15	3.4		6.41		0.13			
	2012	20	2							
	2013	20	0.41		17.80		22			
	2014	20	0.84		3					
	2015	25	5.45		11.60		2.78			
	2016	15	4.66	1.17	0.88		2.43	0.7	0.63	
	2017	30	3.76	1.4	1		2.6	0.84		

Table 7. Comparative pesticide use at Park District Golf Courses 2011-17. See above for abbreviations.

The Park District also tracks total pesticide use for each Park including pesticide used by contractors and park staff (Tables 8a, 8b and 8c).

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PARK	Applicator	Activator 90 (adjuvant, gal)	Bee Bopper (oz)	Competitor (adjuvant, gal)	Grain Bait (Diphacinone, lbs)	Dimension Ultra (dithiopyr, gal)	Envoy plus (clethodim, gal)	Esplanade 2005C	Garlon 3A (triclopyr, gal)	Garlon 4 Ultra (triclopyr, gal)	Gas Cartridges (oz)	Glyphosate Products (gal)	Green Clean Liquid 2 (sodium carbonate peroxyhydrate, gal)	Green Clean Pro (Sodium carbonate peroxyhydrate, lbs)	Hasten Oil (adjuvant, gal)	Liberate (adjuvant, gal)	Milestone (aminopyralid, gal)	Pathfinder II (triclopyr, gal)	Polaris (imazapyr, gal)	Pro-Spreader (adjuvant, gal)	Pro-Tron (adjuvant, gal)	R-11 (adjuvant, gal)	Specticle Flo (indazaflam, gal)	Stylet Organic Oil (gal)	Suppress (capric acids, gal)	Surflan AS (oryzalin, gal)	Telar (chlorsulfuron, gal)	Transline (clopyralid, gal)	Turfion (triclopyr, gal)	
Anthony Chbot	Contractor	0.88										4.92				1	0.41													
	Park Staff		168	4.03						2.15					0.13															
Alameda Creek Trails	Park Staff		116									15.5											0.04							
Ardenwood Farm	Contractor						0.24					1.5		0.75		0.17							0.28							
	Park Staff		28									0.06													0.8					
Black Diamond Mines	Contractor									0.5							0.02													
	Park Staff			18.3						6.25		6.64											0.59							
Botanical Garden	Park Staff	28	0.12							0.12		1.5																		
Briones	Contractor									0.11							0.01													
	Park Staff											2.5											0.63							
Crown Beach	Park Staff			0.07		0.08						0.38																		
Cull Canyon	Park Staff											1.41																		
Contra Costa Trails	Park Staff																					0.98	0.24				6			
Coyote Hills	Park Staff			2							135	0.94														5				
Contra Loma	Contractor									0.09							0.01													
	Park Staff											2																		
Carquinez Martinez Shoreline	Contractor									0.23							0.02													
	Park Staff											3											0.29							
Don Castro	Park Staff											0.26								0.09									0.23	
Del Valle	Contractor									0.19					1.63		0.38													
	Park Staff											2.81											0.56							
Diablo Foothills	Contractor																													
	Park Staff			0.06						0.06		0.86					0.01						0.06			0.63				
East Contra Costa Trails	Park Staff											33.8											0.88			11				

Table 8a. All general and special use pesticides by park in 2017 (applied by staff and contractors).

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PARK	Applicator	Activator 90 (adjuvant, gal)	Bee Bopper (oz)	Competitor (adjuvant, gal)	Grain Bait (Diphacinone, lbs)	Dimension Ultra (dithiopyr, gal)	Envoy plus (clethodim, gal)	Espinaide 200SC	Garlon 3A (triclopyr, gal)	Garlon 4 Ultra (triclopyr, gal)	Gas Cartridges (oz)	Glyphosate Products (gal)	peroxyhydrate, gal)	lbs)	Hasten Oil (adjuvant, gal)	Liberate (adjuvant, gal)	Milestone (amino pyralid, gal)	Pathfinder II (triclopyr, gal)	Polaris (imazapyr, gal)	Pro-Spreader (adjuvant, gal)	Pro-Tron (adjuvant, gal)	R-11 (adjuvant, gal)	Specticle Flo (indazafam, gal)	Stylet Organic Oil (gal)	Suppress (capric acids, gal)	Surflan AS (oryzalin, gal)	Telar (chlorofluor, gal)	Transline (clopyralid, gal)	Turflon (triclopyr, gal)		
		Garin/Dry Creek	Contractor										6						0.1												
	Park Staff			0.3	60				0.3																						
Hayward Shoreline	IPM			1.1	0.2							0.2				0.1	0.1		2.9												
Kennedy Grove	Contractor								0																						
Lake Chabot	Park Staff								1	7.3					1								0.6						0.5		
Las Trampas	Contractor								0.3			4.8											0.3								
	Park Staff																														
Miller Knox	Contractor								2																						
	IPM			0.2															0.3												
	Park Staff			0.8								2.8											0.1	2.5							
Martin Luther King	Contractor				380																										
	IPM			3.8	0.3							0.3					0.1	0.4	15			2	0.1								
	Park Staff											0.6																			
Point Pinole	Contractor						0.3					1.5		1.2		0.2									9.6						
	IPM			1.3															4										0		
	Park Staff								1.2		0			2.1																	
Pleasanton Ridge	Contractor											0.4				0.1															
Quarry Lakes	Park Staff			1.2								4.8						0.4					0.4	0.1							
Roberts	Park Staff			0.6						0.4																					
Shadow Cliffs	Park Staff											4.3								1.1							2.4				
Sibley Park	Contractor			33					12								0														
	Contractor																0.4														
Sunol	Park Staff			0.2					0.2		0.2												0								

Table 8b. All general and special use pesticides by park in 2017 (applied by staff and contractors).

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Appendix A

General Park Use Pesticide Descriptions

Glyphosate (i.e. Round Up) is a broad spectrum, non-selective post-emergent herbicide used in landscape, right-of-way and open space. All products in this category have a caution signal word. These products include: Roundup Pro (EPA Reg. No. 524-475), Roundup Custom (formerly Aquamaster) (EPA Reg. No. 524-343) and Roundup Pro Max 524-579.

Oryzalin is a broad spectrum, somewhat selective pre-emergent herbicide used in landscape and right of way location. Products in this category include Surflan AS (EPA Reg. No. 70506-44), which has 40.4% active ingredient and a signal word of caution. Starting in 2017, the Park District stopped using Surflan and uses a reduced risk, pre-emergent herbicide, Spectacle (indaziflam).

Indaziflam is a broad spectrum pre-emergent herbicide used in landscape and right of ways. This product is sold as Spect(i)cle Flo (EPA Reg. No. 432-1518). This product contains 7.4% 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% active ingredient and a caution signal word and Pathfinder (EPA Reg. No. 62719-176) with 13.6% active ingredient and a caution signal word.

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 (0.005% active ingredient) manufactured by Alameda County Agricultural Department (CDFA Reg. No. 10965-50001). This product has a caution signal word.

Capric Acid (i.e. Suppress EC) is an organic (OMRI registered) non-selective, foliar burndown herbicide (EPA Reg. No. 51517-9). This product contains 79% the active ingredients caprylic and capric acids and has a warning signal word.