Midpeninsula Regional
Open Space District

R-18-81
Meeting 18-28
July 11, 2018

AGENDA ITEM 8

Annual Integrated Pest Management Report for Calendar Year 2017

GENERAL MANAGER'S RECOMMENDATION

No Board action required.

SUMMARY

On December 10, 2014 (R-14-34), the Midpeninsula Regional Open Space District's (District) Board of Directors (Board) adopted the Final Environmental Impact Report (FEIR) for the Integrated Pest Management Program and approved the Integrated Pest Management (IPM) Program and Policy. The program requires an annual report of past pest control activities, both chemical and non-chemical, on District lands. This report presents the results of the third year of pest management activities prescribed under the District IPM Program. The District treated 44 species, including 16 listed noxious weeds (plants that have been defined as a pest by state law or regulation) using a variety of treatment methods. The District worked on controlling an additional 11 nonnative species as compared to 2016. In total, the number of hours for IPM - resource management work declined in 2017 as compared to 2015 due largely to a shift in District field crew time to focus on the completion of Measure AA capital projects, including the grand openings of the Mount Umunhum Summit and Lower La Honda Creek Open Space Preserve.

DISCUSSION

Integrated Pest Management (IPM) is a long-term, science-based, decision-making system that uses a specific methodology to manage damage from pests. The District defines pests in its Resource Management Policies as "animals or plants that proliferate beyond natural control and interfere with natural processes, which would otherwise occur on open space lands". Moreover, the District defines target pests as "plant or animal species that have a negative impact on other organisms or the surrounding environment and are targeted for treatment." Meeting IPM objectives requires monitoring site conditions before, during, and after treatment as well as revising methods as necessary in accordance with adaptive management principles.

On December 10, 2014 (R-14-34), the District's Board adopted the FEIR for the IPM Program and approved the IPM Program and Policy. As a component of the IPM Program, an Annual Report is required to be presented to the Board that includes the following information for IPM work completed the prior calendar year:

- Summary of pest problems that the District encountered, and a comparison to past years;
- Summary of District pest control treatments used;

- Qualitative assessment on the effectiveness of the District's pest control program, and suggestions for increasing future effectiveness;
- Summary of pesticide use;
- Summary of public notifications and public inquiries about IPM on District lands; and
- Assessment of compliance with the Guidance Manual.

The attached Annual Report (Attachment 1) is the third annual report prepared for the IPM Program and describes the quantitative IPM activities undertaken in 2017, as well as a qualitative assessment of the Program. Trending data is required for per-acre herbicide use at individual sites in natural areas only. Scientifically valid trending data will be available in year four (4) of the Program and presented in the future 2018 IPM Annual Report, which the Board will receive in 2019. Although trend analysis is not yet available, selected sites have comparative per-acre herbicide use within the 2017 IPM Annual Report (see Attachment 1). IPM Annual Reports from 2015 (R-16-120) and 2016 (R-17-50) are also available for review.

Listed below are the highlights from the third year of the program:

Summary of Pest Problems and Comparison to Past Years
Of the 874 non-native species found within District boundaries, 44 California Invasive Plant Council rated plant species were treated on an ongoing basis to control for natural resource protection and long-term management (Table 1). These species have the potential to invade natural areas, displace native species, and reduce biodiversity**.** In addition, the State of California considers 16 of these species as noxious weeds. Eight (8) new pest control projects were identified as high priority for treatment on District lands and implemented in 2017.

Table 1: Treated Species by Rating for Ongoing and New Projects

Year	Species Treated	Cal-IPC Rating			CDFA Rated	Alert
		Limited	Moderate	High		
2017	**44**	**5**	**17**	**9**	**16**	**4**
2016	**33**	**3**	**14**	**10**	**17**	**3**
2015	**31**	**4**	**12**	**8**	**12**	**4**

The grand total number of hours for IPM - resource management work declined in 2017 as compared to 2015 due primarily to a significant shift in District field crew time to focus on the completion of Measure AA capital projects (Table 2). Since 2015, total hours have decreased 35%. Although staff time declined by 4,808 hours, contractor time increased by 775 hours, and volunteer time fluctuated over the three-year timeframe. Contractor time increased primarily due to the substantial planting and seed collection efforts for large scale, project-related restoration work (e.g. Mount Umunhum Summit and Bear Creek Redwoods restoration efforts), a portion of which is funded through a Santa Clara Valley Water District grant.

Table 2: Comparison of Hours by Crew Type and Year

Year	Staff	Contractor	Volunteer	Total
2015	5431	2132	1736	9299
2016	Unknown[1]	1659	2883	4542
2017	623	2907	2559	6089

[1] Staff hours were not recorded into the Weed Database or CalFlora as this was a transitional year from one database to another.

Table 3 shows the comparison of planned hours as described in the 2017 IPM Plan versus actual hours completed. The District completed 79% or 6,089 hours of the planned 7720 hours in 2017. The largest share of the reduced hours was in the Staff hours due to a shift in staff time to focus on Measure AA capital projects. Volunteers were on target to meet goals, but the resignation of one of the Volunteer Program Leads reduced the number of Preserve Partners programs and the recruitment of Advanced Resource Management Stewards.

Table 3: Comparison of Planned versus Actual Hours for 2017

Hours	Staff	Contractor	Volunteer	Total
Planned	1459	2989	3272	7720
Actual	623	2907	2559	6089
Difference	836	82	713	1631
% of Planned Accomplished	43 %	97 %	78 %	79 %

Summary of District Pest Control Treatments
A summary of hours for each treatment method expended by staff, contractors, and volunteers for the 2017 calendar year is presented in Table 4 below:

Table 4: Treatment Methods and Crew Type[2]

Treatment Method	Hours			Total	%
	Staff	Contractor	Volunteer		
Brush Cut	13	242	-	255	4.2 %
Cut	42	34	172	247	4.1 %
Dig	27	268	211	506	8.3 %
Flame	-	56	-	56	0.9 %
Herbicide	217	515	-	732	12.0 %
Mow	-	14	-	14	0.2 %
Pull	324	1778	2176	4278	70.3 %
TOTAL	**623**	**2907**	**2559**	**6,089**	**100 %**
%	**10.3 %**	**47.7 %**	**42.0 %**	**100 %**	

Manual removal of weeds via pulling remains the most prevalent treatment method at 70% of all hours; herbicide use accounts for 12% of all hours.

Changes to pest control treatment methods are determined each year using the best available science in weed management during the creation of the IPM Annual Plan, which is finalized each January and is used to lay out the work plan for the new calendar year. Table 5 presents a comparison of the treatment methods across the three years of the IPM Program. Table 5 shows that the largest shift has been in the reduction hours spent applying herbicide (reduced from 60.8% to 12.0%, with a relative reduction of 48.8 %) and the largest increase in the percentage of hours spent hand pulling (increased from 35.5% to 70.3%, with a relative increase of 34.8%).

[2] Treatment hours for Natural and Rangeland areas only as brushing/mowing of roads, trails, defensible space, or emergency landing zones changes minimally from year to year.

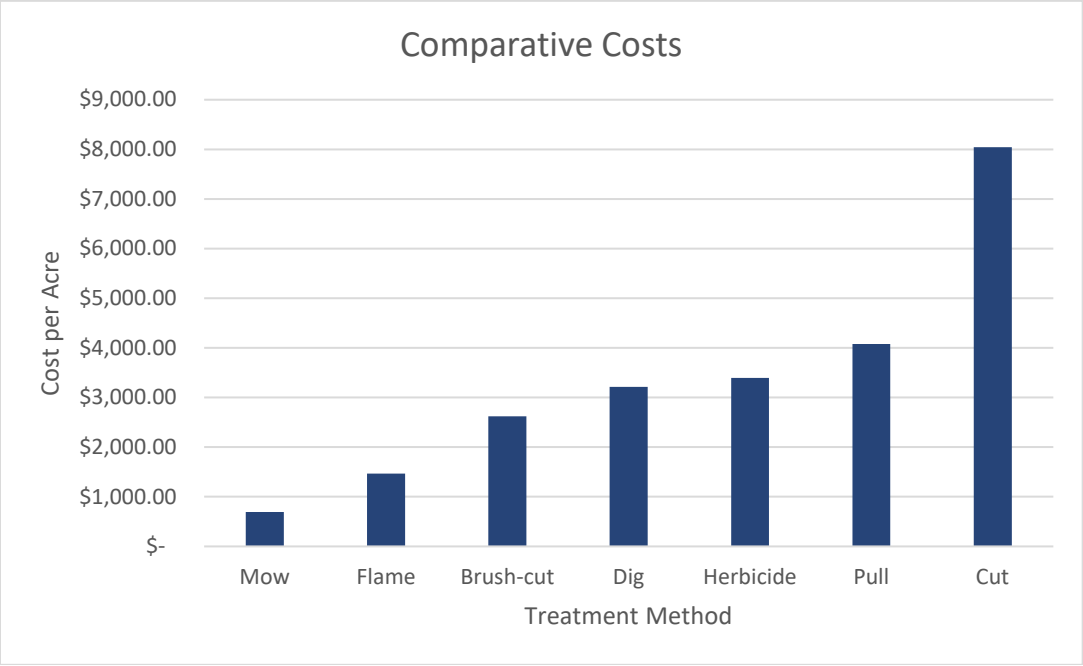
Table 5: Percent of Time by Treatment

Treatment Method	% of Time		
	2015	2016	2017
Brush Cut	0.8 %	8.0 %	4.2 %
Cut	0.0 %	8.1 %	4.1 %
Dig	1.6 %	15.7 %	8.3 %
Flame	1.3 %	0.0 %	0.9 %
Herbicide	60.8 %	13.2 %	12.0 %
Mow	0.0 %	0.0 %	0.2 %
Pull	35.5 %	55.0 %	70.3 %

Figure 1 (below) shows a comparative cost for each treatment method for 2017. Mowing and brush cutting are shown as cost per gross acre, as treatment is applied to the total project area. All other treatment methods are shown as cost per infested acre, as treatment is applied as spot treatment of target species. The District uses the following hourly costs estimates for comparative cost analysis purposes:

- Contractor - $50.00 per hour
- Staff – $43.45 per hour
- Volunteers - $24.14 per hour[3]

Figure 1: Treatment Cost per Infested Acre



Effectiveness of Pest Control Program and Suggestions for Increasing Effectiveness
Structural pest control in 2017 (e.g. Administrative Office, preserve restrooms) was limited to one of six approved pesticides for buildings, all of which are "Caution" labeled (as opposed to "Warning" or "Danger" labels), and therefore pose a reduced risk to workers or occupants of treated buildings.

[3] Signifies the estimated value of volunteer work and not true cost, as this is pro bono, volunteer work. This value is provided for analysis purposes only. Refer to: https://independentsector.org/news-post/value-volunteer-time/

Non-Structural Pest Control, which is the control of high priority invasive plants in natural areas by both herbicidal and non-herbicidal methods, protects and restores native vegetation at preserves by eliminating or controlling the spread of competing invasive vegetation. The District has set a goal to reduce the per-acre usage of herbicides over time at individual sites, and acknowledges that in some instances use will initially increase, followed by a reduction in herbicide use once the pest is eliminated or reduced to a level that can be effectively managed with non-herbicidal methods.

Methods used on District lands to reduce pesticide usage include the techniques of mow/spray/mow and timed mowing. These mechanical techniques greatly reduce herbicide use because workers first mow larger vegetation and, once the vegetation has re-sprouted to a vulnerable stage, spot treat the area with herbicide, and then re-mow once dead. Staff performed this technique on stinkwort (an invasive species first reported in California in 1984 in Santa Clara County that has since spread to 36 of the 58 California counties) with great success at the Hicks Creek Ranch parking area in Sierra Azul Open Space Preserve. Another method used is timed mowing, which is employed to control of yellow star thistle at Russian Ridge and Windy Hill Open Space Preserves. Timed mowing is mowing at a specific point in time in a plant's growth cycle (when 2 to 5% of the total population of seedheads are in bloom) to reduce its density and seed dispersion.

Due to a reduction of available staff time for pest control in natural areas and rangeland given other high priority needs, District staff will evaluate and reprioritize treatment sites to ensure that sufficient resources can be dedicated on select priority sites for effective IPM management. This will provide greater treatment success to target pests year over year.

Pesticide Use

Staff, contractors, and tenants each report on the pesticide use at District lands. Table 6 below summarizes the known use of pesticides on District lands, excluding that of PG&E, who is not covered under the District's IPM Program. County Agricultural Departments require PG&E to report pesticide use directly to the County. District staff reviews all proposed PG&E work and the use of herbicide is limited to the approved pesticide list under the IPM program. PG&E adheres to the District's herbicide Best Management Practices and mitigation measures.

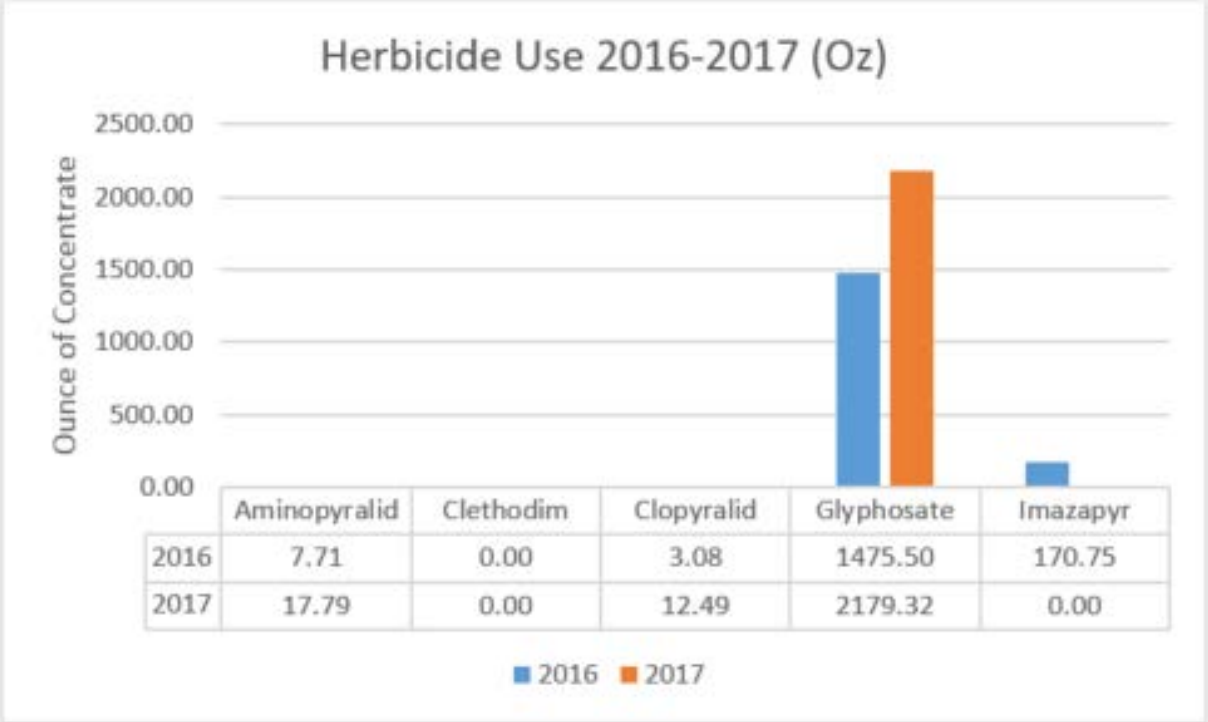
Table 6: Pesticide Use on District Lands

Pesticide	*Active Ingredient*	*Amount Used (ounces)*	*Acres Treated*	*Ounces/Acre*
Fungicide	Potassium salts of phosphorus acid	4,841.86	22.6	214.24
Herbicide	Aminopyralid	17.79	147.29	0.12
	Clethodim	0.0	0.0	-
	Clopyralid	12.49	5.25	2.38
	Glyphosate	2,181.59	172.89	12.62
	Imazapyr	0.0	0.0	-
Insecticide	Pyrethrin	72	-	-
Rodenticide	Cholecalciferol	0.0	0.0	-

Recommended application rates, as specified on the product label, vary by Active Ingredient and formulation of any particular pesticide product. For example, the specified application rate for Roundup ProMax with glyphosate as the Active Ingredient ranges from 32 to 160 ounces (oz) per acre, depending on the target plant species. The specified application rate for Milestone with Aminopyralid as the Active Ingredient ranges from three to seven oz per acre, depending on the target plant species.

Figure 2 (below) presents an analysis of the herbicides used by District staff and contractors to control pest plant species. The main active ingredient used is glyphosate, the active ingredient in Round-Up. Herbicide use increased over the previous year. This increase is the direct result of intensive invasive species work to prepare and open Bear Creek Redwoods for public recreation in 2019. This initial knock down period within the Phase I area is expected to transition to manual and mechanical treatment methods in future years, partially replacing the need for chemical applications. Intensive invasive species work, focusing on initial knockdown of large populations is shifting to the Phase II and III portions of the Preserve (estimated to begin in 2019 and 2027 respectively).

Figure 2: Herbicide Use 2016-2017



	Aminopyralid	Clethodim	Clopyralid	Glyphosate	Imazapyr
2016	7.71	0.00	3.08	1475.50	170.75
2017	17.79	0.00	12.49	2179.32	0.00

Public Notification and Inquiries

Prior to, during, and after the application of a pesticide (including herbicides, insecticides, or other types of pesticides) on District preserves, employees and contractors post signs at the treatment area notifying the public, employees and contractors of the District's use of pesticides. All contractors notify the District before application on any property, and comply with requirements for notification and posting of signs.

In 2017, the District recorded sixteen public inquiries relating to the IPM Program. Inquiries ranged from sharing of District information with other agencies (i.e. Presidio Trust), the use and

safety of herbicides, to non-chemical weed control options. Please see Section 7.2 in Attachment 1 for more details. Because of the ongoing scientific evaluations regarding the toxicity of glyphosate and public concern over its use both in the US and Europe, staff proceeded to conduct an updated expert, third-party literature review of the toxicology of glyphosate, the results of which are discussed in a separate Agenda Item for the same July 11, 2018 regular Board meeting.

Compliance with the Guidance Manual
As the science of pest control advances and more effective, safer, and less harmful pesticides are developed, changes to the *List of Approved Pesticides* document is expected. As manufacturers update, discontinue, or substitute products, and as target pests change over time, recommended additions or deletions of approved products will be made by staff. Staff are evaluating three pesticides for potential inclusion in the District's IPM Program and these pesticides are currently undergoing CEQA review by Blankinship and Associates of Davis, CA. The full Board will consider this review in September of 2018.

FISCAL IMPACT

Receipt of the 2017 Annual IPM Report will not result in a direct fiscal impact. Implementation of the IPM Program occurs across several different departments, including Land and Facilities, Visitor Services, and Natural Resources. Each department separately budgets for pest management activities under the General Fund – Operating Budget. Future annual reports will include analyses of the budgetary impacts of pest management activities as more data become available.

BOARD COMMITTEE REVIEW

The IPM Policy established direction that the General Manager present annual IPM Program reports for the Board. This report presents the annual review for calendar year 2017.

PUBLIC NOTICE

Public notice was provided as required by the Brown Act. Public notice was sent to 104 interested parties and tenants by postal or electronic mail.

CEQA COMPLIANCE

All of the activities undertaken in 2017 to manage pests on District lands, and summarized in this report, were conducted in compliance with the FEIR for the Midpeninsula Regional Open Space District Integrated Pest Management Program, which was approved by the Board on December 10, 2014.

NEXT STEPS

Staff will complete the CEQA review of additional recommended pesticide products and bring these to the full Board for possible inclusion on the *List of Approved Pesticides* document. Staff will continue implementation of the 2018 Annual IPM Plan (Year 4 of the IPM Program), consistent with the FEIR of the IPM Program. In October of 2018, staff will begin preparing the 2019 Annual IPM Plan to guide IPM work for calendar year 2019. District staff will evaluate and

reprioritize natural and rangeland treatment areas to better account for available staff time pending the availability of additional internal and/or external resources.

The 2018 Annual IPM Report will present trends and a comprehensive analysis of the program. This evaluation will include trend analysis of pest management activities, including pesticide usage, for Board presentation. In addition, an analysis and evaluation of IPM on agricultural lands will be performed.

Attachment

1. Integrated Pest Management Annual Report, 2017

Responsible Department Head:
Kirk Lenington, Natural Resources

Prepared by:
Coty Sifuentes-Winter, Senior Resource Management Specialist, Natural Resources

Contact person:
Coty Sifuentes-Winter, Senior Resource Management Specialist, Natural Resources

ATTACHMENT 1

2017

Annual IPM Report

Integrated Pest Management Program Goal:

"Control Pests by consistent implementation of IPM principles to protect and restore the natural environment and provide for human safety and enjoyment while visiting and working on District lands."

Coty Sifuentes-Winter

Midpeninsula Regional Open Space District

Table of Contents

List of Figures

Figure 1: Preserve Partners manually removing Stinkwort

List of Tables

1 Introduction

This report presents the results of the third year of pest management activities prescribed under the Midpeninsula Regional Open Space District (District) Integrated Pest Management (IPM) Program. The Program was established in 2014 upon adoption by the Board of Directors of the IPM Guidance Manual. Five policies set the foundation of the Program:

- Develop specific pest management strategies and priorities that address each of the five work categories;
- Take appropriate actions to prevent the introduction of new pest species to District preserves, especially new invasive plants in natural areas, rangeland, and agriculture properties;
- Manage pests using the procedures outlined in the implementation measures;
- Monitor pest occurrences and results of control actions, and use adaptive management to improve results;
- Develop and implement an IPM Guidance Manual to standardize pest management, and IPM procedures across all District Lands.

Figure 2: French broom removal at Achistaca

2 Implementation of IPM Program

Full implementation of the IPM Program was originally scheduled to be completed by 2019. Due to Staff time commitments to Measure AA capital projects and staff shortages (e.g. retirement of the Senior Resource Management Specialist, resignation of the Rangeland Ecologist and Volunteer Program Lead) delayed some aspects of the IPM Program in 2017. The new fully implemented IPM Program is still scheduled for December

Figure 4: French broom at Bear Creek Redwoods - Dec 1, 2017

Figure 3: French broom at Bear Creek Redwoods - Dec 2, 2017

of 2019. Major aspects of the IPM Program to be developed in 2019 include a landscape-level monitoring protocol and an Early Detection/Rapid Response Protocol.

2.1 Landscape-Level Monitoring Protocol

To better assess both natural (e.g. succession, disturbances such as wildlife fire) and man-made effects (e.g. management activities, climate change) in natural areas, a landscape-level monitoring protocol is needed. This protocol will allow staff to see changes in vegetation and habitat over time.

2.2 Early Detection / Rapid Response Protocol

Early Detection / Rapid Response (EDRR) places emphasis on preventing new pest populations from becoming established on District lands through increased surveys for pests. If new pest populations have become established, EDRR would implement rapid response measures to control pests before they spread. EDRR programs are known to increase the likelihood that pest invasions would be addressed successfully while the population size and extent are not beyond that which can be contained and eradicated on both practical and economic scales. The IPM Guidance Manual currently includes EDRR strategies to respond to pests, however, a comprehensive EDRR program cannot be undertaken with current staffing levels. Under this protocol, the District would dedicate additional resources (i.e., increased staff and budget) towards implementation of EDRR strategies that include:

- identifying potential threats in time to allow control or mitigation measures to be taken;
- detecting new invasive species in time to allow efficient and safe eradication or control decisions to be made;
- taking additional preventive actions such as providing facilities to clean vehicles and tools to stop the spread of seeds of invasive plants;
- responding to invasions effectively to prevent the spread and permanent establishment of invasive species;
- providing adequate and timely information to decision-makers, the public, and to partner agencies concerned about the status of invasive species within an area; and
- adaptively implementing detection and early response strategies over time.

The purpose of more frequent pest surveys is to determine if and when a new pest population is being established. Increased pest surveying may allow District personnel and/or contractors to more rapidly identify and prevent pest infestations prior to establishment, thereby decreasing the amount of pest management treatments necessary on District lands over time.

3 Summary of Pest Problems

This section is a summary of pest problems that the District has encountered during the year.

3.1 Treatment Surveys

The District's Best Management Practices from the FEIR Integrated Pest Management Program (Table 3-4) outlines the use of pretreatment surveys. Specifically it states, "A District biologist shall survey all selected treatment sites prior to work to determine site conditions and develop any necessary site-specific measures. On a repeating basis, grassland treatment sites shall be surveyed once every five years and brushy and wooded sites shall be surveyed once every three years. Brush removal on rangelands will require biological surveys before work is conducted in any year. Site inspections shall evaluate existing conditions at a given treatment site including the presence, population size, growth stage, and percent cover of target weeds and pests relative to native plant cover and the presence of special-status species and their habitat, or sensitive natural communities." Surveys are inputted into CalFlora, an online database. In 2017, District biologists completed the following surveys:

Table 1: Pre-Treatment Surveys

Category	Preserves	Sites Surveyed	Planned Site Surveys	% Completed
Fuel Management	Coal Creek, Purisima Creek, Rancho San Antonio, and Russian Ridge	17	20	85 %
Natural Lands		47	50	94 %
Rangeland		9	10	90 %
Recreational Facilities		62	60	103 %
Total		135	140	96 %

Surveys identified both biotic and abiotic environmental factors including:

- Special status plants and animals in the area (i.e. California red-legged frog)
- Cultural resources (i.e. known archeological sites)
- Aquatic systems (i.e. ephemeral streams)
- Erosive conditions (i.e. steep hill side with treatment to remove large areas of vegetation)
- Presence of disease (i.e. Sudden Oak Death)

3.2 Ongoing and General Maintenance

3.2.1 Vegetative Pest Species

Forty-four (44) plant pest species found on District lands are treated on an on-going basis (Table 1) to control for asset-based protection and long-term management, an increase of Eleven (11) species from 2016. These species have the potential to invade natural areas, displace native plant and wildlife species, and reduce biodiversity. Of the listed species, sixteen (16) are considered noxious weeds by the State of California (Table 2).

Table 2: Ongoing and general maintenance plant pest species

Scientific Name	Common Name	Cal-IPC rating	CDFA rating	Alert / Watch	Additional Information
Aegilops cylindrica	Jointed goatgrass	-	Noxious Weed	Watch	
Aegilops triuncialis	Barbed goatgrass	High	Noxious Weed	-	
Allium vineale	Vineyard onion	-	Noxious Weed	-	Early Detection / Rapid Response species
Baccharis pilularis	Coyote brush	-	-	-	Native, grassland conversion
Avena barbata	Slim oat	Moderate	-	-	
Brachypodium sylvaticum	Slender false brome	Moderate	Noxious Weed	ALERT	
Bromus diandrus	Ripgut brome	Moderate	-	-	
Carduus pycnocephalus	Italian thistle	Moderate	Noxious Weed	-	
Carex pendula	Hanging sedge	-	-	Watch	Early Detection / Rapid Response species
Carthamus creticus	Smooth distaff thistle	-	Noxious Weed	-	
Carthamus lanatus	Woolly distaff thistle	Moderate	Noxious Weed	-	
Centaurea calcitrapa	Purple star thistle	Moderate	Noxious Weed	-	
Centaurea melitensis	Tocalote	Moderate	Noxious Weed	-	
Centaurea solatitialis	Yellow star thistle	High	Noxious Weed	-	
Cirsium vulgare	Bull thistle	Moderate	Noxious Weed	-	
Conium maculatum	Poison hemlock	Moderate	-	-	
Cortaderia jubata	Andean pampas grass	High	-	-	
Cotoneaster franchetii	Francheti cotoneaster	Moderate	-	-	
Delairea odorata	Cape ivy	High	Noxious Weed	-	
Dipsacus fullonum	Fuller's teasel	Moderate	-	-	
Dipsacus sativus	Indian teasel	Moderate	-	-	
Dittrichia graveolens	Stinkwort	Moderate	Noxious Weed	ALERT	
Ehrharta erecta	Upright veldt grass	Moderate	-	-	Early Detection / Rapid Response species

Scientific Name	Common Name	Cal-IPC rating	CDFA rating	Alert / Watch	Additional Information
Elymus caput-medusae	Medusa head	High	Noxious Weed	-	
Erigeron bonariensis	Flax-leaved horseweed	-	-	-	
Eucalyptus globulus	Blue gum	Limited[1]	-	-	
Ficus carica	Common fig	Moderate	-	-	
Foeniculum vulgare	Fennel	High	-	-	
Genista monspessulana	French Broom	High	Noxious Weed	-	
Geranium purpureum	Herb robert	Limited	-	-	
Geranium robertianum	Robert's geranium	-	-	-	
Hedera helix	English ivy	High	-	-	
Ligustrum sinense	Chinees privet	-	-	-	
Lunaria annua	Annual moonwort	-	-	-	
Marrubium vulgare	White horehound	Limited	-	-	
Medicago polymorpha	California burclover	Limited	-	-	
Phalaris aquatica	Harding grass	Moderate	-	-	
Phytophthora ramorum	Sudden Oak Death	-	-	-	Quarantine
Rubus armeniacus	Himalayan blackberry	High	-	-	
Silybum marianum	Milk thistle	Limited	-	-	
Spartium junceum	Spanish Broom	High	Noxious Weed	-	
Vinca major	Periwinkle	Moderate	-	-	
Xanthium spinosum	Spiny cocklebur	-	-	-	Native, California red-legged frog habitat areas

[1] Although Cal-IPC rates this as a limited, the District rates it as a Moderate

Table 3: Treated Species by Rating for Ongoing and New Projects

Year	Species Treated	Cal-IPC Rating			CDFA Rated	Alert
		Limited	Moderate	High		
2017	44	5	17	9	16	4
2016	33	3	14	10	17	3
2015	31	4	12	8	12	4

3.2.2 Fauna Pest Species

Eight (8) species of fauna were monitored and/or treated in 2017.

Scientific Name	Common Name	Preserve	Location	Activity
Felis catus	Cat, feral	Rancho San Antonio		Monitoring
Mus musculus	House mouse	Multiple – see below	Deer Hollow Farm; Residential	Monitoring, Trapping
Otospermophilus beecheyi	California Ground squirrel	Rancho San Antonio	Deer Hollow Farm	Exclusion
Pseudemys nelsoni	Florida red-bellied cooter	Skyline Ridge	Alpine Pond	Attempted trapping
Rattus norvegicus	Norway rat	Multiple – see below	Deer Hollow Farm; Residential	Monitoring, Trapping
Rattus rattus	Black rat	Multiple – see below	Deer Hollow Farm; Residential	Monitoring, Trapping
Sus scrofa	Pig, feral	Russian Ridge	Mindego Ranch	Monitoring
Trachemys scripta elegans	Red-eared slider	Bear Creek Redwoods	Mud Lake	Monitoring, Trapping

Between January and December of 2017, the District hired *Complete Pest Control* to do rodent control at ten residential locations throughout the District[2] as listed below:

- El Corte de Madera OSP (1)
- La Honda OSP (2)
- Monte Bello OSP (1)
- Russian Ridge OSP (2)
- Skyline OSP (2)
- Tunitas Creek OSP (2)
- Windy Hill OSP (1)

[2] The number in parenthesis is the number of building that pest control activities occurred.

3.3 New Pest Control Projects

Potential pest control projects were summited to the IPM Coordinator using the District's New Pest Control Project. Potential projects were evaluated using the Project Ranking System developed by the IPM Coordination Team. The Project Ranking System evaluates projects using five categories:

- Safety
  - Human health
  - Environmental health
- Prevents and controls the most destructive pests
- Protects biodiversity
- Provides for public engagement
- Feasibility and effectiveness

Eight (8) new pest control projects were determined to have high priority for treatment on District lands (Table 4). In addition, multiple projects at Bear Creek Redwoods were initiated in anticipation of its opening to the public in spring of 2019.

Table 4: New Pests Control Projects

Scientific Name	Species	Cal-IPC rating	CDFA rating	Alert	Gross Acres	Infested Acres
Baccharis pilularis	Coyote brush	-	-	-		
Centaurea solstitialis	Yellow star thistle	High	Noxious	-	3.0	0.3
Cortaderia jubata	Andean pampas grass	High	-	-	Trace	Trace
Dittrichia graveolens	Stinkwort	Moderate	Noxious	ALERT	0.4	0.3
Genista monspessulana	French Broom	High	Noxious	-	Trace	.01
Phalaris aquatica	Harding grass	Moderate	-	-	Trace	Trace
Pinus radiata	Monterey pine	Moderate	-	-	Trace	Trace

4 Summary of Pest Control Treatments

4.1 Type of Control with Cost per Acre

Treatment area and hours were not available for staff in 2016 due to the data collection protocol undergoing revisions. The following data reflects natural areas and does not take into account brushing/mowing of roads, trails, defensible space, or emergency landing zones. Data for brushing/mowing of roads, trails, defensible space, or emergency landing zones are not presented because these activities do not change from year to year.

Table 5: Treatment Methods and Hours in Natural Areas in 2017

Treatment Method	Hours			Total	% of Total
	Staff	Contractor	Volunteer		
Brush Cut	13	242	-	**255**	**4 %**
Cut	42	34	172	**247**	**4 %**
Dig	27	268	211	**506**	**8 %**
Flame	-	56	-	**56**	**1 %**
Herbicide	217	515	-	**732**	**12 %**
Mow	-	14	-	**14**	**0 %**
Pull	324	1778	2176	**4278**	**70 %**
TOTAL	**623**	**2907**	**2559**	**6089**	
% of Total	**10 %**	**48 %**	**42 %**		

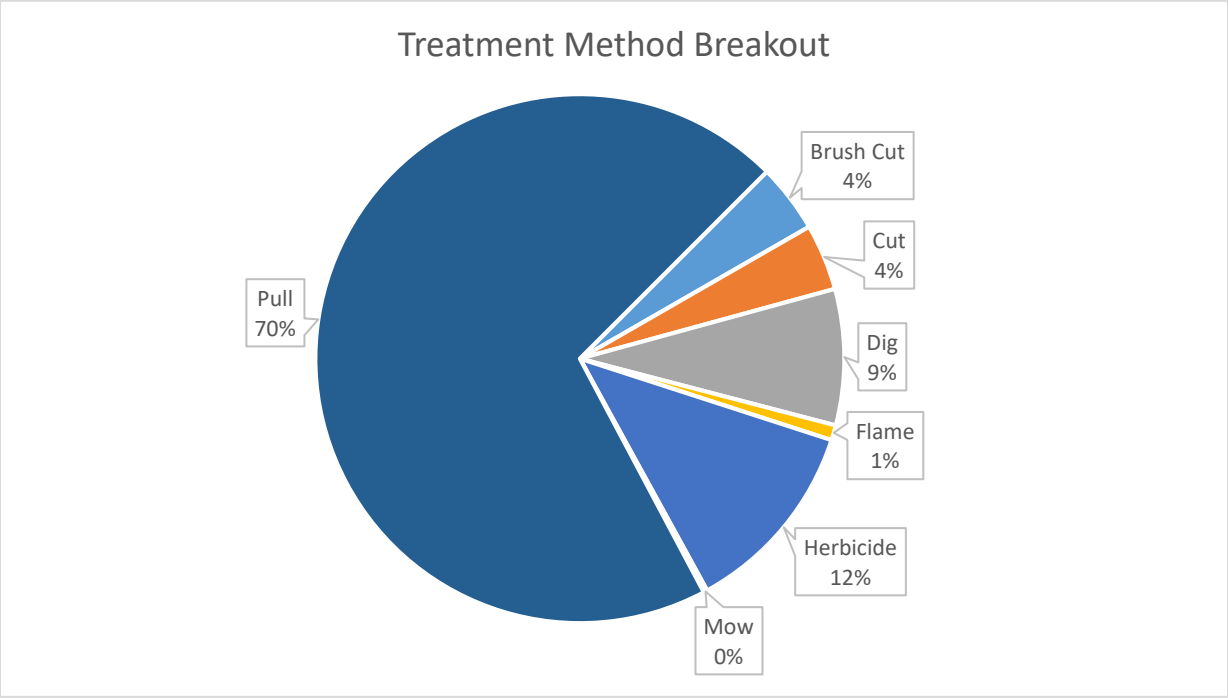


Figure 5: Treatment Method Breakout

Manual removal of weeds via pulling remains the most prevalent treatment method at 70% of all hours; herbicide accounts for 12% of all hours (Figure 5).

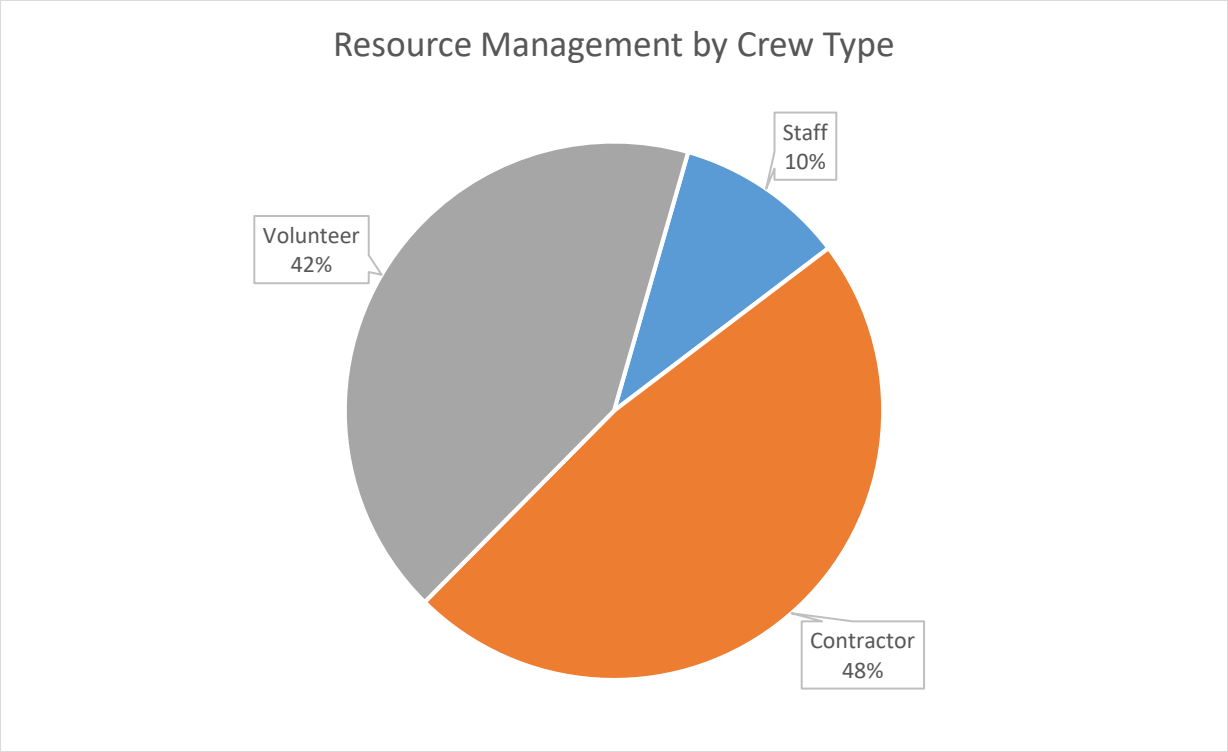


Figure 6: Resource Management by Crew Type

Contractors make up the largest contributor to IPM - Resource Management activities for Natural Areas. Over 48% of staff hours (304 hours) were dedicated to run Preserve Partners projects or working with ARMS volunteers.

Table 6: Comparison of Hours by Crew Type and Year

Year	Staff	Contractor	Volunteer	Total
2015	5431	2132	1736	**9299**
2016	Unknown[3]	1659	2883	**4542**
2017	623	2907	2559	**6089**

Total hours for IPM - resource management work (Table 6) declined as compared to 2015 due largely to a shift in focus for District field personnel to Measure AA capital projects. Since 2015, total hours have decreased 35%. Contractor hours, however, have increased and Volunteer hours have fluctuated between 2015 and 2017.

Figure 7 (below) shows the comparative cost for different treatment methods for 2017. Mowing and brush cutting are shown as cost per gross acre. All other treatment methods are shown as cost per infested acre. The District uses the following hourly costs estimates for comparative cost analysis purposes only:

[3] Staff hours were not recorded into the Weed Database or CalFlora as this was a transitional year from one database to another.

- Contractor - $50.00 per hour
- Staff – $43.45 per hour
- Volunteers - $24.14 per hour[4]

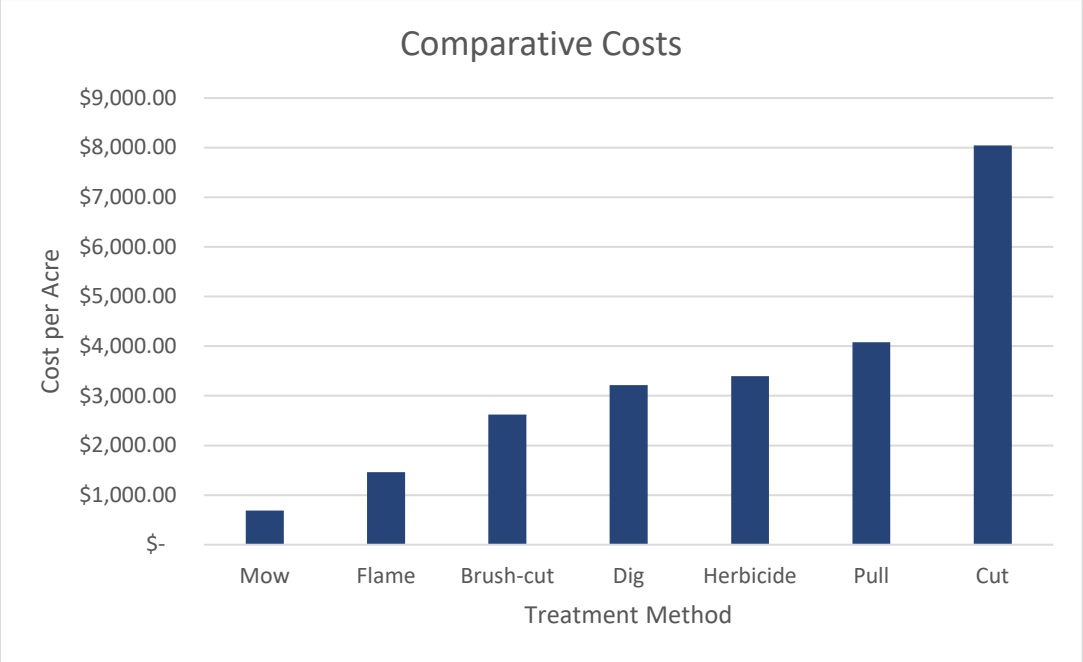


Figure 7: Treatment Cost per Acre.

[4] Signifies the estimated value of volunteer work and not true cost, as this is pro bono, volunteer work. This value is used for analysis purposes only. Refer to: https://independentsector.org/news-post/value-volunteer-time/

5 Effectiveness of Pest Control Program

The IPM Program identifies the following criteria for assessing the effectiveness of the Program every year:

- Work health/exposure in buildings;
- Reduction of pesticide use in buildings;
- Per-acre herbicide use;
- Preservation of biodiversity and natural resource values;
- Public participation in pest control; and
- Staff training, public outreach, and educational activities.

Over time, the IPM Annual Report will evaluate the effects of reducing the amount of herbicide used at individual natural area sites. Baseline data is becoming available for use in future years. Actions undertaken in 2017to meet these criteria are described below.

5.1 Worker Health/Exposure in Buildings

The District is committed to the use of lower pesticide worker health/exposure classifications in buildings. These pesticides were consistent with the six pesticides approved for use on buildings (Table 7) as described in the 2014 IPM Program Environmental Impact Report, all of which are Caution labeled and therefore pose a reduced risk to workers or occupants of treated buildings. A specific type of rodenticide bait is approved under very strict conditions; however, it was not utilized. Only prevention and traps were approved for rodent control in 2017. In addition, two applications of Termidor HE (Caution label, with fipronil as the active ingredient) was used at two District-owned buildings. Although termite control was not evaluated in the original IPM program, fipronil was an approved active ingredient evaluated for insect control under the original IPM Program and it was determined to be suitable for use and consistent with the intent and environmental review of the IPM Program.

Table 7: Pesticides Approved for Use in Buildings and Recreational Structures

Pesticide Category	Active Ingredient	Product Formulation	Purpose	Signal Word
Rodenticide	Cholecalciferol	Cholecalciferol baits	Rodent control	Caution
Insecticide[5]	Indoxacarb	Advion Gel baits	Structural pest control	Caution
	Hydroprene	Gentrol Point Source	Pest Control	Caution
	Fipronil	Maxforce Bait Station	Ant Control	Caution
	Sodium tetraborate	Terro Ant Killer II	Ant Control	Caution
	Diatomaceous earth	Diatomaceous earth	Structural pest control	Caution

[5] Employees, contractors and tenants may install approved ant and roach bait stations inside buildings in tamperproof containers without review by a Qualified Applicator License/Certificate holder.

5.2 Reduction of Pesticide Use in Buildings

The District seeks to comprehensively oversee all pesticide use in and around District buildings, including use by tenants, which is expected to result in an overall reduction of pesticide use in buildings, and in particular, eliminate use of pesticides not appropriate for use around human occupants or visitors, or which can inadvertently escape into the surrounding wildland environment.

5.3 Per-acre Herbicide Use

The District seeks a reduction in per-acre usage of herbicides over time at individual sites, and acknowledges that in some instances, use will initially increase, followed by a reduction in herbicide use once the pest is eliminated or reduced. Use of herbicides in natural areas was precautionary and comparative numbers cannot be provided until next year when work and data collection are conducted in a manner consistent with the IPM Program from year to year. A trend analysis will be performed after four years of data has been compiled. Baseline data is available for the following preserves:

- Bear Creek Redwoods
- La Honda Creek
- Los Trancos
- Rancho San Antonio
- Russian Ridge
- Sierra Azul
- Skyline Ridge
- Thornewood

Below is data for three select preserves. Please note a trend analysis will be completed after 4 years of data has been collected (estimated to take place after the 2019 data has been collected).

Table 8: Herbicide Use at Bear Creek Redwoods

Herbicide	Ounces Used (2016)	Ounces Used (2017)	Acres	Per Acre Usage (2017)
Aminopyralid	1.482	0	1,437	0
Clethodim	0	0		0
Clopyralid	0	0		0
Glyphosate	101.85	292.35		0.20
Imazapyr	243.32	0		0

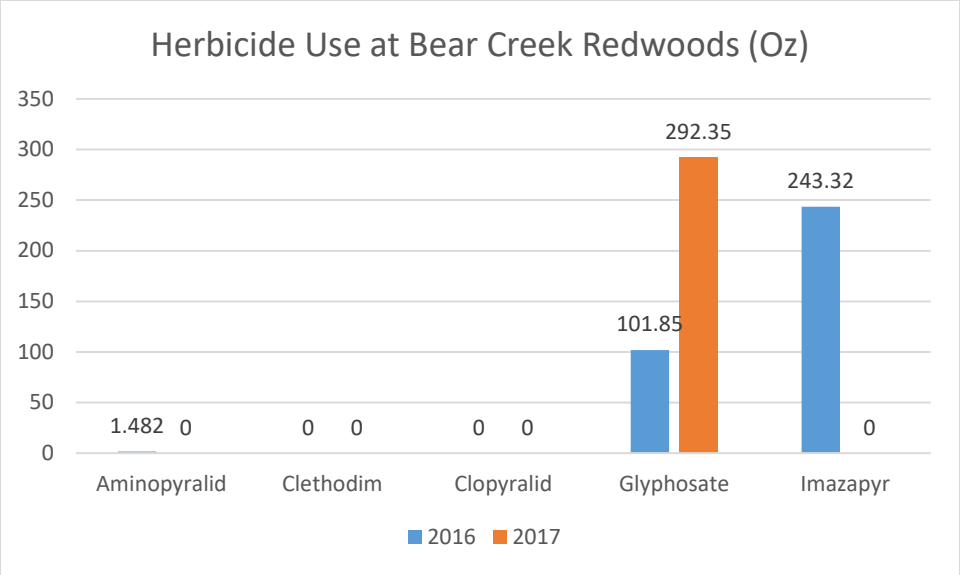


Figure 8: Herbicide Use at Bear Creek Redwoods

Table 9: Herbicide Use at Los Trancos

Herbicide	Ounces Used (2016)	Ounces Used (2017)	Acres	Per Acre Usage (2017)
Aminopyralid	4.328	0	274	0
Clethodim	0	0		0
Clopyralid	0	0		0
Glyphosate	28.25	37.18		0.14
Imazapyr	0	0		0

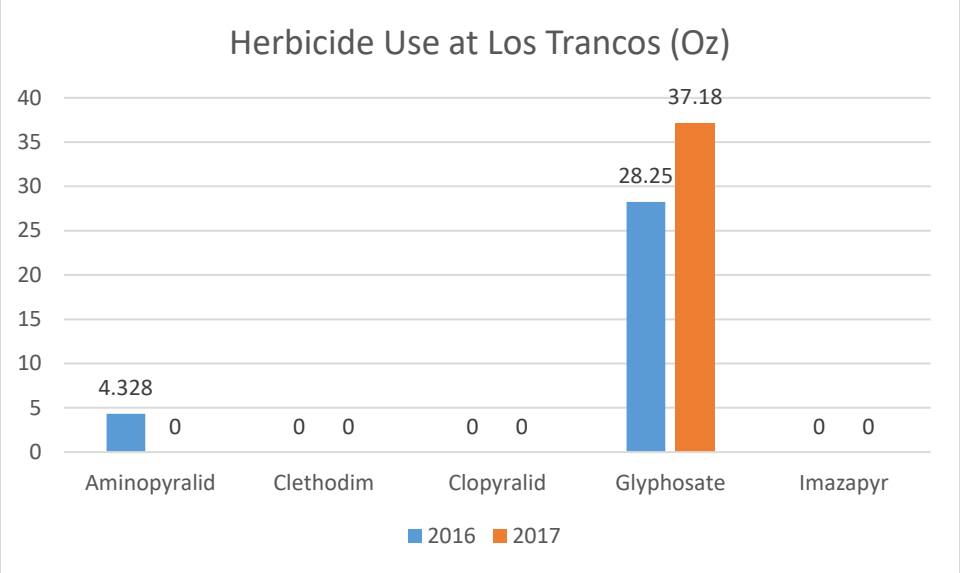


Figure 9: Herbicide Use at Los Trancos

Table 10: Herbicide use at Skyline Ridge

Herbicide	Ounces Used (2016)	Ounces Used (2017)	Acres	Per Acre Usage (2017)
Aminopyralid	0	0	2,143	0
Clethodim	0	0		0
Clopyralid	3.075	12.49		0.006
Glyphosate	0	0.5		0.0002
Imazapyr	0	0		0

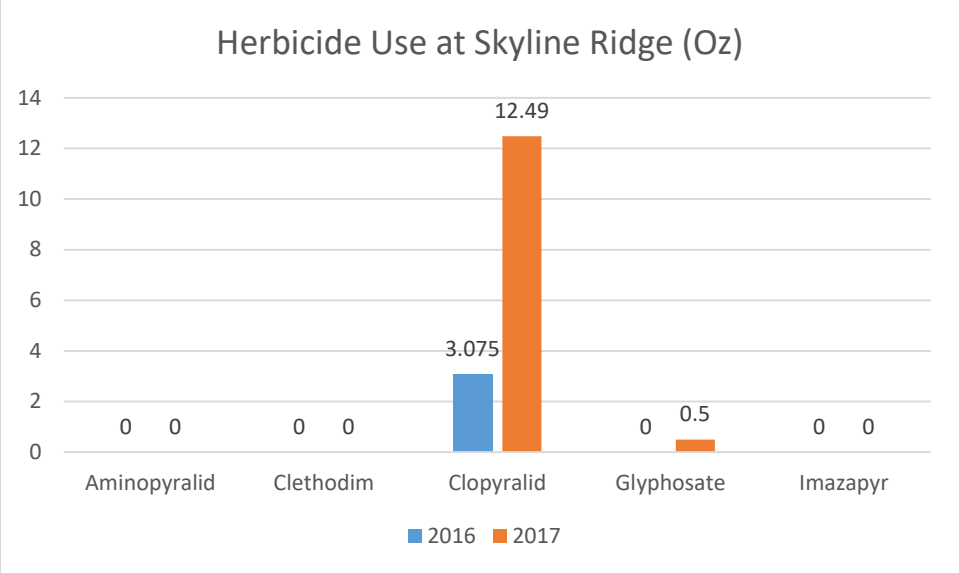


Figure 10: Herbicide Use at Skyline Ridge

5.4 Preservation of Biodiversity and Natural Resource Values

As part of this section, District staff provides an annual qualitative assessment of natural resources conditions of IPM projects in natural areas, rangelands, and agricultural properties in the Annual IPM Report.

5.4.1 Natural Areas

In natural areas, herbicide and non-herbicide methods were used to control high priority invasive plants to protect and restore native vegetation at preserves. Qualitative observations of note are provided below by area or land use type.

5.4.1.1 Bear Creek Redwoods

In 2017, efforts to control English Ivy (*Hedera helix*), French Broom (*Genista monspessulana)*, Bigleaf periwinkle (*Vinca major*), and stinkwort (*Dittrichia graveolens*) continued in Bear Creek Redwoods Open Space Preserve. Populations of ivy, broom, and periwinkle are widespread throughout the preserve, and efforts were focused on strategic areas in order to be the most beneficial in terms of invasive control.

Stinkwort occurs in various areas throughout the preserve in much smaller population sizes. Since 2016, priority areas for each species have been targeted for control, and progress continued through 2017.

Contractor efforts to control French Broom in the initial target areas within the preserve began in early May in 2016 and continued through 2017, focusing on the largest of the mapped patches above Mud Lake, through the BC05 gate. This large area with a high percentage of cover contained individuals up to 15 feet tall or more. Methods of control included manual removal when possible, followed by cut and paint herbicide treatment with Glyphosate when necessary. In the wet months, these areas were followed up with hand pulling and flame treatment of seedlings and smaller individuals. All removed and cut materials were piled in the shade to help prevent the germination of viable seed. The removal of dense stands of French Broom opened up several acres of forest understory, giving the existing natives room to grow while providing an opportunity to propagate on their own without the invasive competition.

The control efforts to manage English Ivy on the preserve began in early July of 2016. The focus of treatment methods centered on the cutting and painting of upright vines climbing up the native trees in several areas close to gates BC03, BC09, and BC13. All upright vines were cut and painted with glyphosate in order to prevent the ivy from further constricting the trunks of native trees, and inhibiting future berry development, thereby preventing further propagation. During repeat treatment of French Broom, follow up efforts were performed to ensure any missed vines were cut in 2017. Invasive treatments of Periwinkle on the preserve also began in September of 2016 with a combination of manual removal and a chemical application of Polaris, and again in mid-May of 2017 with continued manual removal. Efforts primarily focused on populations surrounding the Upper Lake, near gate BC04.

Figure 11: English ivy at Bear Creek Redwoods OSP - December 2017

Stinkwort control efforts began in late June 2016 with an application of Milestone and a repeat treatment in August using glyphosate. Retreatment of stinkwort continued in mid-July of 2017 with another application of glyphosate, as that was proven to be a more effective herbicide than Milestone on this species. The control efforts were focused on several outlying populations found in the preserve, with the most attention and time spent on the open chaparral above Highway 17, close to gate BC01. An early scouting of this area in 2018 showed little to no signs of *dittrichia* skeletons, which had been present in the previous years, indicating that the glyphosate reached an effective

level of control in 2017. Stinkwort needs to continue to be treated to prevent this very invasive species from establishing itself as a large vector to infest the preserve in future years.

It is recommended that the control efforts of French broom, English Ivy, periwinkle, and stinkwort be continued so the existing native plants and seed bank in the forest understory and chaparral can germinate and establish a foothold as the competition for resources will be reduced between the invasive and native species. In addition, the continued treatment of the limited stinkwort populations will help to prevent widespread distribution of this species within the preserve.

5.4.1.2 Mt. Umunhum

Midpen Staff, Volunteers, and Contractors are removing target invasive weed species by hand at the Mt. Umunhum summit revegetation areas and along the Mt. Umunhum Trail in priority areas, some of which are rare plant habitat. Target species for hand removal include tocalote, *Centaurea melitensis*; yellow star thistle, Centaurea solsistalis; Italian thistle, *Carduus pycnocephalus*; stinkwort, *Dittrichia graveolens*; California burclover, *Medicago polymorpha*; *Erodium* sp.; several non-native annual grasses including Bermuda grass, *Cynodon dactylon*; ripgut brome, *Bromus diandrus*; velvet grass, *Holcus lanatus*; and soft chess, *Bromus hordeaceus.*

Two priority weeds, spotted knapweed (*Centaurea stoebe ssp. micranthos*) and medusa head grass (*Elymus caput-medusae*) were located at the Mt Um summit in previous years, but were not detected in 2017. Monitoring will continue for these species throughout the Mt Um summit and Mt Um Trail to ensure these species are removed.

5.4.2 Rangeland

Midpen uses conservation grazing to manage fuel (flammable vegetation) for fire protection; enhance the diversity of native plants and animals; help sustain the local agricultural economy; and foster the region's rural heritage. Midpen uses conservation grazing on approximately 10,800 acres as a tool to manage grassland habitat on portions of these five preserves:

- Russian Ridge Open Space Preserve
- Skyline Ridge Open Space Preserve
- Purisima Creek Redwoods Open Space Preserve
- Tunitas Creek Open Space Preserve
- La Honda Creek Open Space Preserve

In the absence of natural disturbance (i.e. fire), the District periodically does brush removal on grasslands to slow the encroachment.

5.4.2.1 Driscoll Ranch

In 2017, treatment efforts to control purple star thistle, *Centaurea calcitrapa*, and smooth distaff thistle, *Carthamus creticus* continued in the Driscoll Ranch area of the La Honda Open Space Preserve. As in previous years of treatment, the priority areas identified for follow up efforts were pastures 4, 5, and 6, and small areas within pastures 2 and 3. Control efforts also continued along Sears Ranch Road from the entrance of the preserve up to the former Wool House area where the current boundary of the priority area ends. Areas around the former Wool House that were identified for control efforts prior to the demolition activities in 2016 were also followed up with repeat treatments with Milestone.

Figure 12: Purple star thistle rosettes manually removed by the old Wool House location

The contractor crew manually removed purple star thistle rosettes in late April of 2017 in the priority areas mentioned above. The control efforts began in the biologically sensitive areas around the upper and lower turtle ponds, and expanded outward through pasture 4, and small areas of pastures 1 and 2 adjacent to Sears Ranch Road. Manual removal then proceeded up both sides Sears Ranch Road into the previously treated areas of pasture 5, and 6, where it was observed that the numbers of purple star thistles are continuing to decline up to the former Wool House area. The small roadside patch of smooth distaff thistle treated in 2016 was removed by hand, and had also declined from the previous year.

All of these areas were effectively treated by manual removal, with the exception of the former Wool House area where the demolition activities occurred. In this area, where there has been the most ground

disturbance, the higher number of rosettes combined with the compacted soil in the area necessitated the use of herbicide treatment with Milestone. However, the number of purple star thistles in this area had also declined from 2016.

In June of 2017, follow up treatments of previously targeted areas mentioned above was carried out to ensure the quality control of seasonal control efforts. This allowed for a clean sweep of any rosettes that were missed, or had germinated since the previous visit. All purple star and distaff thistles that were observed in pastures 1, 2, 4, 5, and 6 were removed by hand, with a small herbicide follow up in the former Wool House Area.

The previous years of herbicide treatment with Milestone in combination with manual removal has resulted in a significant decline in the number of purple star thistle. Within the focus areas, population sizes had become sparse enough to switch to primarily manual removal in 2017. The former Wool House area is the only exception, as the disturbed soil from demolition activities in this area continues to flush out the seed bank from seasonal germination. The switch to primarily manual removal has resulted in increased efficiency in the treatment areas, as control efforts have gone faster and allowed more thorough inspections of the pastures relative to 2016.

Purple star and smooth distaff thistle control efforts should continue on an annual basis in all areas that were previously treated in order to keep these invasive species from resurging. With continued funding for contractors and the continued efforts of MROSD staff and volunteers, the areas of treatments will be able to expand further into areas that have not yet been targeted for management. This will further increase the control of these target species, which will continue to enhance and preserve the grasslands for the environment and the public who visit the preserve.

5.4.2.2 Mindego Hill

In 2017, the treatment of purple star thistle (*Centaurea calcitrapa*) and smooth distaff thistle (*Carthamus creticus*) continued in the Mindego Hill area of the Russian Ridge Preserve. As in 2016, the abundance of these species continue to show significant evidence of decline from the ongoing control efforts. The purple star thistle population had the greatest decline, especially within the biomonitoring areas where populations of San Francisco Garter Snakes and California Red Legged Frogs are concentrated. The smooth distaff thistle has been more difficult to control, but has also shown an overall decline in population, especially in areas closer to Mindego Hill. Species abundance within the vicinity of the Kneudler Lake area continue to be more problematic. However, where proper timing and accessibility were aligned, herbicide treatment has shown effective levels of control.

The endangered San Francisco Garter Snake population at Mindego Lake is continuing to increase in numbers. While a direct link between San Francisco Garter Snake populations and thistle presence is not available, it has been proven that invasive thistle populations have a negative impact on wildlife habitat and forage, deplete soil and water resources, and reduce plant and animal diversity (DiTomaso, 1999). Therefore, controlling these invasive populations will enhance grasslands and increase the level of biodiversity, which will increase the potential habitat for wildlife.

In the Big Springs area of Mindego Hill, purple star thistle has become increasingly scarce, especially within the last few years of treatment. Ongoing invasive species control efforts have reduced previously large patches of harding grass, *Phalaris aquatica*, to only a few scattered individual grass stands. This will allow for more focus on the existing French broom, *Genista monspessulana*, in this area, which will need continuous follow up treatments. The larger individuals have been removed in previous control efforts, and the existing seed bank is continuing to flush out. Efforts need to continue as funding and volunteer availability allow as the long term seed bank of this species will continue to germinate every year.

The addition of cattle grazing on the preserve has brought its own dynamic to the vegetation management of the grasslands. Grazing activities have decreased the biomass of invasive species on the preserve. Furthermore, the disturbance caused by the cattle activity has resulted in an increase in seed germination from the existing seed banks of purple star and smooth distaff thistles in the disturbed soil. Follow up treatments in these areas are recommended in order to keep these invasive species from returning in higher numbers, and will utilize the grazing activity as a means of flushing out the seed bank.

As in 2016, smooth distaff thistle continues to be the most difficult invasive to control. Large areas on the steepest part of the hill above Kneudler Lake continue to exhibit large populations and a high percentage of coverage. However, other areas, specifically those within closer proximity to the lake, have shown gradually decreasing populations. The biomonitoring area around Kneudler Lake has been treated more consistently with Milestone in a more timely fashion relative to plant phenology, and the herbicide has shown positive effects. This biologically sensitive area was treated with Milestone in May in 2017, as opposed to early June as in 2016. As the control efforts progressed, the increased maturity of the thistles eventually prevented an effective use of herbicide, so control methods were switched to hand removal. Upon recent scouting in 2018, areas that had been treated with herbicide in May of 2017 showed significantly less coverage than areas that were hand pulled. Areas that were unable to be hand pulled or treated with Milestone showed the highest percent of thistle coverage. The difference in treatment response between manual removal and Milestone may be attributed to the preemergent effect of the herbicide, inhibiting seed germination. The more accessible

Figure 13: Distaff thistle sprayed with Milestone and blue dye at Kneudler Lake

areas where smooth distaff thistle populations had been treated with an application of Milestone around Mindego Hill Trail have shown a significant reduction in populations with each follow up treatment.

In future years, it is highly recommended that smooth distaff thistle be treated with a Milestone application early in the season, which will increase the efficacy on seedlings and rosettes, and further utilize the preemergent qualities of the herbicide by preventing seed germination.

5.4.3 Agricultural Properties

Assessment of agricultural properties did not occur in 2017 as planned due to staffing shortages within the Vegetation Program. Review and assessment of agricultural properties, which represent a small percentage of District land, will begin in FY 2018-19 once both a new IPM Coordinator (June 4, 2018) and Rangeland Ecologist (TBD) are hired.

5.5 Summary of Public Participation in Pest Control

The public is an integral part of the success of the IPM program. Volunteers who assist with invasive plant identification and control are a valuable asset to the IPM program. In 2017, the District's Preserve Partner volunteers contributed 2,664 hours to Resource Management through eighty-three outdoor service projects. The District hosted twenty-one Special Group projects, a subset of the Preserve Partners, which include school groups, technology companies, scout troops, running clubs and community groups. Preserve Partner projects were held in nineteen open space preserves.

Figure 14: Weed wrench crew

Preserve Partner projects focused primarily on invasive plant control addressing sixteen invasive species: French broom, Spanish broom, slender false brome, purple star thistle, yellow star thistle, Italian thistle, teasel, stinkwort, coyote brush, vinca, barbed goat grass, jointed goat grass, medusa head, and tocalote. There were Preserve Partner projects to remove two species previously not addressed: Ehrharta and hanging sedge. French broom removal dominated Preserve Partner projects with thirty-four French broom projects taking place in twelve open space preserves.

There were twenty-one active Advanced Resource Management Stewards (ARMS) in 2017. The ARMS volunteers work independently on resource management projects on their own time. To attack key populations of invasive plants more effectively, the Volunteer Program Lead recruits ARMS for small mobile "strike teams". In 2017, twenty ARMS "strike teams" were deployed to address nine species of invasive plants. In total, the ARMS volunteers contributed 889 hours to resource management with project sites located in twenty open space preserves.

Stewardship partnerships formalized in 2016 continued in 2017. Grassroots Ecology contributed 914 hours of resource management at two sites. French broom removal continued at the Hawthorns in the Windy Hill

Open Space Preserve. Over 200 native plants were installed at the Russian Ridge Open Space Preserve parking lot as part of the restoration project implemented there last year. Village Harvest contributed 150 hours of resource management in the orchard at the Steven's Canyon Ranch in the Saratoga Gap Open Space Preserve.

In 2017, the Volunteer Program Manager coordinated a new program with the Student Conservation Association (SCA). This program provided an opportunity for local, underserved students to learn Geographic Positioning System (GPS) skills and then apply these skills to map a variety of natural features and infrastructure on District land. The SCA contributed 2,000 resource management hours over 20 project days at various open space preserves.

Volunteers were instrumental in assisting the Natural Resources Department complete native plant revegetation projects in 2017. Preserve Partners spent eight project days, approximately 400 hours, revegetating the Mt. Umunhum summit area as well as contributing time to planting projects at the Fremont Older parking lot, the Rosetta property on Mt. Umunhum Rd., and the Woods Trail in Sierra Azul.

5.6 Summary of Staff Training, Public Outreach, and Educational Activities

5.6.1 Staff Training

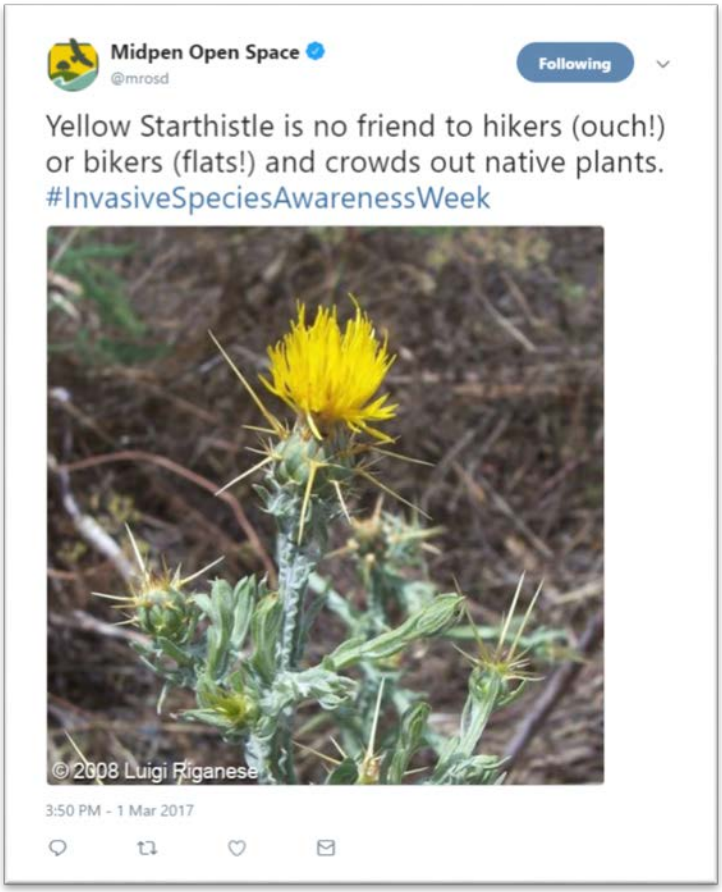
The mandatory annual Pesticide Safety and Training was held at both field offices in May of 2017. All California Department of Pesticide Regulation required training information was presented by the District's Pest Control Advisor (PCA), Mark Heath of Shelterbelt Builders, Inc.

In October 2017, the IPM coordinator, Resource Management Specialist I, Volunteer Program Lead, and Maintenance Supervisor participated in the annual California Invasive Species Council symposium.

5.6.2 Public Outreach

5.6.2.1 Facebook Posts

5.6.2.2 Twitter


Midpen Open Space
@mrosd
Following
Yellow Starthistle is no friend to hikers (ouch!) or bikers (flats!) and crowds out native plants. #InvasiveSpeciesAwarenessWeek
© 2008 Luigi Riganese
3:50 PM - 1 Mar 2017

6 Summary of Pesticide Use

The reporting of pesticide use on District lands includes the following entities:

- Staff
- Contractors
- Tenants

The following tables summarizes the known use of pesticides on District lands, excluding PG&E which is not covered under the District's Integrated Pest Management Program, but is still required to report pesticide use to each County Agricultural Department.

Pesticide	**Active Ingredient**	**Product Used (oz)**	**Acres Treated**	**Oz / Acre**	**Max Legal Rate (oz. per 36" tree)[3]**
Fungicide (preventative treatment for Sudden Oak Death)	Potassium salts of phosphorus acid	4,841.86	22.6	214.24	256 Oz.

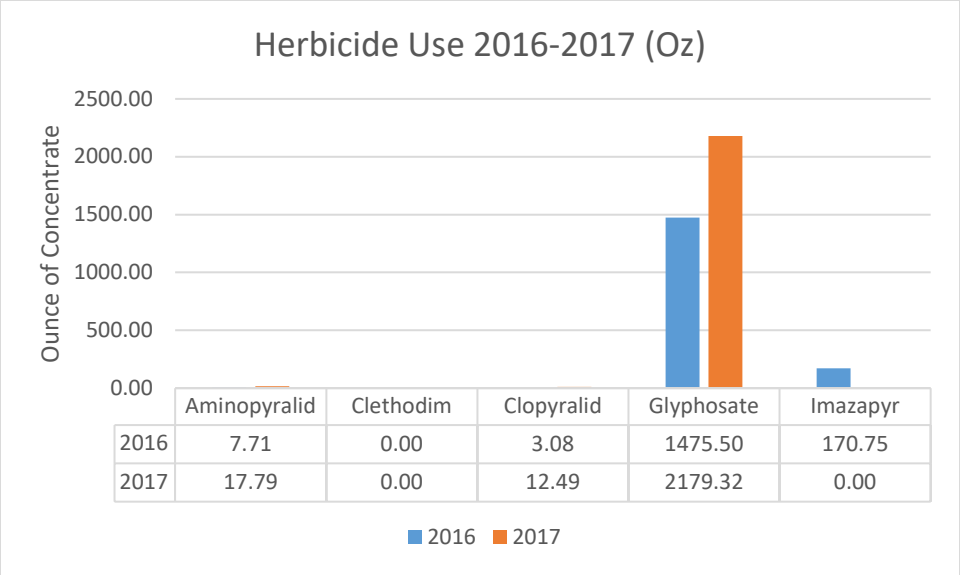
Pesticide	**Active Ingredient**	**Product Used**	**Acres Treated**	**Oz / Acre[6]**	**Max Legal Rate[7] (Oz/Acre)**
Herbicide	Aminopyralid	17.79	147.29	0.12	7.0
	Clethodim	0.0	N/A	N/A	26
	Clopyralid	12.49	5.25	2.38	10.7
	Glyphosate	2181.59	172.89	12.62	224
	Imazapyr	0.0	N/A	N/A	48

Pesticide	**Active Ingredient**	**Product Used (oz)**	**Acres Treated**	**Oz / Acre**
Insecticide	Pyrethrin	72	N/A	N/A

Pesticide	**Active Ingredient**	**Product Used (oz)**	**Acres Treated**	**Oz / Acre**
Rodenticide	Cholecalciferol	0	0	N/A

[6] Ounces per acre can only be compared when product formulations have the same Active Ingredient. For example, the rate for Roundup ProMax with glyphosate as the Active Ingredient is 32 to 160 oz per acre. The rate for Milestone with Aminopyralid as the Active Ingredient is 3 to 7 oz per acre.

[7] Maximum legal rate is the maximum amount of product that can legally be used per the label of the product.



	Aminopyralid	Clethodim	Clopyralid	Glyphosate	Imazapyr
2016	7.71	0.00	3.08	1475.50	170.75
2017	17.79	0.00	12.49	2179.32	0.00

Figure 15: Herbicide use from 2016 through 2017

7 Public Interactions

7.1 Notifications

7.1.1 Pesticide Applications

Prior, during, and after the application of a pesticide (including herbicides, insecticides, or other types of pesticides) on District preserves, employees or contractors post signs at the treatment area notifying the public, employees and contractors of the District's use of pesticide. Posting periods designated below are the District's minimum requirements; signs may be posted earlier and left in place for longer periods of time if it serves a public purpose or if it provides staff flexibility in accessing remote locations.

- For pesticide application in outdoor areas of all District-owned preserves and in buildings which are not occupied or are rarely visited (e.g. pump houses), signs are posted at the treatment areas 24 hours before the start of treatment until 72 hours after the end of treatment. Signs stating] "Pesticide Use Notification" are placed at each end of the outdoor treatment area and any intersecting trails.

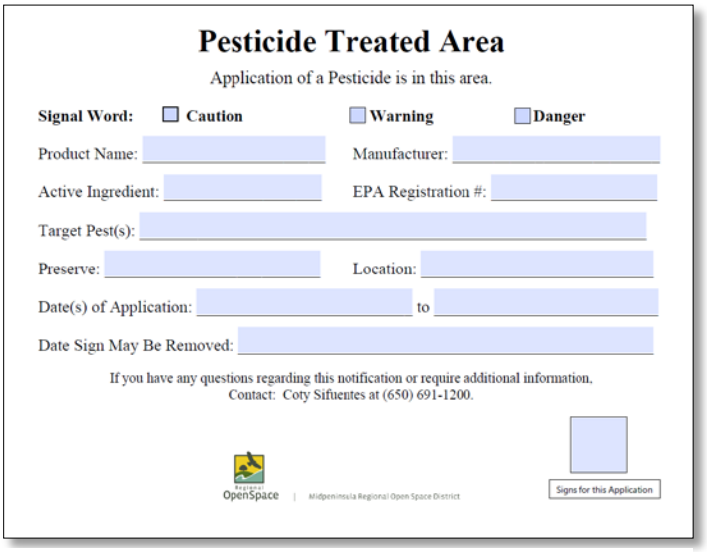


Figure 16: Pesticide Notification Sign

- For urgent application of pesticides to control stinging insects, signs are posted at the treatment area 72 hours after the end of treatment, but no pre-treatment posting is required.
- For pesticide application in occupied buildings such as visitor centers, offices and residences, notification is provided to building occupants (employees, visitors, residents) 24 hours before the start of treatment by email, letters or telephone calls. Additionally, for buildings which might be visited by more than just a single family, signs stating "Pesticide Use Notification" will be placed at the entrances to the building 24 hours before the start of treatment until 72 hours after the end of treatment. The use of approved insecticidal baits in tamper-proof containers require notification 24 hours before the start of treatment by email, letters or telephone calls, but will not require posting of signs.
- The information contained in the pesticide application signs include: product name, EPA registration number, target pest, preserve name and/or building, date and time of application, and contact person with telephone number. The contact person is the IPM Coordinator.
- On lands that the District manages but does not own (e.g., Rancho San Antonio County Park), the District will provide notification of pesticide use in the same manner and applying the same actions as it does with its properties, unless the contracting agencies have adopted more restrictive management

standards. In those cases, the more restrictive management standards would be implemented by the District.

- In the event of an immediate public safety concern, notification occurs at the time of treatment but pre-posting may not be possible.

All contractors notify the District before application on any property, and comply with requirements for notification and posting of signs described above.

At the discretion of the District staff and depending on the site conditions, neighboring landowners are notified if the District is conducting pest management near a property line.

7.2 Inquiries

The District received a number of inquiries in 2017 concerning the IPM Program.

Date	Staff	Inquirer	Contact Method	Request/Comment	Response
3/8/2017	C. Sifuentes	S. Carlton, PG&E	E-Mail	Can herbicide be used on PG&E easement within 10 APNs	List of species of concerned issued. Only herbicides listed on the District's approved list allowed.
4/4/2017	S. Hooper	POST	E-Mail	Protection measures for wildlife during treatment. Can District provide BMPs?	District shared the IPM BMPs
4/10/2017	C. Sifuentes	D. Johnson, Cal-IPC	E-Mail	Request for District to support funding for Weed Management Areas.	Support letter issued
5/1/2017	C. Sifuentes / General Information	G. Masciejewski	E-Mail	Concern over the lack of bees at Russian Ridge.	District explained that honey bees are non-native and there are 100's of native pollinators in the area
5/1/2017	M. Chaney	P. Luong	E-Mail	Request for permit to keep honey bees within Preserve boundaries.	Request was denied due to the non-native status
5/3/2017	C. Sifuentes	J. Chayka, Marin County Parks	E-Mail	Can the District share the latest IPM Report.	2016 IPM Report was shared
5/15/2017	C. Sifuentes	D. Johnson, Cal-IPC	E-Mail	Discuss non-chemical approaches to weed control	Staff was assigned to participate in the Technical Advisor Committee
5/23/2017	C. Sifuentes	E. Uhler, Central Coast Wilds	E-Mail	Alerting District to new population of Medusahead grass	Field Staff assigned to remove new population

Date	Staff	Inquirer	Contact Method	Request/Comment	Response
6/13/2017	G. Baillie, C. Sifuentes	P. Helmke, City of San Jose	E-Mail	Post fire rehab. Request for referrals for contractors to do stabilization.	District shared contractor list with the City
7/25/2017	C. Sifuentes	A. Forrestel, National Park Service	Phone	Can the District provide example of Pest Control Recommendation	2017 Pest Control Recommendations sent via e-mail
7/19/2017	General Information	J. Crowther	E-Mail	Concern about yellow star thistle at Skyline Ridge and Monte Bello OSP	Explained invasive species prioritization
8/2017-9/2017	C. Sifuentes	B. Leininger, M. Liebhold	E-Mail	Multiple question into PG&E use of herbicide and vegetation management practices	Response e-mail issued
10/24/2017	Board of Directors	M. Liebhold	E-Mail	Request for review of Glyphosate	Response letter issued. District contracted with Blankinship & Associates to conduct an up to date literature review.
10/24/2017	C. Sifuentes	B. Cody, IMS	E-Mail	Request for name of firm selected for the Pesticide Toxicological Service RFPQ	Name of selected firm was sent (Blankinship & Associates)
11/15/2017	C. Sifuentes	C. Conforti, Presidio Trust	E-Mail	Request for information on Envoy Plus herbicide	Toxicological report was shared. Staff shared qualitative information of effectiveness
12/7/2017	C. Sifuentes	B. Cody, IMS	E-Mail	Request for name of firm selected for the CEQA on three new pesticides and two species of special concern RFPQ	Name of selected firm was sent (Blankinship & Associates)

No changes to District protocol were made due to public comments. Because of the ongoing scientific evaluations regarding the toxicity of glyphosate and public concern over its use both in the US and Europe, staff determined it would be important to conduct an updated literature review of the toxicology of glyphosate

8 Consultants and Contractors

8.1 Blankinship & Associates - $28,970

Preparation of toxicological services for the inclusion of three new pesticides in the IPM Program, a review of glyphosate, and CEQA services

8.2 CalFlora - $2,900

Annual subscription to the CalFlora Database

8.3 California Environmental Services - $5,293

Relocation of Woodrats within treatment area of Woods Trail (Sierra Azul Open Space Preserve)

8.4 Community Tree Service - $10,801

Eucalyptus removal at Woods Trail (Sierra Azul Open Space Preserve) as part of mitigation for Mt. Umunhum

8.5 Ecological Concerns, Inc. - $296,418

Treatment of invasive species District wide

8.6 Shelterbelt Builders, Inc. - $5,690

Preparation of Pest Control Recommendations and the annual pesticide safety-training requirement

9 Compliance with Guidance Manual

9.1 Effectiveness of Changes

9.2 Experimental Pest Control Projects

9.2.1 Slender False Brome (*Brachypodium sylvaticum*)

In spring of 2016, the District begun consultation with Santa Clara University to set up an experiment looking at non-herbicide and herbicide options on slender false brome. Test plots on a private property has been set up. Results are expected in two to three years.

9.3 Changes to Guidance Manual or Control

9.3.1 Updating the List of Approved Pesticides

The List of Approved Pesticides is intended to change over time as the science of pest control advances and more effective, safer, and less harmful pesticides are developed; as manufacturers update, discontinue, or substitute products; and as the District's target pests change over time.

9.3.1.1 Product Additions

In instances where new products with new active ingredients are found to be safer, more effective, and/or less costly than products on the on the List of Approved Pesticides, the District may elect to add new pesticides. This type of change typically requires additional toxicological review, and depending on the results, may also require additional environmental review.

A toxicological review has been completed on four new pesticides, three of which District staff has concluded should be reviewed for CEQA compliance and will be presented to the Board in the Fall of 2018:

- Insecticide
  - Python Dust Bag (removed for consideration due to toxicity concerns)
  - Wasp Freeze II
- Herbicide
  - Garlon 4 Ultra
  - Capstone

10 List of Preparers and Contributors

MROSD
Cydney Bieber, Web Administrator
Jean Chung, Property Management Specialist I
Ellen Gartside, Volunteer Program Lead
Amanda Mills, Resource Management Specialist II
Coty Sifuentes-Winter, Senior Resource Management Specialist
Susan Weidemann, Property Management Specialist II

Ecological Concerns, Inc.
Garrick Hansen, Project Manager

Appendix A - District Best Management Practices

District BMPs for IPMP

BMP ID#	Best Management Practices
1	All pesticide use shall be implemented consistent with Pest Control Recommendations prepared annually by a licensed Pest Control Advisor.
2	Surfactants and other adjuvants shall be used and applied consistent with the District's Pest Control Recommendations.
3	Applicators shall follow all pesticide label requirements and refer to all other BMPs regarding mandatory measures to protect sensitive resources and employee and public health during pesticide application.
4	Pesticide applicators shall have or work under the direction of a person with a Qualified Applicator License or Qualified Applicator Certificate. Contractors and grazing and agricultural tenants may apply approved herbicides after review and approval by the District and under the direction of QAL/QAC field supervisors. Employees, contractors and tenants may install approved ant and roach bait stations inside buildings in tamper-proof containers without review by a QAL/QAC. Tenants may not use rodenticides; only qualified District staff or District contractors may use approved rodenticides and these should only be used in the event of an urgent human health issue and in anchored, tamper-proof containers inside buildings.
5	All storage, loading and mixing of herbicides shall be set back at least 300 feet from any aquatic feature or special-status species or their habitat or sensitive natural communities. All mixing and transferring shall occur within a contained area. Any transfer or mixing on the ground shall be within containment pans or over protective tarps.
6	Appropriate non-toxic colorants or dyes shall be added to the herbicide mixture to determine treated areas and prevent over-spraying.
7	Application Requirements - The following general application parameters shall be employed during herbicide application: ◢ Application shall cease when weather parameters exceed label specifications, when wind at site of application exceeds 7 miles per hour (MPH), or when precipitation (rain) occurs or is forecasted with greater than a 40 percent probability in the next 24-hour period to prevent sediment and herbicides from entering the water via surface runoff; ◢ Spray nozzles shall be configured to produce a relatively large droplet size; ◢ Low nozzle pressures (30-70 pounds per square inch [PSI]) shall be observed; ◢ Spray nozzles shall be kept within 24 inches of vegetation during spraying; ◢ Drift avoidance measures shall be used to prevent drift in locations where target weeds and pests are in proximity to special-status species or their habitat. Such measures can consist of, but would not be limited to the use of plastic shields around target weeds and pests and adjusting the spray nozzles of application equipment to limit the spray area.
8	Notification of Pesticide Application – Signs shall be posted notifying the public, employees, and contractors of the District's use of pesticides. The signs shall consist of the following information: signal word, product name, and manufacturer; active ingredient; EPA registration number; target pest; preserve name; treatment location in preserve; date and time of application; date which notification sign may be removed; and contact person with telephone number. Signs shall generally be posted 24 hours before the start of treatment and notification shall remain in place for 72 hours after treatment ceases. In no event shall a sign be in place longer than 14 days without dates being updated. See the IPM Guidance Manual for details on posting locations, posting for pesticide use in buildings and for exceptions.
9	Disposal of Pesticides – Cleanup of all herbicide and adjuvant containers shall be triple rinsed with clean water at an approved site, and the rinsate shall be disposed of by placing it in the batch tank for application. Used containers shall be punctured on the top and bottom to render them unusable, unless said containers are part of a manufacturer's container recycling program, in which case the manufacturer's instructions shall be followed. Disposal of non-recyclable containers shall be at legal dumpsites. Equipment shall not be cleaned and personnel shall not bathe in a manner that allows contaminated water to directly enter any body of water within the treatment areas or adjacent watersheds. Disposal of all pesticides shall follow label requirements and local waste disposal regulations.
10	All appropriate laws and regulations pertaining to the use of pesticides and safety standards for employees and the public, as governed by the U.S. Environmental Protection Agency, the California Department of Pesticide Regulation, and local jurisdictions shall be followed. All applications shall adhere to label directions for application rates and methods, storage, transportation, mixing, and container disposal. All contracted applicators shall be appropriately licensed by the state. District staff shall coordinate with the County Agricultural Commissioners, and all required licenses and permits shall be obtained prior to pesticide application.
11	Sanitation and Prevention of Contamination - All personnel working in infested areas shall take appropriate precautions to not carry or spread weed seed or plant and soil diseases outside of the infested area. Such precautions will consist of, as necessary based on site conditions, cleaning of soil and plant materials from tools, equipment, shoes, clothing, or vehicles prior to entering or leaving the site.
12	All staff, contractors, tenants, and volunteers shall be properly trained to prevent spreading weeds and pests to other sites.
13	District staff shall appropriately maintain facilities where tools, equipment, and vehicles are stored free from invasive plants.

District BMPs for IPMP

BMP ID#	Best Management Practices
14	District staff shall ensure that rental equipment and project materials (especially soil, rock, erosion control material and seed) are free of invasive plant material prior to their use at a worksite.
15	Suitable onsite disposal areas shall be identified to prevent the spread of weed seeds.
16	Invasive plant material shall be rendered nonviable when being retained onsite. Staff shall desiccate or decompose plant material until it is nonviable (partially decomposed, very slimy, or brittle). Depending on the type of plant, disposed plant material can be left out in the open as long as roots are not in contact with moist soil, or can be covered with a tarp to prevent material from blowing or washing away.
17	District staff shall monitor all sites where invasive plant material is disposed on-site and treat any newly emerged invasive plants.
18	When transporting invasive plant material off-site for disposal, the plant material shall be contained in enclosed bins, heavy-duty bags, or a securely covered truck bed. All vehicles used to transport invasive plant material shall be cleaned after each use.
19	Aquatic Areas –A District-approved biologist shall survey all treatment sites prior to work to determine whether any aquatic features are located onsite. On a repeating basis, grassland treatment sites shall be surveyed once every five years and brushy and wooded sites shall be surveyed once every three years. Brush removal on rangelands will require biological surveys before work is conducted in any year. Aquatic features are defined as any natural or manmade lake, pond, river, creek, drainage way, ditch, spring, saturated soils, or similar feature that holds water at the time of treatment or typically becomes inundated during winter rains. If during the survey it is found that aquatic features are present within 15 feet of the proposed treatment area, the District shall either eliminate all treatment activities within 15 feet of the aquatic feature from the project (i.e. do not implement treatment actions in those areas) or if the District chooses to continue treatment actions in these areas, it shall follow the requirements of the mitigation measure for special-status wildlife species and the CDFW Streambed Alteration Agreement.
20	Application of herbicides shall be conducted in accordance with the California Red-Legged Frog Injunction (Center For Biological Diversity v. U.S. Environmental Protection Agency (2006) Case No.: 02-1580-JSW) in known or potential California red-legged frog habitat specifically by: not applying specified pesticides within 15 feet of aquatic features (including areas that are wet at time of spraying or areas that are dry at time of spraying but subsequently might be wet during the next winter season); utilizing only spot-spraying techniques and equipment by a certified applicator or person working under the direct supervision of a certified applicator; and not spraying during precipitation or if precipitation is forecast to occur within 24 hours before or after the proposed application. Preserves in which these precautions must be undertaken are: Miramontes Ridge, Purisima Creek Redwoods, El Corte de Madera, La Honda Creek, Picchetti Ranch, Russian Ridge, Sierra Azul, Tunitas Creek, Skyline Ridge, Rancho San Antonio, Monte Bello and Coal Creek OSPs and Toto Ranch.
21	A District-approved biologist shall survey all selected treatment sites prior to work to determine site conditions and develop any necessary site-specific measures. On a repeating basis, grassland treatment sites shall be surveyed once every five years and brushy and wooded sites shall be surveyed once every three years. Brush removal on rangelands will require biological surveys before work is conducted in any year. Site inspections shall evaluate existing conditions at a given treatment site including the presence, population size, growth stage, and percent cover of target weeds and pests relative to native plant cover and the presence of special-status species and their habitat, or sensitive natural communities. In addition, worker environmental awareness training shall be conducted for all treatment field crews and contractors for special-status species and sensitive natural communities determined to have the potential to occur on the treatment site by a District-approved biologist. The education training shall be conducted prior to starting work at the treatment site and upon the arrival of any new worker onto sites with the potential for special-status species or sensitive natural communities. The training shall consist of a brief review of life history, field identification, and habitat requirements for each special-status species, their known or probable locations in the vicinity of the treatment site, potential fines for violations, avoidance measures, and necessary actions if special-status species or sensitive natural communities are encountered.
22	Nesting Birds - For all IPM activities that could result in potential noise and other land disturbances that could affect nesting birds (e.g., tree removal, mowing during nesting season, mastication, brush removal on rangelands), treatment sites shall be surveyed to evaluate the potential for nesting birds. Tree removal will be limited, whenever feasible, based on the presence or absence of nesting birds. For all other treatments, if birds exhibiting nesting behavior are found within the treatment sites during the bird nesting season: March 15 – August 30 for smaller bird species such as passerines and February 15 - August 30 for raptors, impacts on nesting birds will be avoided by the establishment of appropriate buffers around active nests. The distance of the protective buffers surrounding each active nest site are: 500 feet for large raptors such as buteos, 250 feet for small raptors such as accipiters, and 250 feet for passerines. The size of the buffer may be adjusted by a District biologist in consultation with CDFW and USFWS depending on site specific conditions. Monitoring of the nest by a District biologist during and after treatment activities will be required if the activity has potential to adversely affect the nest. These areas can be subsequently treated after a District-approved biologist or designated biological monitor confirms that the young have fully fledged, are no longer being fed by the parents and have left the nest site. For IPM activities that clearly would not have adverse impacts to nesting birds (e.g. treatments in buildings and spot spraying with herbicides), no survey for nesting birds would be required.

District BMPs for IPMP

BMP ID#	Best Management Practices
23	San Francisco dusky-footed woodrat and Santa Cruz kangaroo rat – All District staff, volunteers, tenants, or contractors who will implement treatment actions shall receive training from a qualified biologist on the identification of dusky-footed woodrat, Santa Cruz kangaroo rat, and their nests. Generally, all San Francisco dusky-footed woodrat, Santa Cruz kangaroo rat, and their nests will be avoided and left undisturbed by proposed work activities. If a nest site will be affected, the District will consult with CDFW. Rodenticides, snap traps, and glue boards shall not be used in buildings within 100 feet of active San Francisco dusky-footed woodrat nests or Santa Cruz kangaroo rat nests; instead rodent control in these areas will be limited to non-lethal exclusion and relocation activities including relocation of nests if approved by CDFW. Tenants will contact the District for assistance in managing rat populations in buildings and under no circumstances will be allowed to use rodenticides.
24	Where appropriate, equipment modifications, mowing patterns, and buffer strips shall be incorporated into manual treatment methods to avoid disturbance of grassland wildlife.
25	Rare Plants – All selected treatment sites shall be surveyed prior to work to determine the potential presence of special-status plants. On a repeating basis, grassland treatment sites shall be surveyed once every five years and brushy and wooded sites shall be surveyed once every three years. Brush removal on rangelands will require biological surveys before work is conducted in any year. A 30-foot buffer shall be established from special-status plants. No application of herbicides shall be allowed within this buffer. Non-herbicide methods can be used within 30 feet of rare plants but they shall be designed to avoid damage to the rare plants (e.g., pulling).
26	Cultural Resources – District staff, volunteer crew leaders, and contractors implementing treatment activities shall receive training on the protection of sensitive archaeological, paleontological, or historic resources (e.g., projectile points, bowls, baskets, historic bottles, cans, trash deposits, or structures). In the event volunteers would be working in locations with potential cultural resources, staff shall provide instruction to protect and report any previously undiscovered cultural artifacts that might be uncovered during hand-digging activities. If archaeological or paleontological resources are encountered on a treatment site and the treatment method consists of physical disturbance of land surfaces (e.g., mowing, brushcutting, pulling, or digging), work shall avoid these areas or shall not commence until the significance of the find can be evaluated by a qualified archeologist. This measure is consistent with federal guidelines 36 CFR 800.13(a), which protects such resources in the event of unanticipated discovery.
27	Post-Treatment Monitoring – District staff shall monitor IPM activities within two months after herbicide treatment (except for routine minor maintenance activities which can be evaluated immediately after treatment) to determine if the target pest or weeds were effectively controlled with minimum effect to the environment and non-target organisms. Future treatment methods in the same season or future years shall be designed to respond to changes in site conditions.
28	Erosion Control and Revegetation - For sites with loose or unstable soils, steep slopes (greater than 30 percent), where a large percentage of the groundcover will be removed, or near aquatic features that could be adversely affected by an influx of sediment, erosion control measures shall be implemented after treatment. These measures could consist of the application of forest duff or mulches, straw bales, straw wattles, other erosion control material, seeding, or planting of appropriate native plant species to control erosion, restore natural areas, and prevent the spread or reestablishment of weeds. Prior to the start of the winter storm season, these sites shall be inspected to confirm that erosion control techniques are still effective.
29	Operation of noise-generating equipment (e.g., chainsaws, wood chippers, brush-cutters, pick-up trucks) shall abide by the time-of-day restrictions established by the applicable local jurisdiction (i.e., City and/or County) if such noise activities would be audible to receptors (e.g., residential land uses, schools, hospitals, places of worship) located in the applicable local jurisdiction. If the local, applicable jurisdiction does not have a noise ordinance or policy restricting the time-of-day when noise-generating activity can occur, then the noise-generating activity shall be limited to two hours after sunrise and two hours before sunset, generally Monday through Friday. Additionally, if noise-generating activity would take place on a site that spans over multiple jurisdictions, then the most stringent noise restriction, as described in this BMP or in a local noise regulation, would apply. For IPM sites where the marbled murrelet has the potential to nest, as identified in the District's 2014 maps (see attachment) if noise-generating activities would occur during its breeding season (March 24 to September 15), the IPM activities would be subject to the noise requirements listed in the most current in the CDFW RMA issued to the District (see attachment).
30	All motorized equipment shall be shut down when not in use. Idling of equipment and off-highway vehicles will be limited to 5 minutes.
31	Grazing Animals – Animals that have grazed in areas treated with Milestone herbicide will be moved to an untreated holding area for three days prior to being transferred to an area containing plant species of concern.