

ANNUAL IPM & PESTICIDE USE REPORT

2015

IPM Department

EAST BAY REGIONAL PARK DISTRICT

Approved 6/30/2016

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Stewardship Department



2015 Integrated Pest Management Report



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

Introduction

This annual report provides the Board of Directors of the East Bay Regional Park District (EBRPD), Ecology Committee (advisory to the Board), and the interested public with a summary, analysis, and evaluation of pesticide use and a descriptive review of IPM techniques utilized by park staff that provide more sustainable and effective pest control while reducing the amount of pesticides used during 2015. For reference, this report also includes a brief description of the District's Integrated Pest Management (IPM) program.

IPM Program

IPM is a strategic approach for preventing and suppressing pests before they reach unacceptable levels. An IPM model uses an ecological framework to analyze and treat pest problems and mandates the selection and integration of the most appropriate combinations of available pest control methods. These include cultural, mechanical, chemical, and biological strategies in ways that minimize risk to public safety, health and the environment. The goal of the IPM program is to provide long-term resolution to pest problems. However, the strategies selected will vary by location, timing, pest species, environmental considerations, level of desired control and cost factors.

Implementation of the EBRPD IPM program involves seven major components:

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1. Annual IPM & Safety Training (formerly Pesticide Application Safety Training): required, annual safety training for all pesticide handlers in the District. Now includes comprehensive training on the ecology & biology of pests, ecosystem approaches to pest problems and best science updates as it pertains to pest management.
2. Supplemental IPM Training: training on alternative pest control strategies that focus on mechanical and cultural techniques. These include alternating years of training on Vertebrate Trapping Techniques, Volunteer Leadership & Weed Work.
3. Pest Control Recommendation Request: a detailed description of the problem, history, desired objective of pest problems submitted by park staff to IPM.
4. Pest Control Recommendation (PCR): a legal requirement for pesticide application that ensures safe, effective and environmentally sensitive application of pesticides.
5. Pesticide Use Report (PUR): report generated by park staff detailing the amount and type of pesticide applied, allowing the IPM department to track, report, analyze and manage the IPM program.
6. Contracts and Maintenance Agreements: pest management services directed and tracked by IPM department to control or eradicate invertebrate, plant, and vertebrate pests of a high priority.
7. Data Analysis and Presentation in the Annual Pesticide Use Report: compilation, analysis and presentation of all pesticide use and trends within District parklands presented to the Board, Ecology Committee, Park Staff and interested public. Currently this report is transitioning to the IPM report that will include analysis of pesticide use and reporting of alternative methods to chemical control.

IPM Department Updates

IPM has completed an approved pesticide list for the following programs: Golf Course, Structural, Organic Farming, General Park Use, Botanical Garden, and Special Use.

IPM changed the format of the Annual Pesticide Safety Training to more comprehensive Integrated Pest Management Training. This annual training is required for worker, environment and public safety and now has been expanded to include plant and vertebrate biology, weed ecology, best management strategies to prevent spread and introduction of pest species, integrated vegetation management strategies, among other alternating topics in coming years.

IPM is currently testing the feasibility and effectiveness of OMRI registered non-selective herbicides for general park use with Tilden and Ardenwood park rangers.

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Summary of Pesticide Alternative Practices

Operations and IPM led Volunteers

Park staff continues to utilize an integrated and adaptive management approach to weed management that minimizes pesticide use. These methods 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 comprise the majority of vegetation management performed by staff. For example, most road sides and fence lines are mowed and line trimmed in most parks (figure 2). Park staff that report these activities are detailed in the Integrated Pest Control section.



Figure 2. Line trimming along Garin Road and a double rail fence in lieu of herbicide.

A total of almost 34,000 hours were logged by volunteers District wide for invasive plant removal projects. 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

Stewardship, partnering with park operations, monitors over 35 bat colonies, 14 of which were installed by park staff. Bat boxes provide important habitat for colonial roosting bats in our regional parks. Bats are the primary predator of night-flying insects and are considered a beneficial resource. Healthy populations of bats consume vast quantities of insects including mosquitoes and costly agricultural pests.

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IPM staffed and supervised over 21 programs of volunteer and school groups, totaling of 862 hours of volunteer service by 313 volunteers. Projects include hand removal of French broom, stinkwort, yellow star thistle, forget-me-nots, pampas grass and fennel, among many more. Individual volunteers logged in over 8,000 hours of invasive removal service District wide through operations.

Park staff and IPM have installed and maintain several dozen barn owl boxes, providing additional vertebrate pest control in District lawns and picnic areas. The IPM Barn Owl Box program is currently being inventoried and updated, to include data collection on occupancy and ensure yearly maintenance.

General Park Use Pesticide Trends 2015

Table 1 illustrates the total volume of general park use pesticide products listed by active ingredient but not amount of active ingredient (glyphosate, oryzalin, triclopyr, diphacinone) applied to district parklands in 2015.

- Glyphosate products (non-selective, broad spectrum herbicide) continue to constitute the bulk of herbicide use in the District with a long-term average of 53 percent of general herbicide use. Total use of glyphosate products for the District in 2015 was up from the previous year.
- Oryzalin (Surflan), a pre-emergent, non-selective herbicide, is our second highest use product with a long term average of 31% of general herbicide use. Oryzalin use was up slightly from the previous year. Figure 7 illustrates the relatively constant use of oryzalin over long term. This slight increase over the last few years is due to increasing purchases and land bank openings. This product has been replaced with the reduced risk, pre-emergent herbicide, Spect(i)cle Flo (active ingredient indaziflam). However, oryzalin use will continue as stocks are depleted through 2016 and possibly 2017.
- Triclopyr (Garlon), a post-emergent, selective herbicide, experienced a slight increase in use in 2015 due to increased activity of fuels management and similar resource protection activities. It remains the third highest volume of general park use herbicide with 16% of total long term herbicide average use.
- Diphacinone (treated bait) increased, likely due generous rains in December 2014 and late season precipitation with relatively warm conditions that prolonged the annual grass and forb growing season. These additional resources provided ample forage for ground squirrels (Figure 9). Additionally, diphacinone treated grain is employed in high use lakes and shoreline parks. These high frequency parks contain many acres of turf that provides year round green vegetation, the preferred food source of ground squirrels. This results in robust pest populations that are annually at action thresholds for these parks. The burrowing of these

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populations undermine District facilities and investments that include paved trails, foundations, bridge abutments, recreational structures, etc.

	Diphacinone (lbs)	Triclopyr (gal)	Glyphosate (gal)	Oryzalin (gal)
2015 Total	643	40	100	53
2000-2015 Mean	1105	25	81	47
Standard Deviation	524	16	18	8

Table 1. General park use pesticide long-term means and standard deviations (2000-2015) and tracked pesticide totals for 2015.

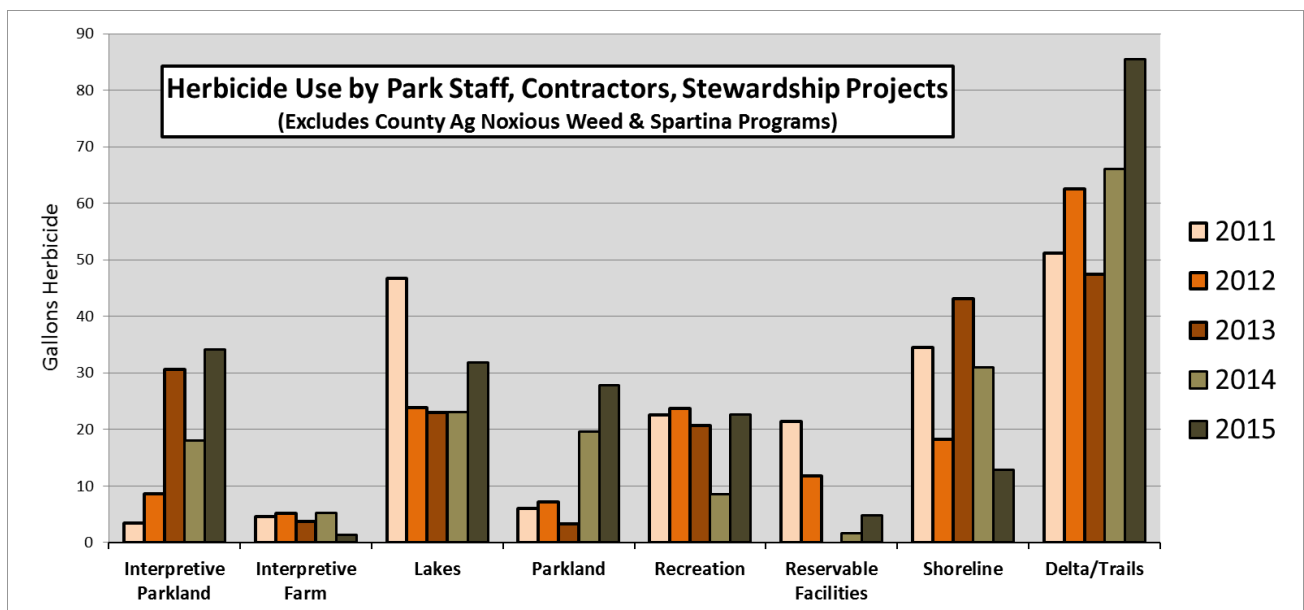


Figure 3. Volume of herbicide used by organizational unit, 2011-2015, including park operations, fuels and resource projects. This chart excludes County Ag Noxious Weed Control Program, Invasive Spartina Program and Fuels.

The comparative volume of herbicide use (2011-15) by organizational unit indicates that Trails/Delta unit continue to require the most herbicide use followed by Shoreline, Lakes, Recreation, Parkland and Interpretive Parklands in that order (figure 3). The top three units, trails, shoreline and lakes, provide the most high density recreational areas that require intensive vegetation management and necessitate the use of this effective tool. Trails/Delta unit has over 150 miles of trail that require right of way clearance along multi-use trails for safety, fuel reduction and recreational enjoyment. The Shoreline and Lakes units have many miles of multi-use trails and hundreds of high use picnic areas, campgrounds and

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essential infrastructure that require vegetation management. In 2015, Shoreline unit herbicide use fell in comparison to 2014, while other units increased.

Figure 16 illustrates the specific herbicide use by organizational unit. Park operations and other District departments often use herbicides for habitat enhancement and resource projects. This use is detailed in following sections. Operations and Stewardship have increased the number of habitat enhancement projects in 2015 from 2014 and herbicide use has correspondingly increased.

Analysis of herbicide use by objective reveals that park maintenance has comprised the bulk of herbicide use over the years. However, in 2015, herbicide use for park maintenance (down from 2014), resource projects and right of way are roughly equal at approximately 65 gallons for 2015 (figure 4). Park maintenance activities include vegetation management around picnic areas, around campground developments, around buildings and fence lines, unpaved parking lots, trail right of way, etc.

Over the last few years triclopyr use has increased concurrent with an increase in fuels work (figure 6). Triclopyr, the active ingredient in Garlon 4A, is used to kill the resprouting of eucalyptus and other stump sprouting hard wood species. Fuels reduction will mitigate future catastrophic wildfires that can and will one day 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 FEMA grant funding, this herbicide use will remain high for the next few years. Triclopyr use in 2015 increased slightly from 2014 for fuels and habitat enhancement projects, while it decreased for hazardous trees, park maintenance and right of way (figure 5). Triclopyr used for fuels and non-fuels were roughly equivalent in 2015 (figure 6).

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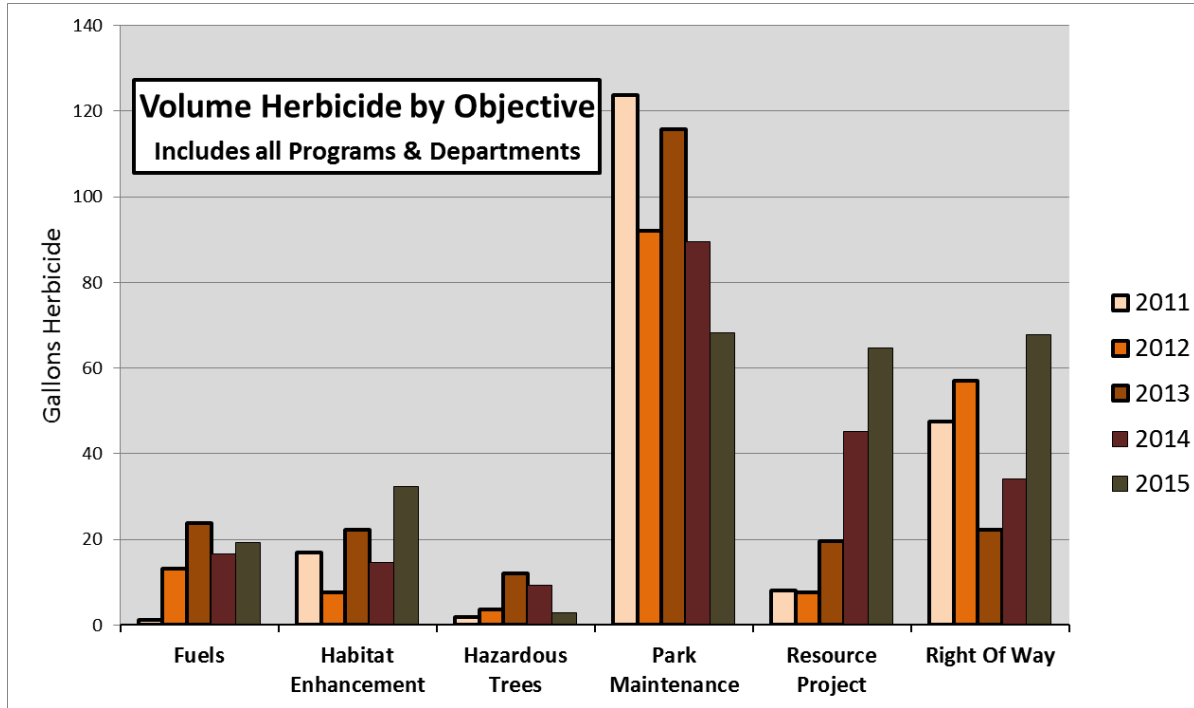


Figure 4. Herbicide use by purpose from 2011-2015. This chart does not include structural, golf course or organic farming data, each treated separately following.

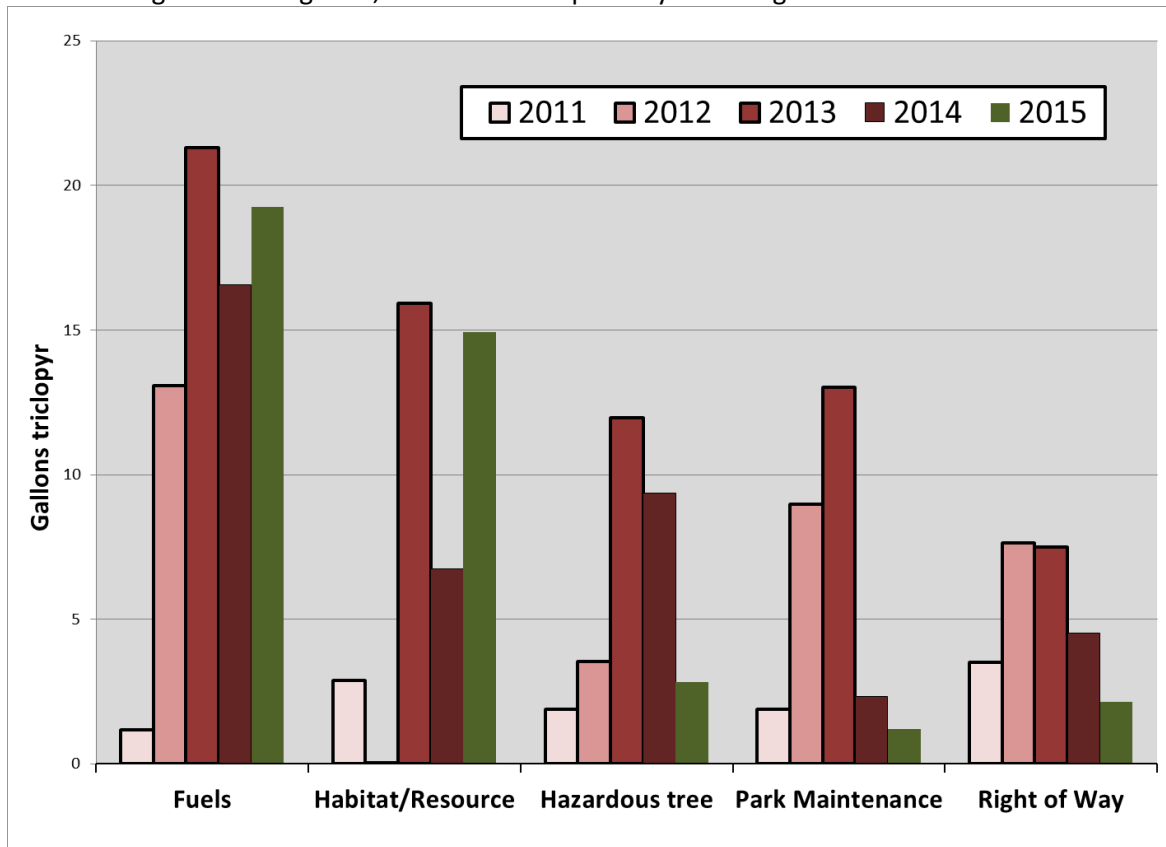


Figure 5. Comparative triclopyr use by objective 2011-2015.

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LONG-TERM AND DISTRICT WIDE TRENDS

Precipitation

RAWS (Remote Automatic Weather Stations) stations throughout the district were analyzed for precipitation patterns. The Briones RAWS weather station (37.934, -122.118; elevation 1450') was chosen as it most closely tracks the overall precipitation monthly averages calculated from all RAWS stations in the District. Precipitation totals for 2015 calendar year at 12.2 inches was well below average. However, precipitation total for the water year 2014/15 (September 2014-August 2015) at 18.89 indicates that the growing season received closer to average (BNE 18-year average of 22.56 inches). Using water year precipitation totals gives readers a more accurate description of the abiotic conditions controlling vegetation growth (figure 6). The degree and extent of this production determines the amount and type of vegetation management that is required in recreational areas. Pesticide use is reported by calendar year and in the past, precipitation was reported annually. This report, and subsequent reports, will present *water year* data in long term pesticide analysis as this more accurately reflects the primary control on vegetation growth (figure 6).

Reporting Statistics

In 2015, 32 parks and special units, 2 concessionaires and 8 staff resource projects submitted Pesticide Use Reports (PUR). Approximately 194 PURs were submitted by operations staff and IPM resource projects capturing 327 application events. IPM reported these PURs to the Alameda and Contra Costa County Agricultural Departments on a monthly basis. Several programs in the District contract out pest control services and contingent to their contracts must submit their PUR to IPM for annual reporting. In 2015, the fuels program submitted a total of 10 PURs for contractor applied herbicide in Tilden Park, Sibley and Carquinez Shoreline. Environmental Programs submitted 4 PURs for resource projects at Point Pinole and Diablo Foothills. Design and Construction submitted one PUR and contractors hired by operations submitted 3 PURs for right of way, 2 PURs for park maintenance work and one PUR for habitat enhancement.

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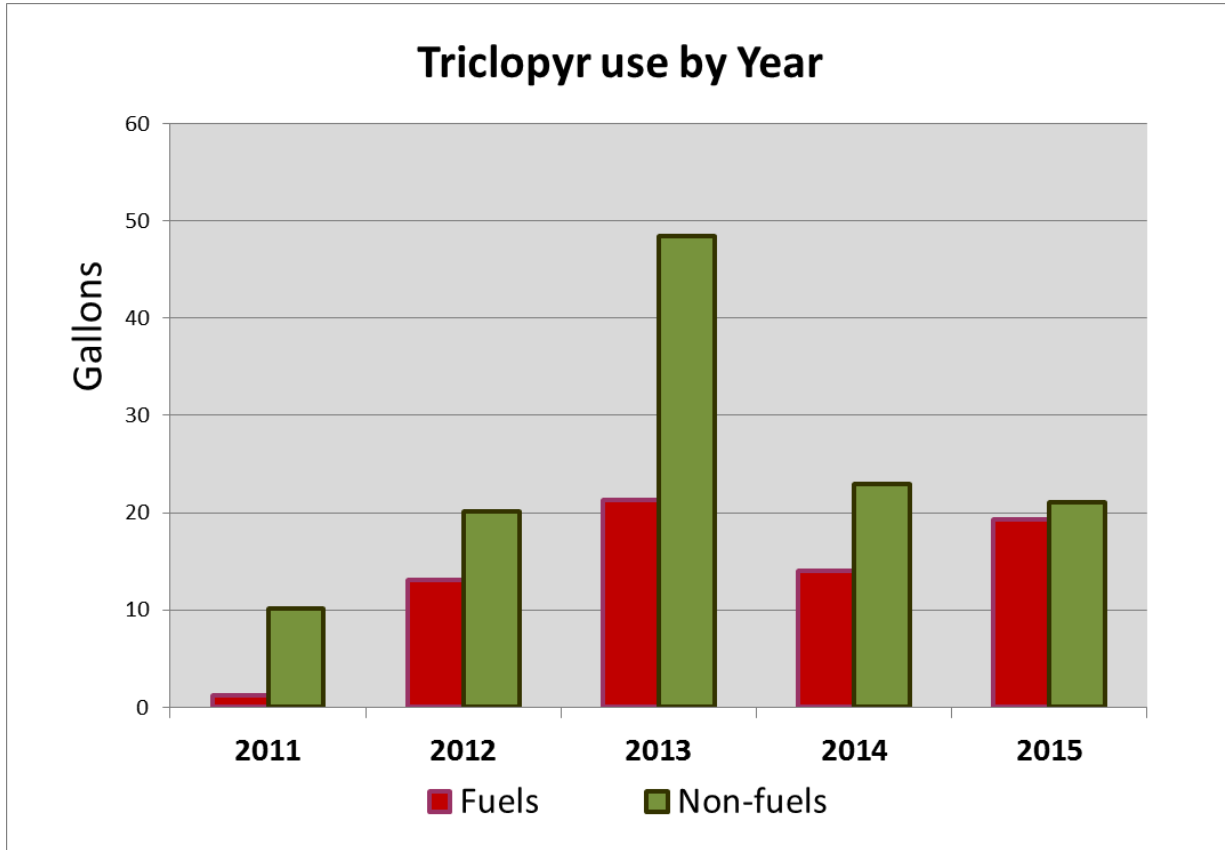


Figure 6. Fuels and non-fuels (operations, habitat enhancement, right of way and resource projects) comparison, 2011-2015.

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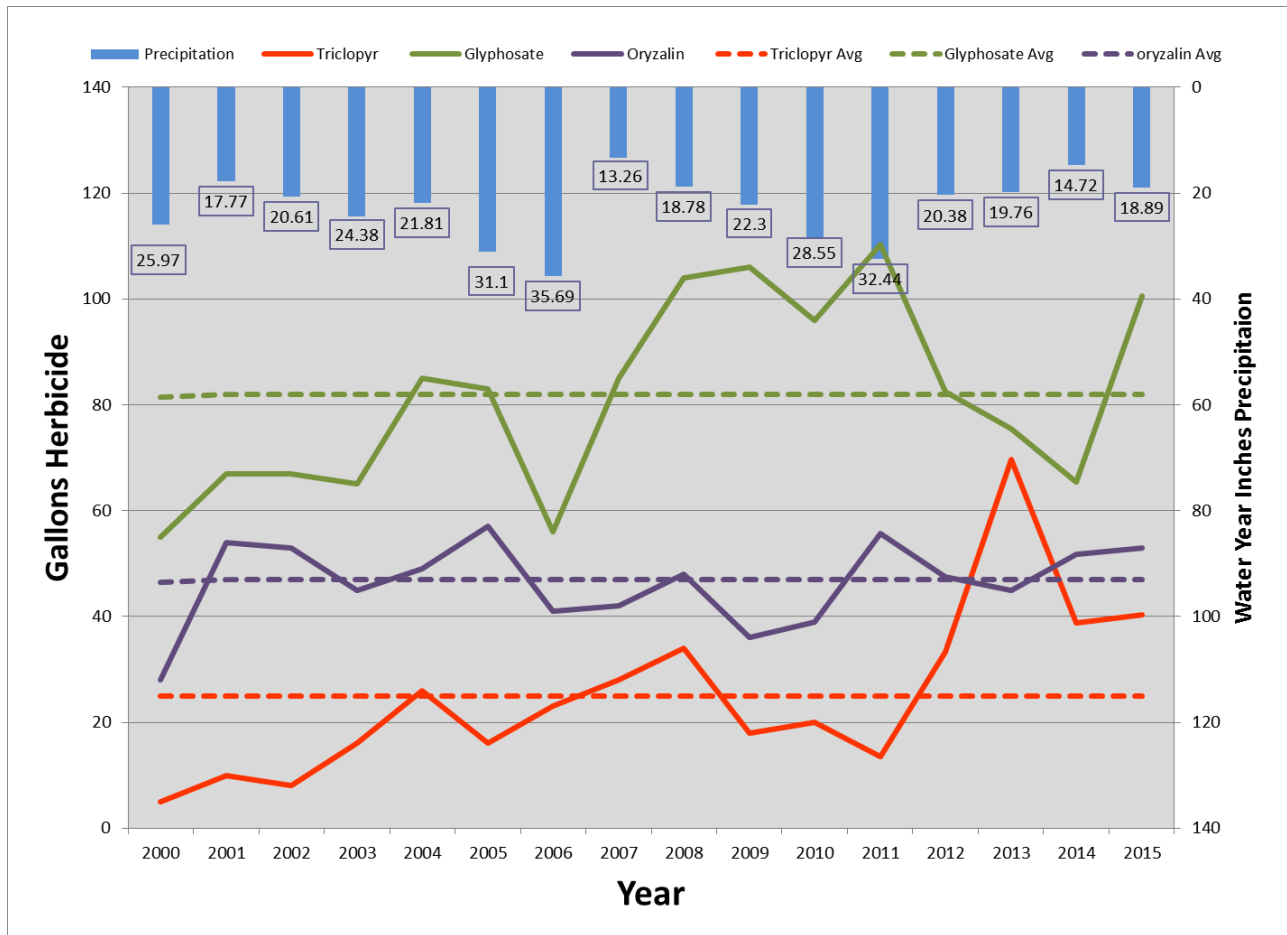


Figure 7. Herbicide use trends and their long term averages from 2000-2015. Also, graphed is the precipitation totals for the water year, i.e., September of the previous year through August of the reporting year. Note that in previous reports, precipitation data was reported by calendar year.

Acreage

The District has continued to grow significantly over the decades, to its current acreage of 119,890 acres at the end of 2015, an increase of 2,246 acres from 2014. From 2000 to present the District has increased by an average of 1,880 acres annually with the largest increases in the year 2009-2011. Figure 10 illustrates that despite the exponential growth in acreage, the District’s pesticide use has remained relatively stable.

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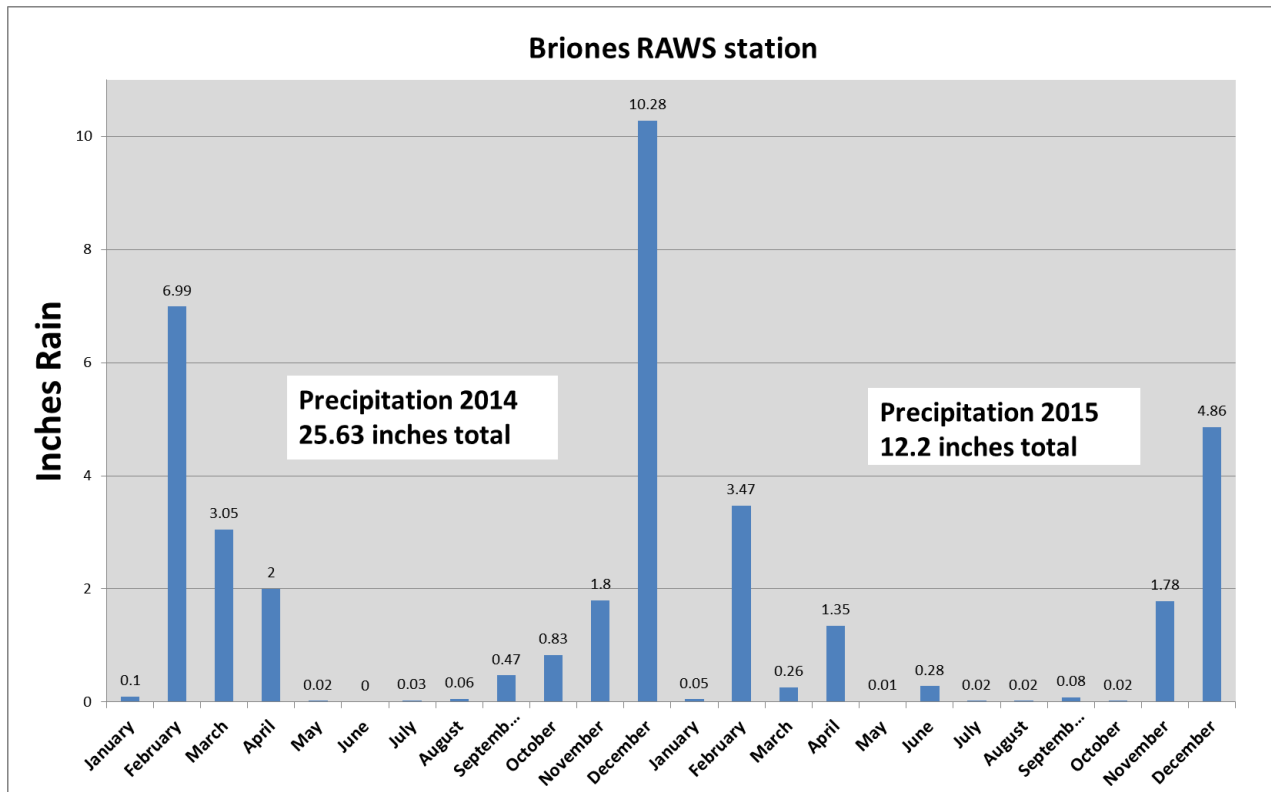


Figure 8. Monthly precipitation patterns at Briones 2014- 2015.

Pesticide Use Trends

Diphacinone, triclopyr, glyphosate and oryzalin use all increased in 2015 by 118%, 4%, 54% and 2% respectively. However, visual inspection of figures 7 (herbicide) and 9 (rodenticide) reveals that long-term trends fluctuate about the mean. This oscillation of pesticide use is to be expected given that use is driven largely by changes in annual precipitation that control vegetative growth. Pesticide use deviations from *long-term averages*, however, are quite different. For example, diphacinone use for 2015 is down 42% from its long term average, while triclopyr is up 62%, glyphosate is up 23% and oryzalin is up 14% from long term averages.

Despite the District's exponential growth, pesticide use remains relatively stable (figure 10). Triclopyr usage is the only exception to this, growing with the increase in funding for the District's fuels program. Overall, low pesticide use District wide is due largely to the fact that less than one tenth of a percent (0.01%) of the District is classified as developed and potentially subject to pest management activities. Additionally, pest management activities on developed properties are often subject to integrated approaches that include behavioral (education), cultural (burning), and mechanical (mowing, trapping, etc.). Further, herbicide treatments for areas outside of developed and recreational resources include treatment to control and eradicate noxious weeds, habitat enhancement and listed species recovery.

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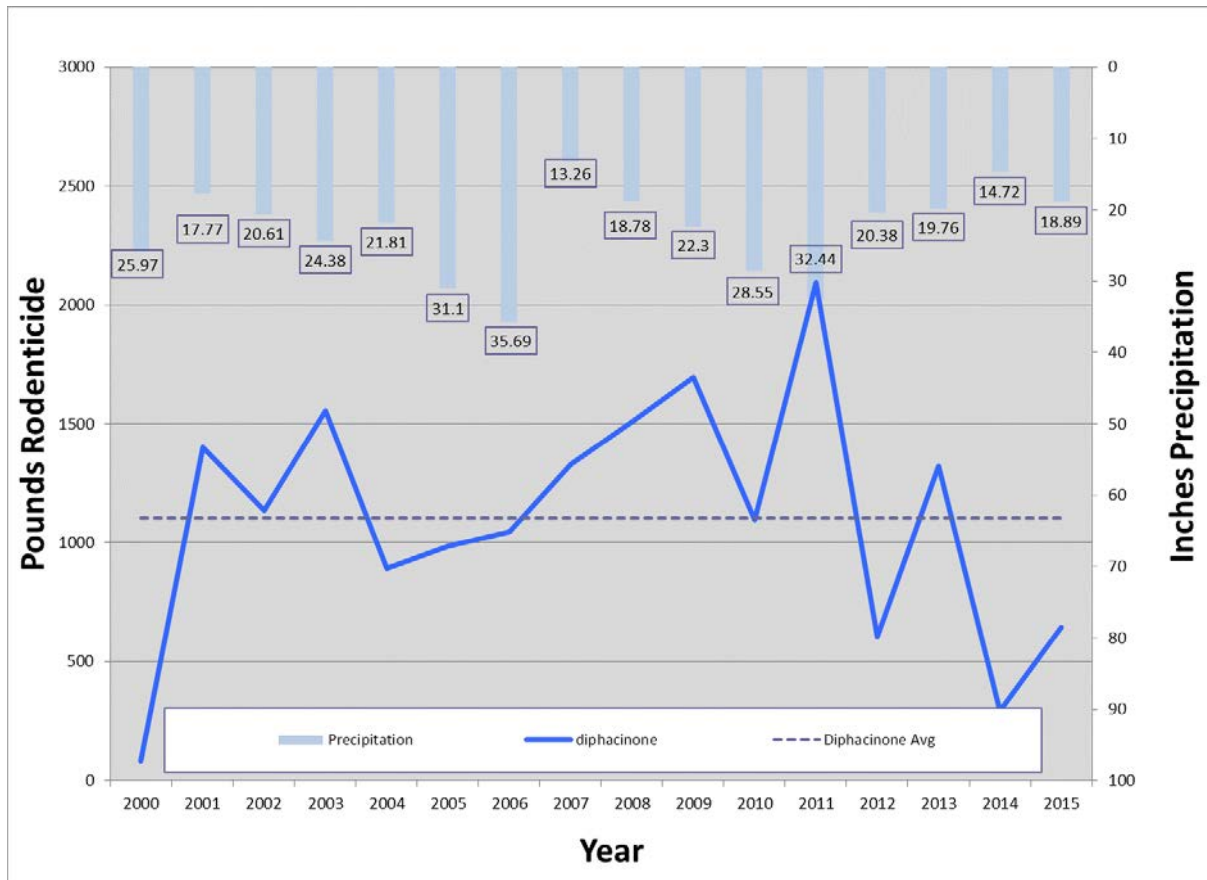


Figure 9. Rodenticide use trends and its long term average from 2000-2015.

Resource & Public Safety Projects

The District and IPM continue to lead and support a number of special resource projects with the intent of eradicating exotic invasive plants that degrade the quality of habitat in District parklands and helps facilitate endangered species recovery. Often, habit enhancement projects are purely mechanical, employing timed mowing, sheet mulching, torching etc. (Figure 11). At times, staff must resort to some general park use herbicides. The 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. Furthermore, the IPM program contracts with the Alameda and Contra Costa Departments of Agriculture to control pests that threaten buildings, park infrastructures and public health throughout District parklands. These county biologists and contractors assist park staff in the control of gophers, ground squirrels and yellow jackets. Following are narratives of these projects with pesticide totals for 2015 and previous years in table 2.

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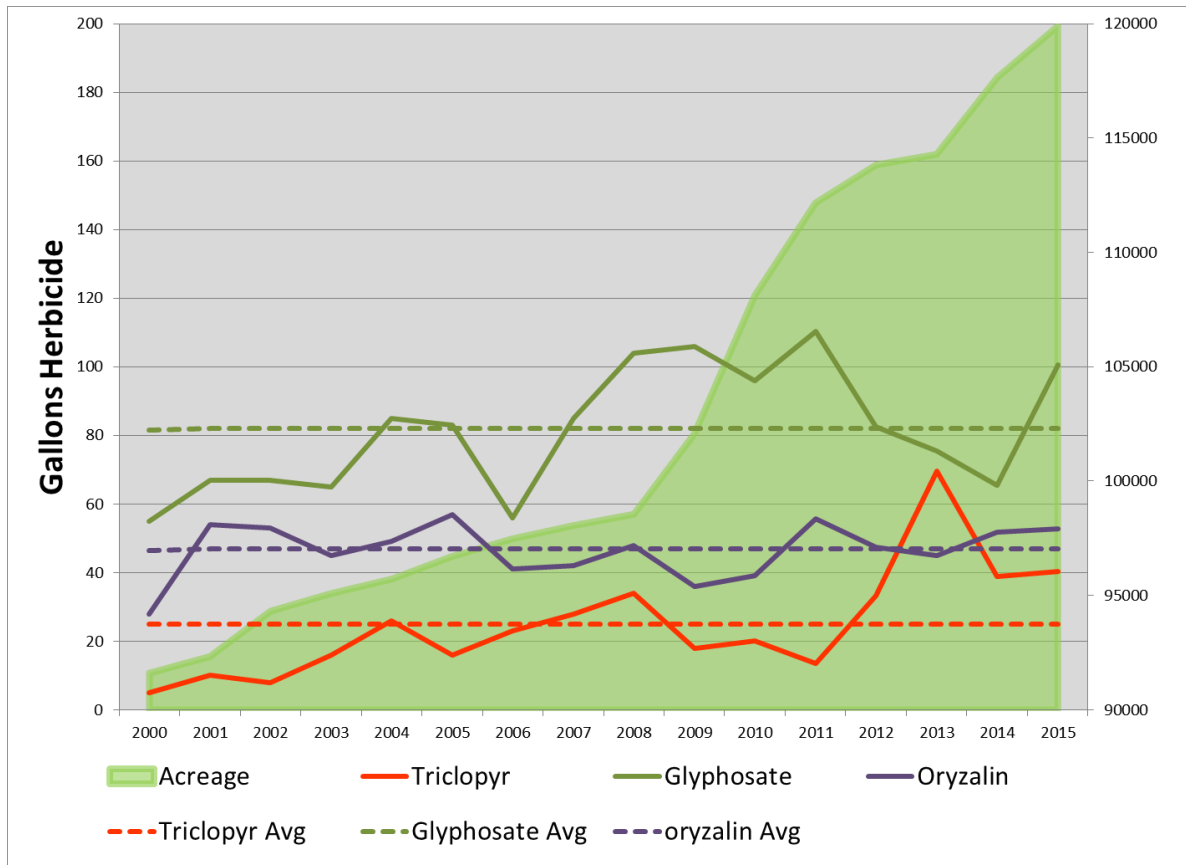


Figure 10. District acreage increase from 2000 through 2015 with respect to herbicide usage.

Operations continues to implement a number of 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, *Dittrichia*, 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. Park staff primarily utilizes herbicides from the general park use list. Operations and IPM programs are detailed below by pest species.

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Figure 11. IPM volunteer groups remove invasive broom and forget-me-nots by hand.

Vertebrate Control in High Use Turf

In 2015, Alameda County Department of Agriculture controlled gopher populations in several, high use lawns at Del Valle and Quarry Lakes in an effort to provide more stable playing surfaces, and reduce damage to turf infrastructure at these very popular parks (table 2). The use of aluminum phosphide and diphacinone in irrigated lawns by county biologists has proven to be an effective means of controlling this pest species while keeping the public safe during recreational activities. Crown Beach also contracted with the County to control ground squirrels along the rip rapped shoreline trails near the visitor center.

Least Tern Island Vegetation Management

The IPM department has worked with wildlife since 2008 in the management of various weedy species, most notably chamomile mayweed on Least Tern Island. These exotic weeds reduce the nesting area of the Least Tern, *Sternula antillarum browni* on a man-made island in the Hayward Regional Shoreline brackish water marsh complex. A mix of pre and post-emergent product applied by IPM staff maintain the low vegetative cover that this federally endangered species requires for successful nesting. 2015 brought another successful breeding season with increasing nesting success due to the cooperative vegetation management and predator reduction. Weed control was achieved using a specialized mix of pre and post emergent herbicides (Dimension Ultra, Milestone and Roundup Custom) to control invasive vegetation.

Barb Goatgrass and Medusahead

Barb goatgrass and medusahead threaten to reduce forage, native grass and forb diversity and ecosystem functions in grasslands. As a result, IPM decided to make control a top priority and completed its first treatment season in 2015. Our 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 110 acres in four parks in eastern Contra Costa and Alameda Counties and is anticipated to be elsewhere. It is

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commonly found along fire roads and all populations are located in grazing units. Considerable effort was put into mapping by academic interns over the last two years.

Treatment efforts focused in three parks, Round Valley, Morgan Territory Regional Preserve and the Galvin land bank in eastern Contra Costa County. A total of 20.5 acres were treated using an integrated strategy. Contractors, supervised by IPM, line trimmed and mowed pest grass populations at the flowering stage (Figure 12). Follow up spot herbicide treatment with glyphosate at 2% followed approximately 3-4 weeks after initial treatment. At this time most plots showed over 70% reduction of pest species after initial treatment. With follow up herbicide treatment, all plots are predicted to experience 70-100% reduction of seed production in these treatment areas.



Figure 12. IPM contractors line trim medusahead and barb goatgrass at flowering stage.

Invasive Spartina

The Invasive Spartina Project (ISP) completed its 12th consecutive season of treatment with a net treatment of 2.0 net acres with 21.3 gallons of Polaris (imazapyr) primarily at Martin Luther King, Jr. Shoreline and Hayward Regional Shoreline. Treatment acres are down by 0.2 acres from the previous year. This data reflects the actual net coverage of the non-native spartina and its hybrids and is supplied by the ISP. 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 California clapper rail. However, federally mandated no-treat zones for Ridgeway'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

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adjacent to District property and all of the no-treat zones are on District property. By the end of 2014, we are at a 29 net acre infestation, down from 805 acres in 2005, an amazing accomplishment.

Pampas Grass and Dittrichia

IPM and park staff at Lake Chabot worked cooperatively on their second season of pampas grass and stinkwort (dittrichia) control. In the 2015 treatment season, the entire infestation around the perimeter of the lake was treated with a combination of chemical and mechanical hand pulling of stinkwort. Other parks that treated pampas grass and stinkwort with IPM support include Martin Luther King Jr. Shoreline, East Contra Costa County Trails, Pleasanton Ridge and Las Trampas. Diablo Foothills continued to use grubbing on stinkwort and Miller Knox supported volunteer pulling at East Shore State Park.

Euphorbia

Tilden Park and Anthony Chabot continued to treat Euphorbia adding more glyphosate products to their strategy. After two years of pulling staff determined that the amount of impact and work required was not sustainable and opted to use more chemical control. 21.54 acres were spot treated with 2.7 gallons of glyphosate product. Volunteers at Redwood Regional Park continue to hand pull euphorbia along East Ridge Trail.

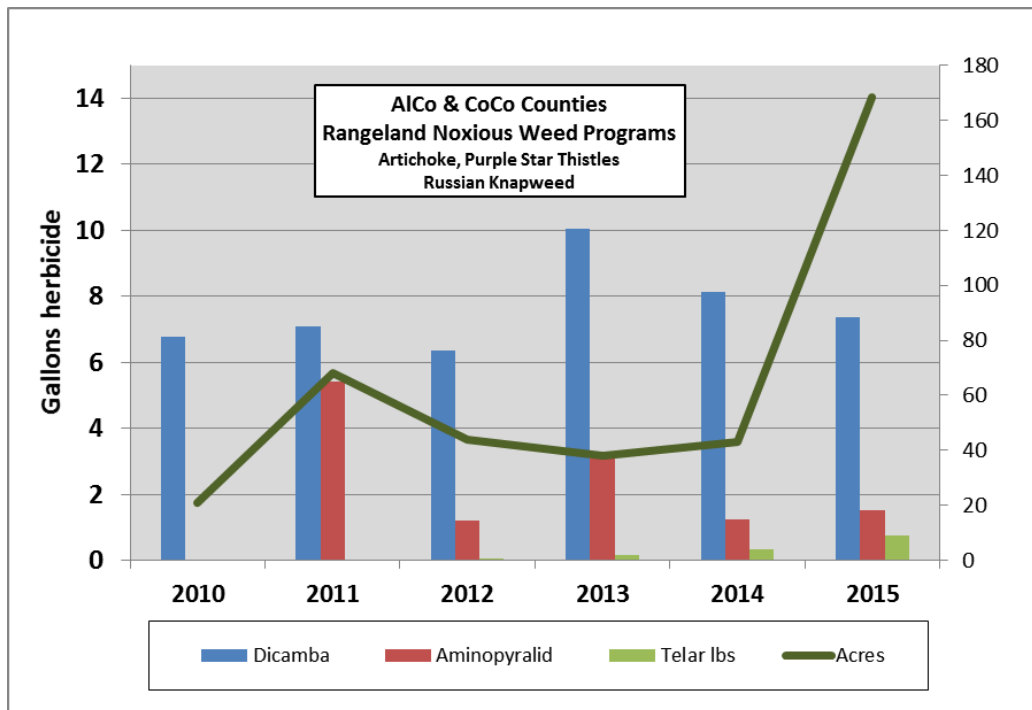


Figure 13. Priority resource management project for rangeland noxious weeds: artichoke, purple star thistles, perennial pepperweed, hoary cress, Russian knap weed, etc.

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Yellow Star Thistle

IPM and operations successfully treated 1000 acres with Milestone (aminopyralid) in several grazing units that were heavily infested with yellow star thistle. Success was estimated at 95% or more based on an ocular estimate, providing a striking visual impact to park visitors as well as release from competition for many native forbs and grasses. Park staff in several parks that include Del Valle, Sunol, Lake Chabot and Point Pinole, have active yellow star thistle control programs using Milestone. These parks treated this state listed noxious weed chemically and mechanically (mowing and line trimming where feasible) throughout 2015. East Contra Costa Trails targeted yellow star thistle in several problem areas along trails with glyphosate and pre-emergent herbicide, oryzalin. Lake Chabot continued to use the remaining Transline (clopyralid) stock on hand as we transition to the more effective Milestone. See table 2.

Noxious Rangeland Weeds

The IPM department works 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. See table 2 for more information. 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 continues to benefit and protect the federally listed Santa Cruz Tar plant (*Holocarpa macradenia*) as well as many other non-listed native plants and grasses. A total of 168 acres were surveyed and treated in both counties for these priority noxious rangeland weeds. Total treatment areas continue to increase due to the acquisition of several key properties in Contra Costa County that occurred in late 2013-14 as well as more focused surveys and investigation (Figure 13). Point Pinole continued its comprehensive attack on Teasel in coastal prairies.



Figure 14. IPM treatments utilized the park helicopter, Eagle, to long line supplies into a remote location of very thick artichoke thistle.

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Blue Green Algae

IPM and Water Management staff worked cooperated frequently to tackle high levels of microcystin in Lake Temescal during the 2015 summer swim season. Staff used substantially less Pak 27, a hydrogen peroxide derived algaecide product that is commonly used in the treatment of drinking and recreational waters in 2015. After many attempts to control the high microcystin levels in 2014 with considerable reduction, staff was unable to reach regulatory levels. As a result, efforts in 2015 were focused more on long term resolution to high nutrient levels that lead to blue green algae bloom.

IPM and water Management also continue to collaborate with California State University East Bay groundwater experts and graduate students on study to determine the source of phosphorous in Lake Temescal (Figure 15).

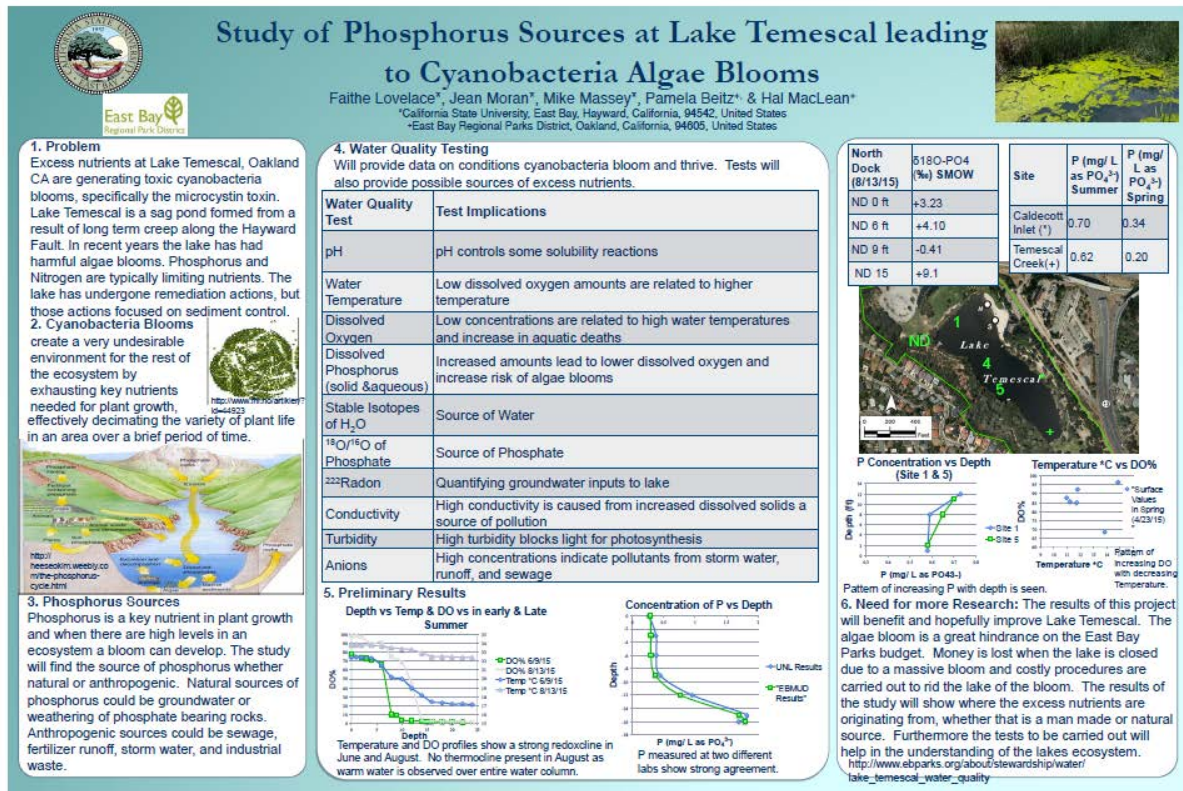


Figure 15. Graduate student Faithe Lovelace’s poster with initial findings on Lake Temescal.

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Pesticide	Active Ingredient	Applicator	Type	Signal Word	Pest	Parks	Purpose	2011	2012	2013	2014	2015
Aluminum phosphide		Counties	Rodenticide	Danger	Gophers	Del Valle, Camp Arroyo, Quarry Lakes, Shadow Cliffs	Safety	7 lbs	17 lbs	11 lbs	9.66 lbs	6.39 lbs
	Dimension 40WP	Stewardship	Herbicide	Caution	Mayweed	Least Tern Island	Endangered species habitat enhancement		15 oz	24 oz	15 oz	10 oz
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
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
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
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
Garlon 3A & 4 Ultra	triclopyr	Stewardship Contractors	Herbicide	Warning	Dittrichia	Lake Chabot	Habitat Enhancement				5.2 gal	7.4 gal
Polaris	Imazapyr	Staff & IPM	Herbicide	Caution	Pampas grass, dittrichia	MLK, Lake Chabot	Habitat Enhancement				1.2 gal	10.9 gal
Pak 27	Sodium Carbonate Peroxyhydrate	IPM & Contractors	Algaecide	Danger	E. coli, Blue green algae	Temescal, Shadow Cliffs	Public Safety				3750 lbs.	50 lbs.
Glyphosate		IPM & Contractors	Herbicide	Caution	Medusahead, barb goatgrass, LT island, dittrichia	Round Valley, Morgan Territory, Hayward Shoreline	Endangered species, habitat enhancement					3.1 gal

Table 2. Pesticide use for special needs and resource projects 2009-14.

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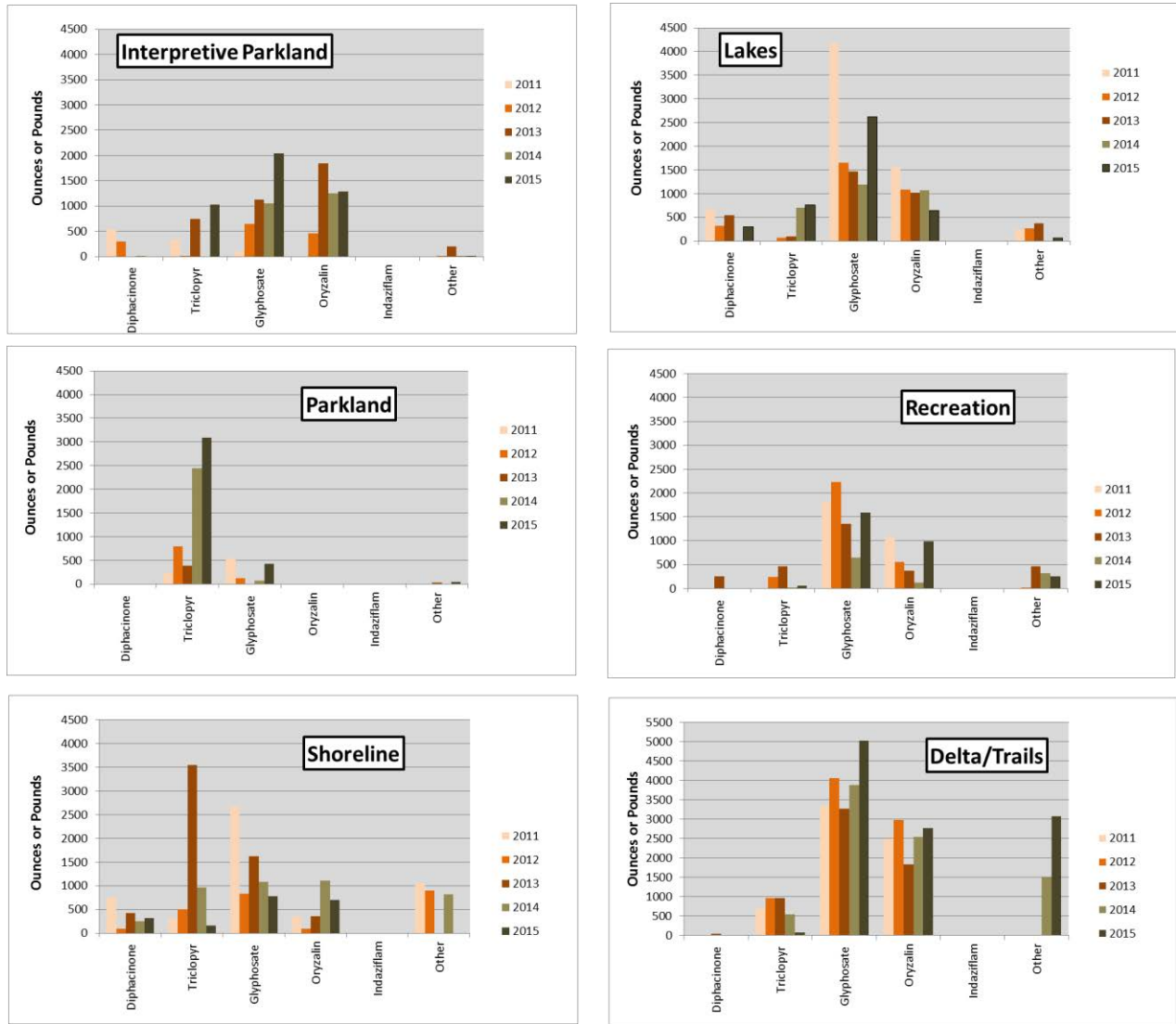


Figure 16. Detailed herbicide use by organizational unit 2011-15.

Structural Pesticide Use

IPM began tracking structural pest control contractors and the products and amounts that they use in 2015. IPM has also developed an Approved List for Structural Pest Control that lists which products structural pest contractors can use beginning in 2016. Of note, anti-coagulants are no longer permitted in structural pest control. Two contractors applied pest control products to control nuisance rodents and insects to a number of District offices, buildings and residences in 2015. The bulk of pesticides used were insecticides for ant and termite control. Table 3 compiles these products and amounts by active ingredient. The District's structural contracts are limited use which means they utilize the

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most environmentally safe products. Rather than herbicide, contracts use hand pulling, grubbing and torching (figure 17).



Figure 17. A gardener uses a propane torch to control weeds in the main office landscaping.

	Insecticides									Rodenticide	
	Chlorfenapyr oz	Indoxacarb oz	Indoxacarb lbs	Deltamethrin oz	Permethrin oz	Pyrethrin oz	Methoprene, permethrin, piperonyl oz	Pyrethrin, piperonyl oz	Bifenthrin oz	Cholecalciferol oz	Bromadiolone lbs
2015	4.25	18.5	0.12	11	8.5	8	16	16	38	457	0.1

Table 3. Structural pest control products listed by active ingredient that were used on District buildings in 2015.

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Organic Farming Use

	Insecticides						Fungicides			
	Iron Phosphate lbs	Pyrethrins gal	Potassium Salts oz	Diatomaceous Earth lbs	Bacillus thuringiensis lbs	Azadirachtin oz	Knotweed oz	Sulpher lbs	Bacillus ssp. Lbs	Spinosad oz
2015	200	15.5	70.7	50	38	2.8	56	250	56	4

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

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 2015.

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Integrated Pest Control by Park or Program

Anthony Chabot

Staff targeted several species in 2015 that included eucalyptus, poison oak, *euphorbia oblongata* (Oblong spurge), yellow star thistle, *Dittrichia graveolens* (stinkwort), teasel, various thistles, French broom and cape ivy. Poison oak was controlled successfully from encroaching on trails and the campground using a combination of herbicide, hand tools and the woods mower. All hazardous eucalyptus trees that were removed from the campground and other recreational facilities were treated with Garlon 4 to reduce or eliminate resprouting. Yellow star thistle was not as responsive to the Milestone treatment as was hoped, but other thistle species were effectively controlled along trails and roads. Staff reported that RoundUp treatment of *Euphorbia oblongata* was up to 90% successful. Retreatment plans for 2016 are underway. Park staff hand pulled stinkwort from along the sides of road and the campground. Staff line trimmed around gates, sign posts, tables, barbeques and fence lines throughout the park and campground.

Ardenwood Farm

Contractors controlled weeds in the picnic areas, parking lots and railways with Roundup Pro Max, Milestone and Spect(i)le Flo. Park staff baited with diphacinone treated oats for ground squirrel control in spinach field flats and controlled poison oak with Roundup Pro Max. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park.

Black Diamond Mines

Staff applied Roundup and Surflan to parking lots, the corporation yard, residences and trail sides for right of way to control nuisance weeds and grasses. They also continued to use triclopyr to control invasive Tree of Heaven and RoundUp for yellow star thistle. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park.

Botanical Garden

The Botanical Garden continues to rely heavily on hand pulling and mulching to control weeds. Staff gardeners applied very small amounts of Roundup Pro Max to control woody perennial weeds and tree sprouts such as Himalayan black berry, poison oak, etc.

Briones

Staff applied Roundup and Surflan to control broadleaf weeds and annual grasses in gravel parking lots, fire trails edges and staging areas. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

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Camp Arroyo

In order to discourage ground squirrel and consequent rattlesnake activity around camp cabins, recreational areas and offices, Rangers at Camp Arroyo used Roundup Pro Max and Surflan to control vegetation. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park.

Concessionaires

Golden Gate Live Steamers used small volumes of glyphosate products to control weeds along tracks, trails and around buildings.

Contra Costa Trails

Park staff applied Roundup and Surflan to control of weedy annuals for right of way, recreational use on multiple regional trails. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Contra Loma

Staff applied RoundUp and Surflan for park maintenance and right of way around buildings, along trails and in picnic areas. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Coyote Hills

Staff applied a very small amount of Roundup and Surflan to control poison hemlock, mustard, stinging nettles and other nuisance weeds along fence lines, picnic areas, benches, roads and trail sides. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

Crown Beach

Park staff applied Roundup to control problem weeds around picnic areas, tables, parking lots and curbs. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Cull Canyon

Park Staff used Roundup and Surflan to control nuisance weeds around picnic tables, in overflow parking lots, around buildings, fences, etc.

Del Valle

Park staff applied Surflan and Roundup around various elements throughout the picnic areas, recreational areas and campgrounds. These include tables, fire pits, curb stops, overflow and gravel parking lots, maintenance structures, roadsides, etc. Lake Del Valle staff followed up herbicide treatment of nuisance weeds in the campground, around buildings and picnic areas with hand pulling, rough mowing and line trimming. Park staff removed stinkwort by hand throughout the Campground and used herbicide as a follow-

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up treatment. Staff provided mechanical control with hand pulling of late season yellow star thistle seedlings after early herbicide treatment. Additionally, staff hand pulled various thistles throughout the park and campground, including purple star, bull, and Italian and milk thistles. Staff also line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

A Contractor continued to treat yellow star thistle and other thistle infestations with Milestone throughout the campground. Biologists from the Agricultural Department controlled vertebrate pests in high use turf areas aluminum phosphide. Park staff supplements county gopher control with trapping throughout the year.

Design & Construction

Design and Construction submitted one PUR for a turf rehabilitation project at Miller Knox for glyphosate.

Diablo Foothills

Environmental Programs continued their treatment of noxious rangeland weeds (artichoke thistle, teasel, mustard, etc.) using Milestone, Telar at Diablo Foothills Park. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed. Park staff used Roundup to control broadleaf and grass weeds in Castle Rock. Rangers also treated stinkwort around the office and near the barn. Diablo Hills & Castle Rock_Park staff utilized mechanical methods to treat the following:

Pest	Staff Hours	Volunteer Hours	Methods
Yellow star thistle	17.5		Line trim, hoe
Various thistles (artichoke, Italian, bull, milk)	39.5	125	Hoe, line trim, mow
Mustard ssp.	25		Hoe, line trim
Stinkwort	37.5		Hoe
Horehound	14.5		Hoe
Medusahead	42.5		Line trim
gophers			Traps

Don Castro

Don Castro utilizes an integrated approach that include hand pulling, torching, mowing and mulching its nuisance weeds to minimize herbicide use. Staff also line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed. Additionally, park staff traps all of its gophers and utilizes yellow jacket traps to control wasps early in the season. Park staff applied a small amount of Roundup around parking lots, picnic areas, and trail sides to control

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nuisance weeds. Staff also used gas cartridges to control gophers in turf around and in the swim complex and Garlon on a broom along trails.

East Contra Costa Trails

Staff used consistent amounts of glyphosate and Surflan for control of weedy annuals for right of way, recreational use on multiple regional trails, vegetation control along fence lines and gravel parking lots. Rangers also targeted pampas grass and yellow star thistle in several problem areas with Roundup. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Fuels

The Fuel Break Maintenance Program is currently under the management of the District's fire department. Herbicide use consists primarily of Garlon applications to eucalyptus stumps, sprouts and other hardwood resprouting species along the Wildland Urban Interface. Fuels contracts occurred in Tilden, Redwood, Sibley and Carquinez Shoreline Parks in 2015. All treatments involved Garlon application directly to stumps or sprouts of eucalyptus species for total of 19.2 gallons over 56 acres.

Garin/Dry Creek

Park staff used a low volume of Roundup and Surflan to control nuisance weeds around interpretive displays, parking lots, picnic sites, infrastructure, etc. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

Golf Courses

Table 4 lists the all fungicides, herbicides and plant growth regulators and rodenticides reported by both golf courses from 2011-2015.

Redwood Canyon Golf Course (formerly Willow Park)

Touchstone Golf, took over the contract for Willow Park Golf Course on Redwood Road in Castro Valley and renamed this public course Redwood Canyon Golf Course (RCGC). When the previous concessionaire vacated, no Pesticide Use Reports were left. Typically, this course utilizes low amounts of fungicides on its tees. RCGC reported for the months of October and December after their contract began. Relatively low volumes of fungicides and no rodenticides or herbicides were reported by RCGC.

Touchstone Golf is in the process of retaining environmental stewardship with Audubon International. They have naturalized areas that are out of play and creating a buffer zones along the banks of the creek and its tributaries on the property. Touchstone is working with IPM to develop an integrated program that minimizes pesticide use.

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Tilden Park Golf Course

Under the new management team of American Golf, the Tilden Golf Course superintendent has changed its fungicide regime and removed several higher impact pesticides and fertilizers. Additionally, the superintendent converted 10 acres of turf to a naturalized buffer zone for Wildcat Creek, saving water and intercepting nutrients. Insecticides have been removed from the approved product list, herbicide applications have been limited to spot spraying and many Prop 65 fungicides have been removed from the approved list. TGC exclusively trapped gophers and moles rather than utilizing rodenticides.

Tilden Park Golf Course uses primarily fungicides that protect putting greens from fungal disease. Cultural management strategies do not provide adequate prevention and control of the many diseases that can affect high use turf grasses. The average golf course has 3 acres of putting greens where the majority of pesticide use occurs. Tilden has natural soil greens that were constructed in the 1930's and has 100 percent *Poa annua* grass as the putting surface. *Poa* is a very aggressive natural grass but unfortunately is susceptible to many diseases. Tilden's strategy is to diversify the types of fungicides used in order to deter resistance development.

Tilden Park Golf Course uses plant growth regulators on tees and greens to suppress seed production of *Poa annua*. This reduces maintenance and increases quality of the putting greens.

Tilden Park Golf Course utilized glyphosate products for tree wells and rough areas while Powerzone controlled English daisy on the fairways.

Hayward Shoreline

Rangers applied Roundup Custom to control nuisance weeds along levee trails and problem areas of pampas grass and stinkwort. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Kennedy Grove

Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed. Staff used Garlon to control resprouting hazardous eucalyptus species around recreational areas. Kennedy Grove/Sobrante Ridge detailed their mechanical/cultural control of invasives, nuisance and right of way weeds with the following:

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Pest	# of plants/area	Methods
Yellow star thistle	2,000 sq. ft.	Sheet mulch
Yellow thistle star	3 cu. Yds.	Hand pull
Stinkwort	1 cu. Yd.	Hand pull
Thistle ssp.	1 cu. Yd.	Hand pull
Poison Hemlock	1 cu. Yd.	Hand pull
Various weeds	2 miles trail	Flail mow
gophers		Snap traps
Yellow Jackets		Traps

Lake Chabot

Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed. Park Staff applied RoundUp around picnic sites, parking lot islands, staging areas, trail edges, buildings and infrastructures. Additionally, rangers targeted milk thistle, stinkwort, teasel and pampas grass in grasslands and lakeshore areas with RoundUp, Transline and Garlon. Park staff complemented the IPM program targeting stinkwort and pampas grass by hand pulling in satellite areas, along trails and lake shorelines. Staff also mowed and line trimmed an expanding medusahead population along Nike road.

Las Trampas

Staff applied Surflan and RoundUp to control various weeds along roads, staging areas, buildings and parking lots. Additionally, rangers targeted a large patch of stinkwort with RoundUp. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

Martin Luther King, Jr. Shoreline/Oyster Bay

Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Park staff controlled ground squirrels with diphacinone baiting in and around lawn areas and trail edges at Oyster Bay.

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, spreading mulch, planting, and removing trash detailed here:

Total Hours	# Volunteers	#Native plants planted	Pounds invasives removed	Gallons of invasives removed
4360	1646	1521	850	1278

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Miller Knox

Rangers applied Roundup and Surflan to control nuisance weeds along trail sides and parking lots. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Pleasanton Ridge

Park staff treated staging areas and fence lines with Surflan and RoundUp to control nuisance weeds. Rangers also targeted nuisance patches of stinkwort with Garlon and Milestone. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

Point Pinole

Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Contractors treated picnic areas trail sides and fence lines with Surflan and RoundUp for nuisance weeds throughout the park. Staff controlled poison oak, eucalyptus sprouts, fennel and teasel with Garlon. Rangers treated yellow star thistle with RoundUp and gophers in turf areas with gas cartridges.

Point Pinole Regional Shoreline continued its robust mechanical weed control and habitat restoration efforts in 2015. The table below highlights many of their accomplishments:

Pest	# of plants/area	Methods
Eucalyptus seedlings	691	Hand pull, weed wrench
broom	48	Weed wrench
yellow star thistle	48 plants	Grub
stinkwort, Mare's tail	20 cu. ft. & 0.3 miles of trail	Hand pull
Oblong Spurge	70 sq. ft	Hand pull, 2 follow ups
Medusahead	20 cu. Ft.	Line trim
Fennel	4 acres	Cut set heads
Baccharis		Hand cutting & bark stripping

Quarry Lakes

Biologists from the Agricultural Department controlled vertebrate pests in high use turf areas aluminum phosphide and diphacinone treated bait. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

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Roberts

Staff applied Roundup to control nuisance weeds in and around the ball field and picnic sites. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Shadow Cliffs

Park Staff treated broadleaf and grass weeds with RoundUp and Surflan in the picnic areas and overflow gravel parking lots. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads were mowed and line trimmed.

Sibley/Huckleberry

Rangers treated eucalyptus and resprouts with Garlon. Sibley Volcanic Preserve hosted many events over the 2015 season, pulling broom, thistles and other harmful invasive plants. Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

Temescal

Park Staff treated broadleaf and grass weeds with RoundUp, Surflan and Garlon in the parking lots, planted medians and trail edges. Staff line trimmed around gates, trails, sign posts, tables and fence lines throughout the park.

Tilden

Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

Tilden rangers utilize a variety of mechanical methods including hand pulling, grubbing, torching, hoeing, line trimming, weed wrenches, etc. in landscaping areas as well as noxious weeds in wildlands. Rangers assist volunteers who work monthly in Tilden targeting broom, cape ivy, among other harmful invasives. All right of way work along trails was accomplished mechanically (line trimmer, hand pruners, etc.). Park Staff treated eucalyptus stumps and sprouts with Garlon and euphorbia with RoundUp.

Vasco Hills Parks

Staff line trimmed around gates, sign posts, tables and fence lines throughout the park. Fire roads and group campsites were mowed and line trimmed.

Park Rangers targeted various populations of stinkwort and nuisance weeds in staging areas with RoundUp and Surflan.

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General Park Use Pesticide Descriptions

Glyphosate is a broad spectrum, non-selective post-emergent herbicide used in landscape, right-of-ways and open space. Products in this category include: Roundup Pro (EPA Reg. No. 524-475), Roundup Custom (formerly Aquamaster) (EPA Reg. No. 524-343), Roundup Pro Max 524-579. Most inventory left of Roundup Pro (EPA No. 524-475) has been phased out for the slightly more concentrated Roundup Pro Max.

Oryzalin is a broad spectrum, somewhat selective pre-emergent herbicide used in landscape and right of ways. Products in this category include Surflan AS (EPA Reg. No. 70506-44). This product is being replaced with the 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 Spectacle FLO (EPA Reg. No. 432-1518). This product is anticipated to be reported the 2015.

Triclopyr 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), Garlon 3A (EPA Reg. No. 62719-37) and Pathfinder (EPA Reg. No. 62719-176).

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%) manufactured by Alameda County Agricultural Department (CDFA Reg. No. 10965-50001) and Ditrac (EPA. Reg. No. 12455-80).

Special-Use Pesticides Descriptions

Aluminum phosphide is a rodenticide products with this active ingredient include Fumotoxin (EPA Reg. No. 72959-1) and Phostoxin (EPA Reg. No. 72959-4)

Dimension 40WP is a pre-emergent (EPA Reg. No. 62719-445) pyradine pre-emergent herbicide

Milestone is a selective herbicide (EPA Reg. No. 62719-537) active ingredient aminopyralid that targets certain families of broadleaved weeds.

Transline (EPA Reg. No. 62719-259) is a selective, broad leaf herbicide whose active ingredient is clopyralid and is used to control tough perennial and annual invasive weeds.

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Polaris is a broad spectrum, post-emergent herbicide (EPA Reg. No. 228-534) whose active ingredient is imazapyr.

Dicamba is a broadleaf, selective, post-emergent herbicide in the chlorophenoxy family used principally for rangeland noxious weed. Products in this category include Vanquish (EPA Reg. No. 228-397) and Clarity (EPA Reg. No. 7969-137) and are applied by Contra Costa County noxious weed programs.

Pak 27 (EPA Reg. No. 68660-9-67690) is an algaecide and derivative of hydrogen peroxide that is commonly used to treat blue green algae in reservoirs and lakes.

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Course	Year	Fungicides gallons																		
		Chlorothalonil (gal)	Chlorothalonil/Propiconazole	Propiconazole	Confront (Triclo/Clopy)	Iprodione	Metenoxam	Fluzinam	fluxapyroxad	myclobutanil	Tebuconazole	Thiophanate-methyl	Triticonazole	PCNB	Fosetyl-Aluminum lbs	Mancozeb lbs	azoxystrobin lbs	Metaconazole lbs	Polyoxin D Zinc lbs	
WPGC	2011	9		1												96				
	2012	30			0.5											120				
	2013		7.5	1.25												72				
	2014		10.43			5										120				
RCGC	2015			2.11			0.35	0.30								32				
	2011	45		16					3.4					5	63	146	30	3		
TGC	2012	44		2									5	48	132			1		
	2013	20	5	2		10							13	66	192					
	2014	16.5	5	4		8							13	66	36					7.2
	2015	45		7		15								66	186					
											2	11			66	35				

Table 3. Comparative pesticide use at District Golf Courses 2011-15.

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Course	Year	Growth Regulators		Rodenticides			Herbicide gallons						
		Ethephon gal	Trinexapac-Ethyl gal	Gopher Getter Type 2	Aluminum Phosphide lbs	Talpirid g	Lontrel (clopyralid)	Powerzone	Vanquish (Dicamba)	Orazalin 4 Pro	Copper Sulfate lbs	Glyphosate	Quindorac
WPGC	2011					76				0.09			
	2012			120		90	0.05		0.38		0.16		
	2013			266		176							
	2014			215		20	0.05				35		
RCGC	2015												
TGC	2011	15	3.4		2			6.41				0.13	0.18
	2012	20	2										
	2013	20	0.41					17.80				22	
	2014	20	0.84					3					
	2015	25	5.45					11.59				2.78	

Table 4. Comparative pesticide use at District Golf Courses 2011-15.

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Evaluation and Conclusion

The bulk of pesticide use is typically for park maintenance. However, in 2015, overall herbicide use for park maintenance, resource projects and right of way were roughly equal. Park maintenance herbicide use was down from 2014 amounts and resource and right of way uses went up. The overall chemical control of pest species has remained relatively constant over the last decade with respect to the long-term mean. The change in relative frequency of use by objective may be due to increased education of park staff that results in more accuracy in reporting. Most importantly, despite continued growth in acreage and opening of land bank areas, chemical control has stayed relatively stable. The bulk of pesticide use (glyphosate and Diphacinone) is largely driven by moisture inputs in the form of winter rains. Oryzalin use, a pre-emergent whose rate is determined by area, is driven by the amount and size of recreational areas that require vegetation management. Thus, use of oryzalin or a similar and less toxic new product will remain relatively constant and increase slowly with the acquisition and development of new and land banked properties. Triclopyr use will continue to grow as fuel reduction activities increase. Over the very long term, once fuel reduction levels are achieved and maintained, triclopyr use should decrease and remain relatively consistent.

The IPM department has replaced several older pesticides with newer, safer and more effective chemicals in 2015. IPM will continue to replace less effective and safe products in the coming years. IPM expanded its worker safety training to a more comprehensive IPM training and will continue to offer mechanical control trainings that include working with volunteers, vertebrate trapping, invertebrate control, etc.

District park staff does an excellent job of balancing the physical demands of park maintenance and land management while ensuring a safe and enjoyable environment for park users and healthy habitat for the flora and fauna that attract so many visitors to district parklands. The IPM department is proud to assist the hardworking park staff serving the diverse public that recreates in the East Bay Regional Park District.

WORKING GOALS AND COMMITMENTS

1. Continue to replace older pesticides with more effective, less toxic products.
2. Continue to update the District's IPM policy.
3. Continue to provide annual pesticide safety training to all District applicators.
4. Continue to work with individual parks to develop and refine park specific IPM programs.
5. Develop and implement a series of IPM related trainings for park staff, including weed identification and control techniques, vertebrate control, invertebrate control, etc.

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6. Continue to monitor and improve pesticide applications by outside agencies in District parklands.
7. Continue to identify and procure funds to expand the control of harmful invasive plants in order to enhance habitat, increase native cover and biodiversity and support recreational activities.
8. Increase volunteer opportunities to control and/or eradicate non-native, invasive species in District parklands through habitat enhancement projects.
9. Work with golf course concessionaires to develop and implement IPM programs.
10. Develop a program to track and quantify the use of IPM techniques (pesticide alternatives).