2018 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."

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1 Introduction

This report presents the results of the fourth 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 1: Contractors mow Distaff thistle (*Carthamus creticus*) near Kneudler Lake in Russian Ridge OSP

2 Implementation of IPM Program

Full implementation of the IPM Program was originally scheduled to be completed by 2019. Due to resource commitments to Measure AA capital projects and multiple key vacancies of positions that support the IPM Program (e.g. retirement of the Senior Resource Management Specialist, resignation of the Rangeland Ecologist and Volunteer Program Lead) some aspects of the IPM Program were delayed in 2018. Major aspects of the IPM Program that are under development in 2019 include a landscape-level monitoring protocol and an Early Detection/Rapid Response Protocol. Once the protocols are developed, their effective annual implementation is dependent on staff capacity in future years.

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. The District is currently a part of a regional effort to develop a fine-scale vegetation map for all of San Mateo County. This map will be extremely helpful for tracking.

2.2 Early Detection / Rapid Response Protocol

Early Detection / Rapid Response (EDRR) places emphasis on preventing the establishment of new pest populations on District lands through increased surveys for pests. If new pest populations get established, EDRR would implement rapid response measures to control pests before they spread. EDRR programs increase the likelihood that pest invasions are addressed successfully before the population size and extent are beyond that which can be practically and economically contained and eradicated. The IPM Guidance Manual currently includes EDRR strategies to respond to pests, however, current staffing levels and commitments limit the District's ability to fully implement a comprehensive EDRR program. As a part of developing this protocol, the District will evaluate the long-term resource needs (i.e., staffing, volunteers, contractors, etc.) and the long-term financial sustainability for successfully implementing the program. EDRR strategies would include:

- Identifying potential threats early to allow control or mitigation measures to be taken;
- Detecting new invasive species in time for allowing 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 surveys 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 Management

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

3.1 Pre-Treatment Surveys

The District's Best Management Practices from the FEIR Integrated Pest Management Program 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 entered into CalFlora, an online database. In 2018, District biologists completed the following surveys:

Table 1: Number of Pre-Treatment Surveys

Category	El Sereno	Fremont Older	Picchetti Ranch	Pulgas Ridge	Miramontes Ridge
Fuel Management	3	4	4	1	1
Natural Lands	7	10	11	19	6
Rangeland	-	-	-	-	-
Recreational Facilities	3	10	3	4	-
Total	13	24	18	24	7

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)
- Jurisdictional areas
- Erosive conditions (i.e. steep hill side with treatment to remove large areas of vegetation)
- Presence of disease (i.e. Sudden Oak Death)

Information recorded during pre-treatment surveys is provided to staff and contractors on the Annual Project Spreadsheet.

3.2 Ongoing and General Maintenance

3.2.1 Vegetative Pest Species

Sixty-one (61) plant pest species found on District lands are treated on an on-going basis (Appendix A) to control for asset-based protection and long-term management, an increase of seventeen (17) species from 2018. These species have the potential to invade natural areas, displace native plant and wildlife species, and reduce biodiversity. Of the listed species, twenty (20) are considered noxious weeds by the State of California (Table 2). Some species that are considered a low priority for treatment in wildlands are treated in restoration sites to ensure that recently installed plants have a higher chance of survival. Increase in number of species treated are partially due to increased quality for field data collection.

Table 2: Treated Species by Rating for Ongoing and New Projects

Year	Species Treated	Cal-IPC Rating			CDFA Rated	Alert
		Limited	**Moderate**	**High**		
2018	61	14	22	13	20	2
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 2018.

Table 3: Invasive fauna species present in District Preserves

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, Sierra Azul	Mindego Ranch	Monitoring
Trachemys scripta elegans	Red-eared slider	Bear Creek Redwoods	Mud Lake	Monitoring, Trapping

3.2.3 Pest Control in Buildings

Between January and December of 2018, the District hired *Complete Pest Control* to do rodent control at thirteen residential locations, with seventeen residences, throughout the District[1] as listed below:

- El Corte de Madera OSP (1) – 4 residences
- Fremont Older (1)
- La Honda OSP (2)
- Monte Bello OSP (1)
- Rancho San Antonio (1) – duplex with 2 residences
- Russian Ridge OSP (2)
- Skyline OSP (2)
- Thornewood (1)
- Tunitas Creek OSP (1) – two structures, one location
- Windy Hill OSP (1)

3.2.4 Fuel Management

The District works with local communities and fire districts to minimize the potential for fires to spread to and from Preserve lands. The District provides necessary fire and fuel management practices to protect forest resources, public health, and safety by:

- Maintain essential roads for emergency fire access, and forest management activities undertaken to reduce fire hazard.
- Maintain adequate fire clearance around District structures and facilities.
- Encourage neighboring property owners to maintain adequate fire clearance around existing development. Consult with regulatory agencies to encourage that construction of new development maintains fire agency recommended setbacks for fire clearance between new development and District forest and woodland.
- Evaluate the potential to reduce forest fuel loading through the removal of smaller trees to reduce forest floor fuel buildup and ladder fuels.

Figure 2: Crews build a shaded fuel break at Sierra Azul OSP

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

- Coordinate with fire agencies and local communities to define locations where fire protection infrastructure is desirable and practical.
- Reintroduce fire as a resource management tool to reduce forest floor fuels and reestablish fire for ecosystem health where stand conditions, access, and public safety permit. Coordinate with other agencies for planning and implementation.
- Seek grant opportunities and partnerships for fuel management projects and monitoring.

3.2.4.1 *Fuel Reduction Permits*

Preserve neighbors wishing to modify vegetation on District preserves to create defensible space around their homes and occupied structures may apply for a Fuel Reduction Permit. District staff perform pre-surveys prior to issuing a permit to ensure adequate protection and mitigation measures are implemented during the work.

In 2018, three (3) Defensible Space Permits were issued to preserve neighbors. One (1) at La Honda Creek OSP, and two (2) at Fremont Older OSP.

3.2.4.2 *Fuel Reduction Projects Implemented by the District*

The District currently maintains various types of fuel breaks at many preserves. This work is accomplished primarily through mechanical means, using handheld power tools or heavy equipment. In addition to the acreage listed below, the District maintains approximately 30 miles of disc lines, mostly along Preserve boundaries.

The IPM program currently covers maintenance for existing fuel breaks, and does not allow for construction of major new fuel breaks. The District is currently seeking additional CEQA compliance that will greatly expand the fuel reduction program on District lands and allow for the creation of new fuel breaks.

Figure 3: Preserve roads are maintained to allow safe passage of emergency vehicles

Table 4: Summary of Fuel Reduction projects District-wide

Purpose	Acres		Total Area
	Foothills	Skyline	
Defensible Space	21.9	33.23	55.13
Landing Zones	6.5	5.25	11.76
Shaded Fuel Break	36.8	22.7	59.5
Other Fuel Break	-	14.4	12.2

TOTAL	**65.2**	**75.58**	**140.78**

3.3 Conservation Grazing

The District's conservation grazing program manages more than 11,000 acres of coastal property as rangelands. On these lands, grazing is used as a broad management tool to achieve outcomes for both conservation of biodiversity and fuel management to reduce wildfire risk while supporting local sustainable agriculture and the viability of grazing in our region. Grazing can reduce the height and thatch build-up of non-native annual grasses, which benefits native bunch grasses and forb species. Since grasslands generally support more plant diversity than nearby wooded or brushy areas, control of non-native annual grasses is one of the most significant actions we can take to promote plant diversity. In addition, several special status wildlife species benefit from the vegetation structure created by grazing activity. As the conservation grazing program continues to grow, we hope to work with our grazing tenants to develop grazing strategies that help target priority invasive plant species.

Grazing can also be an effective tool to reduce biomass and fuel loads, which helps reduce the intensity of wildfires. Using mechanical methods for fuel management can be prohibitively expensive, and grazing allows fuel reduction at scales that would be unfeasible with other methods. Additionally, brush removal for rangeland improvement also contributes to a significant amount of fuel management District-wide.

Table 5: District Properties in the Conservation Grazing Program

Property	Preserve	Total Acres[1]
Apple Orchard	La Honda	222
Driscoll Ranch	La Honda	3,700
McDonald Ranch	La Honda	2,060
Bluebrush Canyon	Purisima Creek Redwoods	302
Elkus-Lobitos	Purisima Creek Redwoods	839
October Farms	Purisima Creek Redwoods	270
Mindego Hill	Russian Ridge	1,047
Big Dipper	Skyline Ridge	955
Toto Ranch	Tunitas Creek	952
Tunitas Creek Ranch	Tunitas Creek	707
TOTAL:		11,054

3.4 New Pest Control Projects

Potential pest control projects were submitted to the IPM Coordinator using the District's New Pest Control Project form. 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

[1] This acreage accounts for grazing leases, and includes some ungrazed land (e.g. drainages, brush patches, etc.) A full inventory of actively grazed lands will result from the upcoming San Mateo Vegetation Map

- Provides for public engagement
- Feasibility and effectiveness

Seven (7) new pest control projects were determined to have high priority for treatment on District lands (Table 4). Additionally, ongoing projects at Sierra Azul that had not previously been captured in the IPM plan were added for the first time, and two minor fuel management treatments were initiated in 2018.

Table 6: New Pests Control Projects

Scientific Name	Species	Cal-IPC rating	CDFA rating	Alert	Gross Acres	Infested Acres
Genista monspessulana	French Broom	High	Noxious	-	0.25	0.12
Dipsacus sativus	Teasel	Moderate	-	-	0.25	0.06
Carduus pycnocephalus	Italian thistle	Moderate	Noxious	-	10	3
Silybum marianum	Milk thistle	Limited			10	3
Centaurea calcitrapa	Purple starthistle	Moderate	Noxious		9.2	0.93
Carthamus lanatus	Distaff thistle	Moderate	Noxious		1.0	0.21
-	Various thistles	-	-	-	50	6.25

Table 7: New Fuel Management Projects

Preserve	Location	Purpose	Treatment Type	Treatment Method	Gross Acres	Person-Hours
WH	Kabcenell Driveway	Defensible Space	Manual & Mechanical	Mowing & Cutting	2.0	100
MR	Madonna Creek Ranch	Defensible Space	Manual & Mechanical	Mowing & Cutting	1.4	40

Figure 4: Preserve Partners volunteers remove Purple star thistle (*Centaurea calcitrapa*) at La Honda Creek OSP

4 Summary of Pest Control Treatments

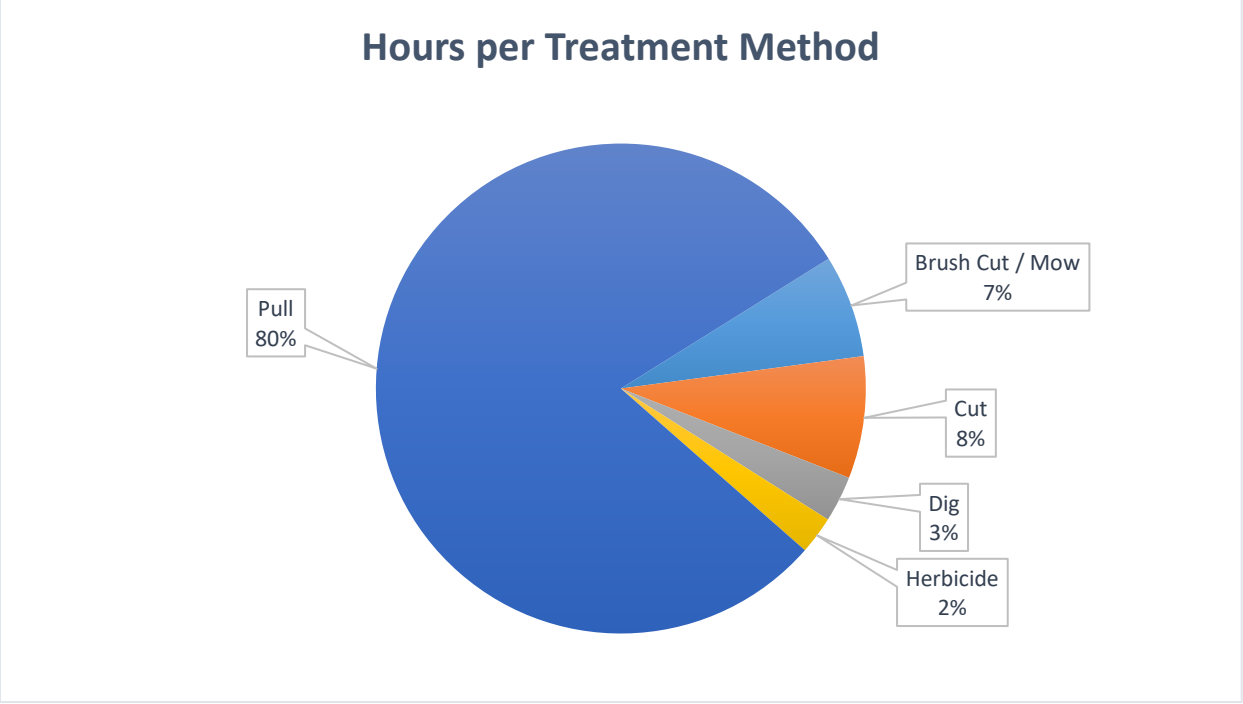
4.1 Type of Control with Cost per Acre

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 8: Treatment Methods and Hours in Natural Areas and Rangelands in 2018

Treatment Method	Hours			Total	% of Total
	Staff	Contractor	Volunteer		
Brush Cut / Mow	287	409	-	**696**	**7 %**
Cut	374	65	388	**826.5**	**8 %**
Dig	51	240	222	**512.5**	**5 %**
Herbicide	81	175	-	**256**	**2 %**
Pull	974	4308	2910	**8192**	**78 %**
TOTAL	**1,767**	**5,197**	**3,520**	**10,484**	
% of Total	**17 %**	**50 %**	**33 %**		

Figure 5: Treatment Method Breakout



Manual removal of weeds via pulling remains the most prevalent treatment method at 82% of all hours; herbicide accounts for 2% of all hours (Figure 5). Herbicide hours were low in 2018 because of the implementation of the SCVWD MOU, which focused on manual treatment methods. In addition, some past herbicide projects have reduced the cover of the target invasive species to levels low enough that manual

follow-up is possible. In a typical year, herbicide use will account for approximately 10% of labor hours. Contractors make up the largest contributor to IPM - Resource Management activities for Natural Areas.

Figure 6: Resource Management by Crew Type

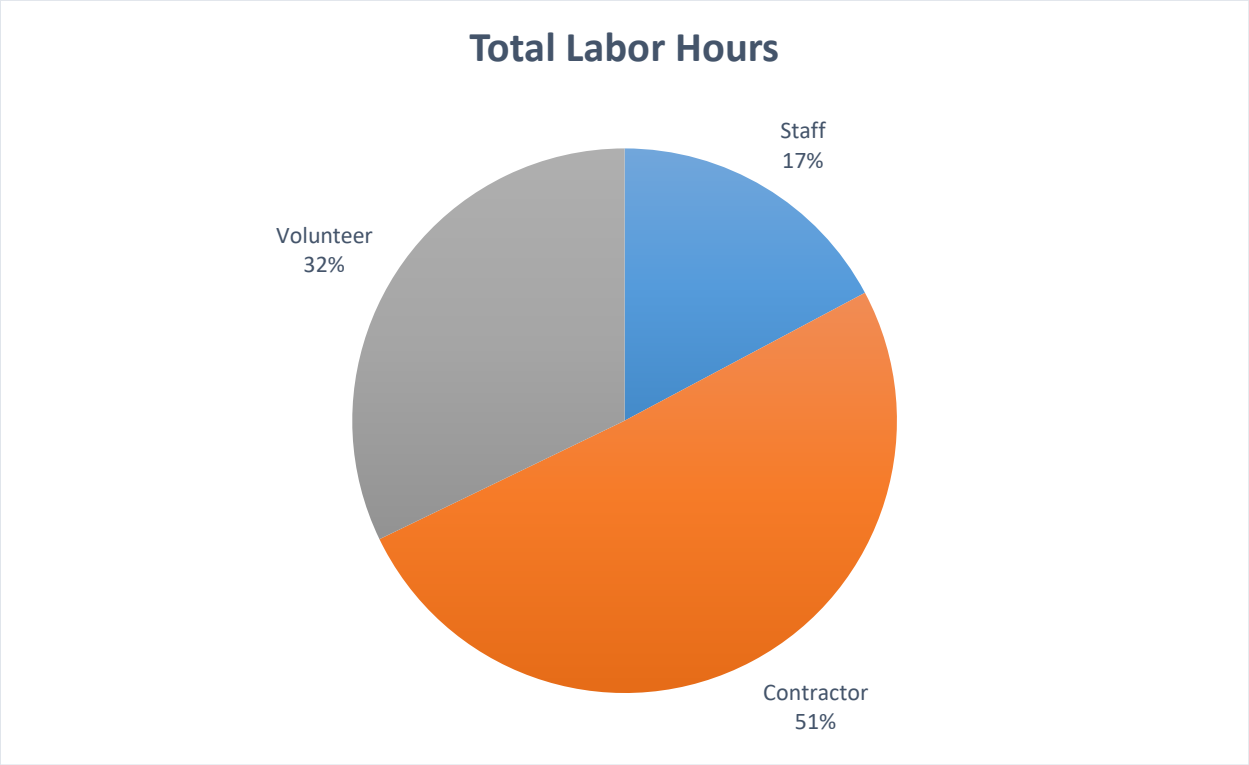
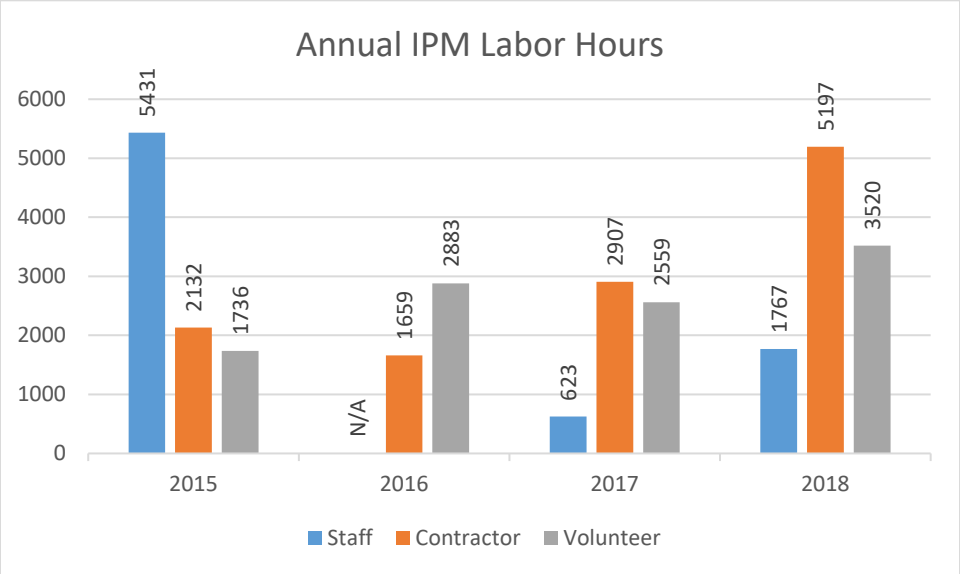


Table 9: Comparison of Hours by Crew Type and Year

Year	Staff	Contractor	Volunteer	Total
2015	5,431	2,132	1,736	**9,299**
2016	Unknown[2]	1,659	2,883	**4,542**
2017	623	2,907	2,559	**6,089**
2018	1,767	5,197	3,520	**10,484**

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

Figure 7: Annual IPM Labor Hours.
2016 was a transitional year for staff data management, so the total labor hours for staff is unknown.



The total number of hours for IPM-related work (Table 8) has increased by 20% from 2015 levels. District field staff almost tripled the amount of work compared to last year. Field staff hours have fluctuated since 2015 based on other competing priorities, including the number of Measure AA capital improvement projects scheduled to be under construction each year. Both volunteer and contractor hours have increased since 2015. The hiring of a second Volunteer Program Lead in 2018 increased the capacity of volunteers to support IPM projects. Increased contractor hours are primarily due to large scale, Measure AA project-related restoration and/or mitigation work. In addition, a five-year Memorandum of Understanding (MOU) grant agreement with Santa Clara Valley Water District (SCVWD) (R-17-79) provided substantial funding for IPM related work at Bear Creek Redwoods Open Space Preserve. Figure 7 (below) shows the comparative cost for different treatment methods for 2018. 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:

- Contractor - $50.00 per hour
- Staff – $43.45 per hour
- Volunteers - $25.43 per hour[3]

[3] 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/new-value-volunteer-time-2019/

Figure 8: Treatment Cost per Acre.

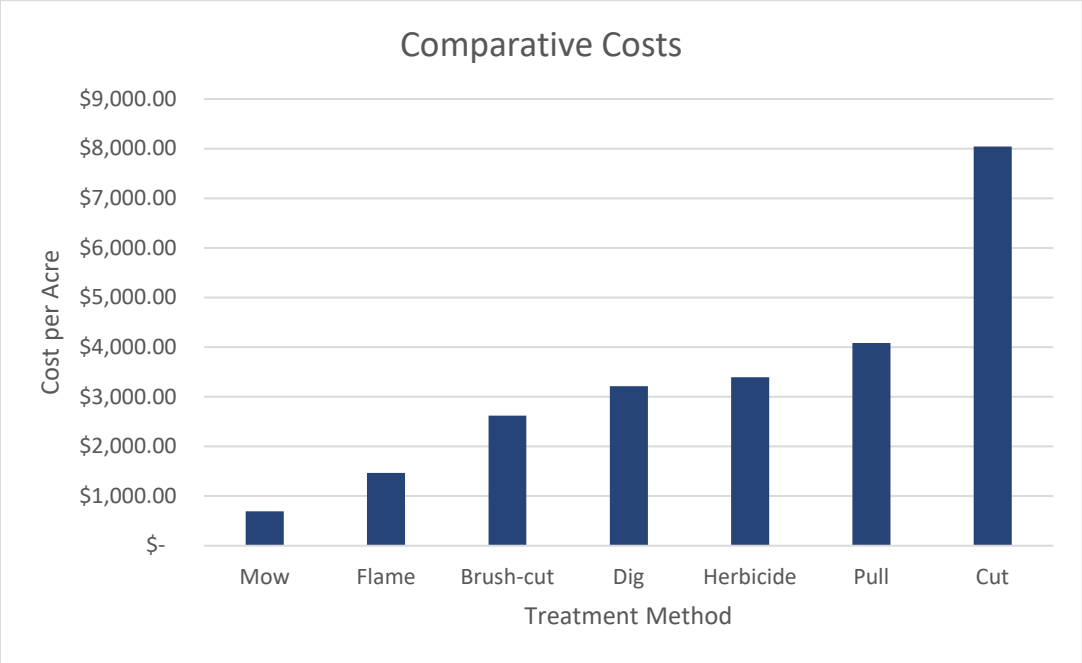


Figure 9: Yellow starthistle (*Centaurea solstitialis*) at Long Ridge OSP

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.

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 9) 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 2018.

Table 10: 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[4]	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

5.2 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.

[4] 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.

5.3 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. Most projects utilize an integrated treatment approach where initial treatment can consist of increased chemical or mechanical methods, and then a shift towards low-intensity manual methods as the infestation becomes under control and the seedbank is eliminated.

District staff selected twelve (12) distinct herbicide projects to perform trend analysis:

- Bear Creek Redwoods, Phase I (two herbicides);
- Big Dipper Ranch (two herbicides);
- Driscoll Ranch (two herbicides);
- Los Trancos (two herbicides);
- Mindego Hill;
- Slender False Brome (SFB) Program; and
- Stinkwort (two herbicides).

Natural Resource staff perform two types of analyses to understand trending data over time, linear regression and the Mann-Kendal Analysis. Although linear regression is simple to use and can be visualized, the Mann-Kendal Analysis shows increasing, decreasing, and no trends at 80% and 90% confidence levels and in addition, can show if a no-trend is stable or non-stable. Linear regression requires a minimum of three (3) years of data, while the Mann-Kendal Analysis requires four (4) years). ***At this time, conclusions drawn from either method should viewed with caution due to the limited amount of data.***

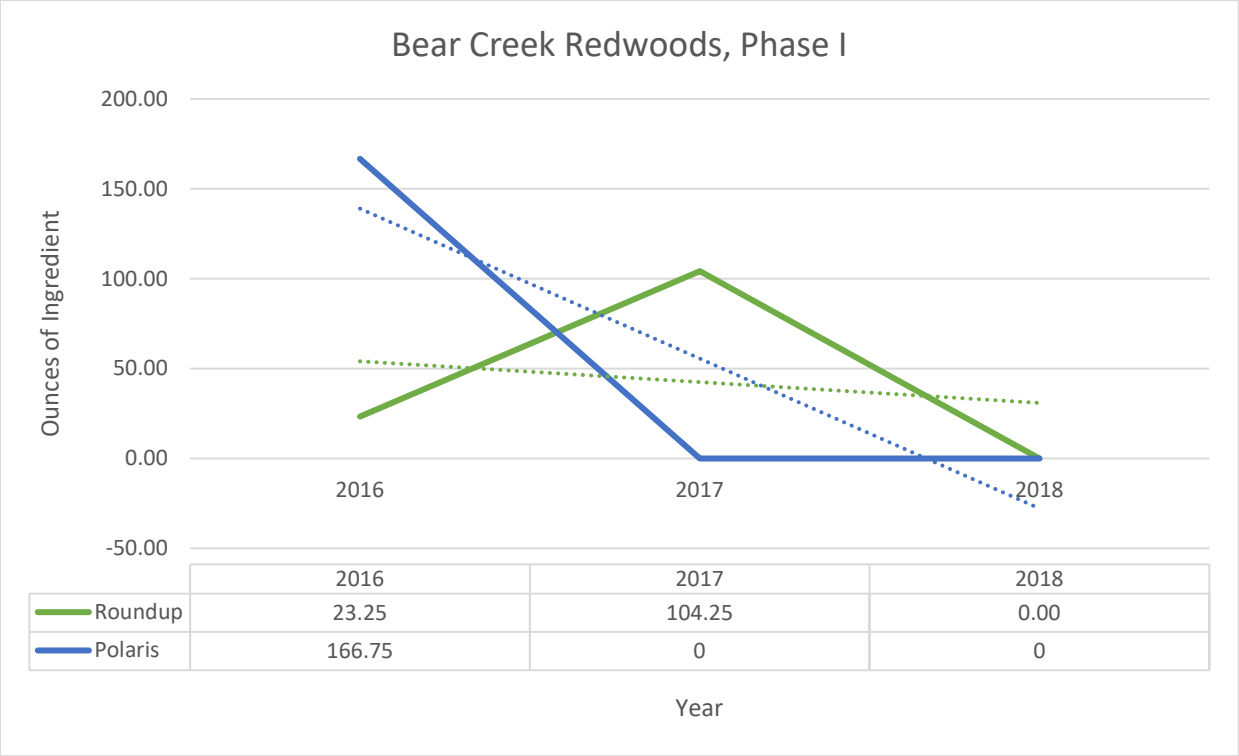
Table 11: Summary of Regression Analysis

Increasing	Decreasing	Trend Not Available
0	10	2

Table 12: Summary of Mann-Kendal Analysis

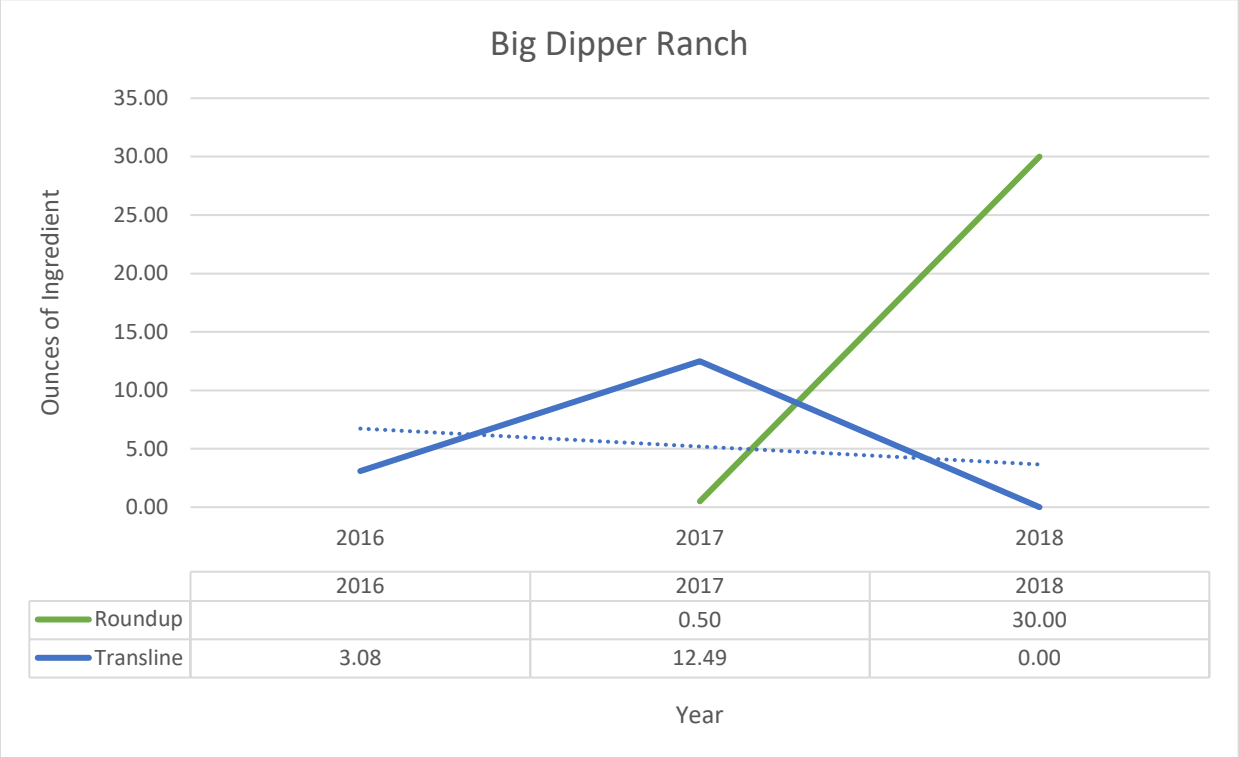
Increasing	No Trend (Non-Stable)	No Trend (Stable)	Decreasing	Trend Not Available
0	1	0	0	11

Table 13: Linear Regression Analysis at Bear Creek Redwoods, Phase I



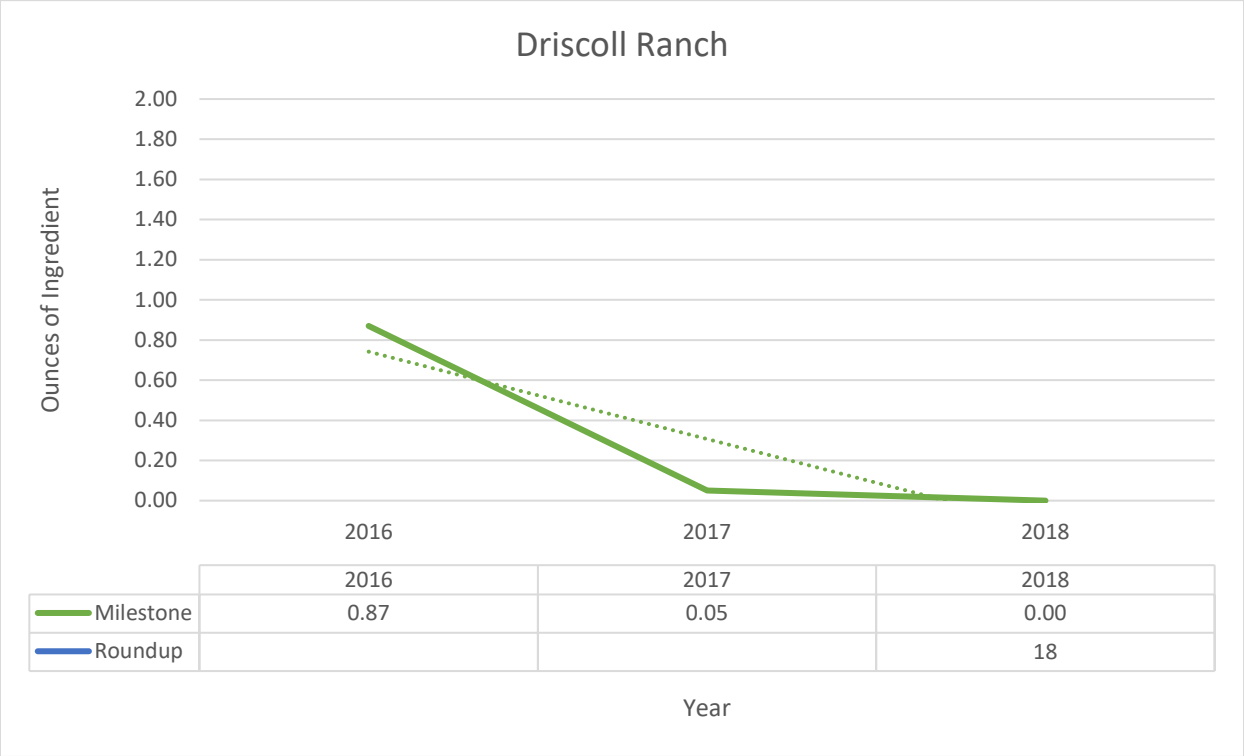
	2016	2017	2018
Roundup	23.25	104.25	0.00
Polaris	166.75	0	0

Table 14: Linear Regression Analysis at Big Dipper Ranch



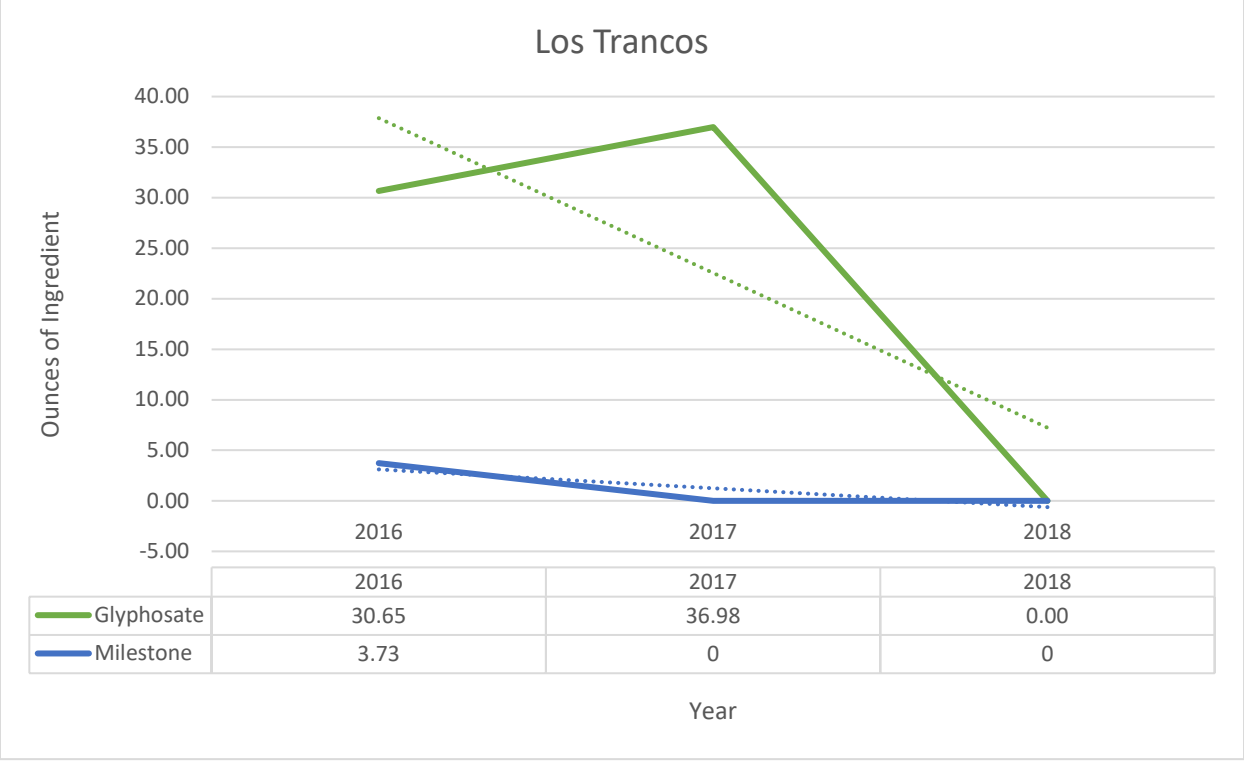
	2016	2017	2018
Roundup		0.50	30.00
Transline	3.08	12.49	0.00

Table 15: Linear Regression Analysis at Driscoll Ranch



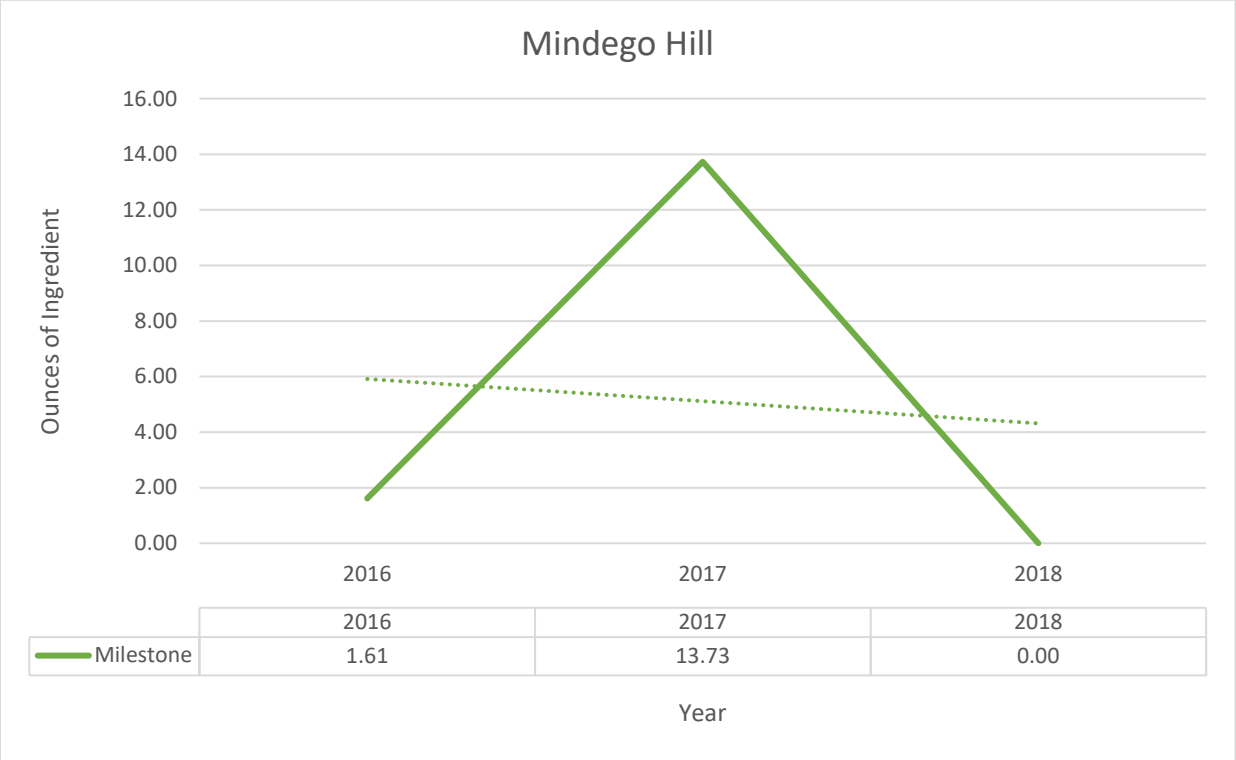
	2016	2017	2018
Milestone	0.87	0.05	0.00
Roundup			18

Table 16: Linear Regression Analysis at Los Trancos



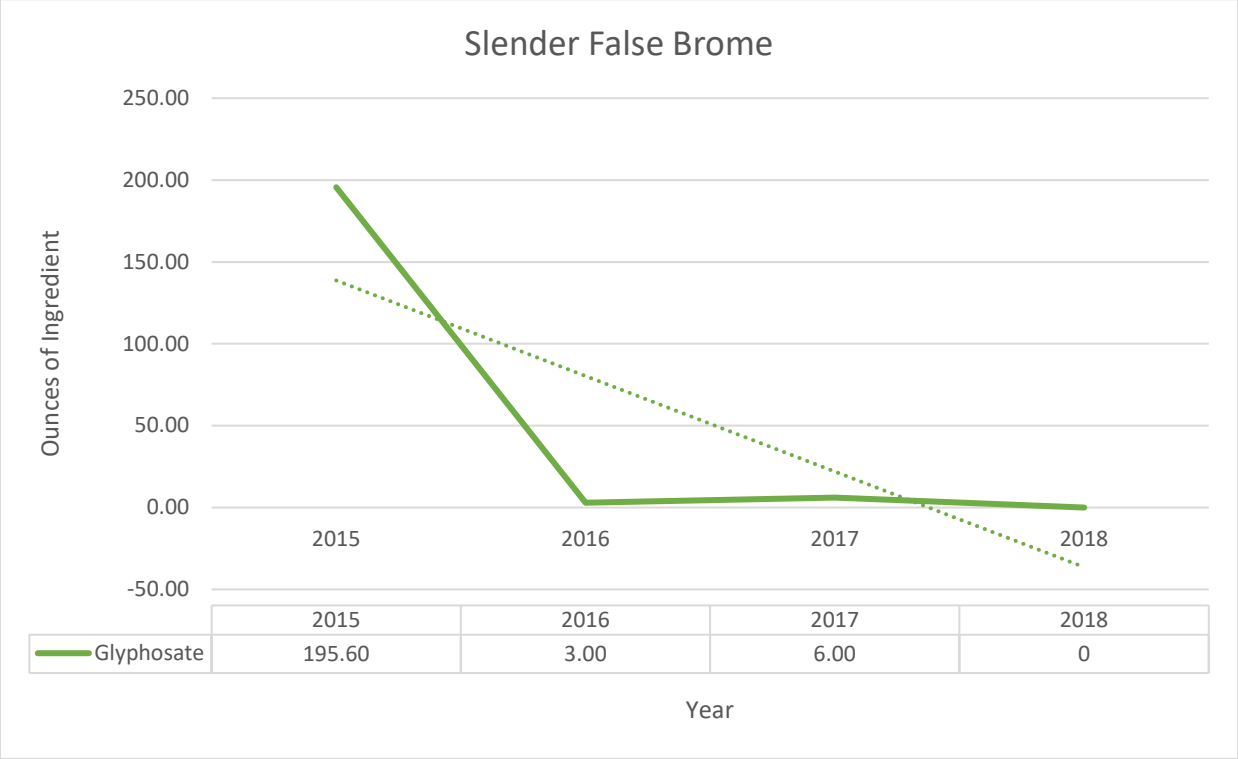
	2016	2017	2018
Glyphosate	30.65	36.98	0.00
Milestone	3.73	0	0

Table 17: Linear Regression Analysis at Mindego Hill



	2016	2017	2018
Milestone	1.61	13.73	0.00

Table 18: Linear Regression Analysis of the Slender False Brome Program



	2015	2016	2017	2018
Glyphosate	195.60	3.00	6.00	0

Table 19: Mann-Kendall Analysis of the Slender False Brome Program

S =	0
n =	4
Mean	56.35
Standard Deviation	93.03
Coefficient of Variation	1.65

Trend ≥ 80% Confidence Level	No Trend
Trend ≥ 90% Confidence Level	No Trend
Stability Test	Non-Stable

Table 20: Linear Regression Analysis of Stinkwort Treatment

	2016	2017	2018
Glyphosate	213.60	233.70	0.00
Milestone	1.49	0	0

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.

5.4.2 Rangeland

The District 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. The District 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.

5.4.3 Agricultural Properties

Assessment of agricultural properties did not occur in 2018 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 2019-20 now that the Rangeland Ecologist has been hired.

5.5 Volunteer Contributions to IPM

The public is an integral part of the success of the IPM program. Volunteers who assist with invasive plant control and detection are a valuable asset to the IPM program. In 2018, the District's Preserve Partner volunteers contributed 1,996 hours to resource management through seventy-two (72) outdoor service projects in eighteen (18) different Open Space Preserves. The District hosted eighteen (18) Special Group projects, a subset of Preserve Partners, which include school groups, technology companies, scout troops, running clubs and other community groups.

Figure 10: ARMS volunteer pulling French Broom at Bear Creek Redwoods OSP

Preserve Partner projects focused primarily on addressing seventeen (17) invasive plant species: French broom, Spanish broom, purple star thistle, yellow star thistle, Italian thistle, milk thistle, bull thistle, acacia, fennel, summer mustard, rose clover, teasel, stinkwort, vinca, barbed goat grass, medusa head, and tocalote. French broom removal dominated Preserve Partner projects with twenty-eight (28) French broom projects taking place in thirteen (13) open space preserves.

"Pop Up" projects were implemented in 2018 as a new model for volunteer participation at Rancho San Antonio Open Space Preserve. A Pop Up project is strategically located in a place with high trail use by visitors and an adequate population of easily identifiable invasive plants in order to engage and utilize the visitors already hiking in the preserve. Pop Up projects are not advertised in advance and registration is not required. A total of ninety-five (95) visitors helped to remove Italian thistle during the two Pop Up projects held on the Rogue Valley trail in 2018.

There were seventeen active Advanced Resource Management Stewards (ARMS) in 2018. The ARMS volunteers work independently on resource management projects in designated preserve areas and on their own time. In total, the ARMS volunteers contributed 820 hours to resource management with project sites located in eighteen (18) open space preserves.

Stewardship partnerships formalized in previous years continued in 2018. Grassroots Ecology contributed over 900 hours of resource management at two sites. French broom removal and yellow starthistle mowing coordination continued at the Hawthorns in the Windy Hill Open Space Preserve. Nearly 700 additional native plants were added to the demonstration garden in the Russian Ridge Open Space Preserve parking lot as part of the restoration project originally installed in 2016. Additionally, Village Harvest contributed 152 hours of resource management in the orchard at the Steven's Canyon Ranch in the Saratoga Gap Open Space Preserve.

Figure 11: Preserve Partners volunteers pull Hanging sedge (*Carex pendula*) at Purisima Creek OSP

In 2018, the Volunteer Program Partnership continued with the Student Conservation Association (SCA). This program exposes local, underserved youth to careers in the open space management field while providing Geographic Information System (GIS) and resource management services to the District. The SCA contributed approximately 2,000 hours mapping invasive, parking infrastructure and non-native vegetation over 25 project days at various open space preserves.

5.6 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 June of 2018. All California Department of Pesticide Regulation required training information was presented by the District's Pest Control Advisor (PCA), Mark Heath of On Point Land Management. Rangers who only handle Wasp Freeze received an abbreviated training in July and September 2018.

In summer 2018, field staff attended a training for CalFlora mapping.

Figure 12: District biologists give biological sensitivity training to staff and volunteers working in endangered species habitat

In November 2018, the IPM coordinator, Senior Resource Management Specialist, Volunteer Program Leads, Maintenance Supervisor, and an OST participated in the annual California Invasive Species Council symposium in Monterey, CA.

5.6.2 Regional Cooperation

Invasive species are not limited by jurisdictional boundaries, so it is of utmost importance to work with neighboring land management agencies to target invasive species at a regional scale. The District is a part of numerous regional cooperatives, including two Weed Management Areas (WMAs) and the Santa Cruz Mountains Stewardship Network (SCMSN). The District is an active member of both the San Mateo and Santa Clara Weed Management Areas (WMA). These cooperatives are coordinated from the County Agricultural Commissioner's offices, and help foster communication and cooperation on high-priority species among agencies in the given region. Through WMAs, the District can apply for grants to receive funding for treating invasive species across multiple jurisdictions.

The District is also a part of the Santa Cruz Mountains Stewardship Network (SCMSN), which aims to coordinate actions across all three counties (San Mateo, Santa Clara, and Santa Cruz) in the Santa Cruz Mountains. The District is helping to develop an "Atlas" in partnership with Cal-IPC and CalFlora to help facilitate sharing GIS data related to invasive species and other natural resources. As the upcoming EDRR protocol is developed, tools such as this which will facilitate regional inter-agency data sharing will be a critical to address emerging threats quickly.

5.6.3 Public Outreach

5.6.3.1 *Facebook Posts*


Midpeninsula Regional Open Space District
November 30, 2018 ·
We are excited to open Bear Creek Redwoods Open Space Preserve next spring. We're working hard to restore the health of its forests and creeks by removing harmful invasive plants, thanks to a grant from SCVWD.
OPENSPACE.ORG
Bear Creek Redwoods Preserve Plan
The Bear Creek Redwoods Preserve Plan is a long-term use and…

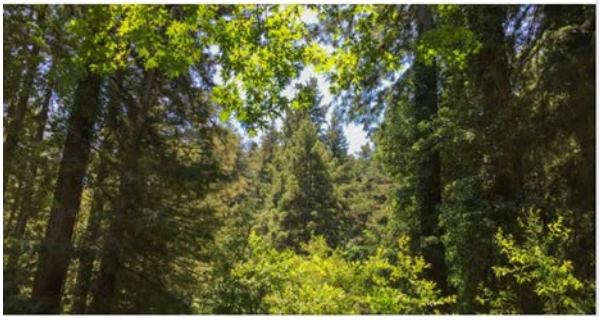

Midpeninsula Regional Open Space District
June 28, 2018 ·
Bear Creek Redwoods Open Space Preserve once had lavish gardens that introduced harmful, non-native plants to the area. We're working to share this preserve's fascinating history when we open it next year, while also restoring its forests and creeks by removing invasive plants thanks to a partnership with Santa Clara Valley Water District. Learn more at https://bit.ly/2IwaB0B


Midpeninsula Regional Open Space District
August 30, 2018 ·
The case of the mystery mammal – SOLVED! We've had several sightings this summer of a mysterious creature swimming across Alpine Pond at Skyline Ridge Open Space Preserve. There was concern it was an invasive nutria but thanks to dedicated volunteer docents monitoring the site, and with support from our own Natural Resources staff and California Department of Fish and Wildlife, we have positively identified it as a muskrat – possibly the first documented observation of one on Midpen property. Thanks to docent Jon Bianchi for the video.
Case of the Mystery Mammal - SOLVED!


Midpeninsula Regional Open Space District
June 4, 2018 ·
It's the start of California Invasive Species Action Week. Check out the recent USGS report that highlights the work Midpen has done to remove invasive species at Russian Ridge Preserve and improve the population of the endangered San Francisco gartersnakes.
#invasivespecies #endangeredspecies
U.S. Geological Survey (USGS)
May 29, 2018 ·
Like Page
May is #AmericanWetlandsMonth! Our country's wetlands are home to unique and fascinating species, including the mesmerizing San Francisco gartersnake. This beau

Midpeninsula Regional Open Space District
May 24, 2018 ·

Midpen's Bear Creek Redwoods Open Space Preserve opens next spring thanks to the support of voters who passed Measure AA. We're hard at work restoring the health of its forests and creeks by removing harmful invasive plants like ivy and broom thanks to a grant from Santa Clara Valley Water District. Learn more here: https://bit.ly/2IwaB0B



Midpeninsula Regional Open Space District
June 8, 2018 ·

Recognize this plant? It's French broom, a non-native plant being removed from Bear Creek Open Space Preserve for a healthier watershed thanks to funding from Santa Clara Valley Water District. Replace any broom in your yard with native golden currant, or other non-invasive alternatives. Find out more from our friends at California Invasive Plant Council here: https://bit.ly/2Gtc9H2

Midpeninsula Regional Open Space District
May 18, 2018 ·

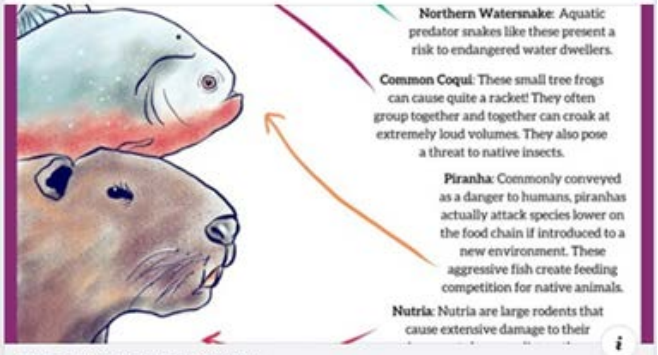
Recognize this plant? It's English ivy, a non-native plant being removed from Bear Creek Open Space Preserve for a healthier watershed thanks to a grant from Santa Clara Valley Water District. Replace any ivy in your yard with native wild ginger, or other non-invasive alternatives suggested here.

Don't Plant a Pest! – California Invasive Plant Council

Don't Plant a Pest! – Californ Council

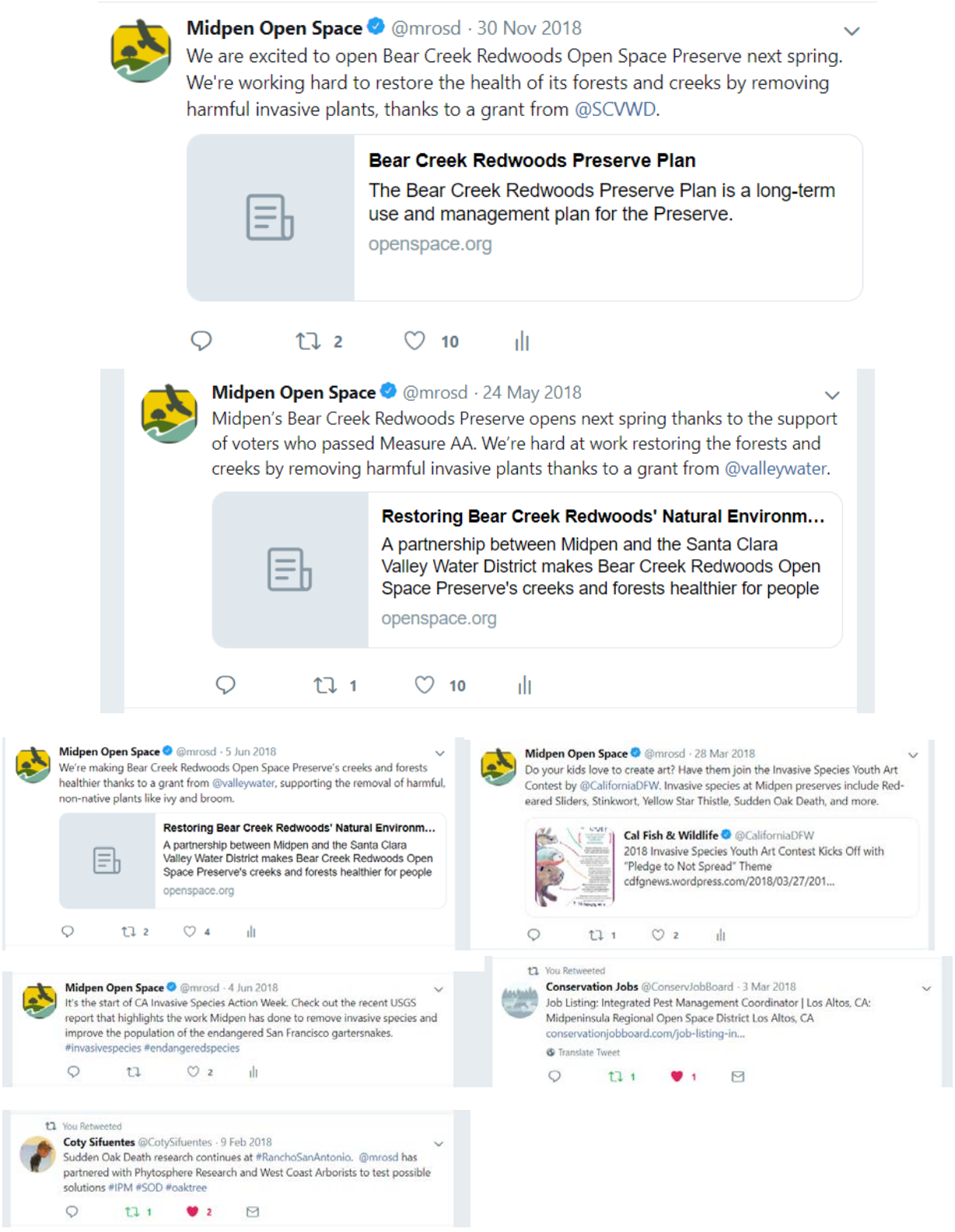
Midpeninsula Regional Open Space District
March 31, 2018 ·

Looking for a fun art activity for youth? @CaliforniaDFW invites young artists to submit art showcasing different ways to prevent the spread of invasive species. Some invasive species found at Midpen preserves include Red-eared Sliders, Stinkwort, Yellow Star Thistle, and Sudden Oak Death.



CDFGNEWS.WORDPRESS.COM
2018 Invasive Species Youth Art Contest Kicks Off with "Pledge to Not Spread" Theme

5.6.3.2 *Twitter*



6 Summary of Pesticide Use

The following tables summarizes the use of pesticides on District lands by staff and contractors. This data excludes PG&E, which is not covered under the District's Integrated Pest Management Program. PG&E is required to report pesticide use to each County Agricultural Department separately.

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	0[5]	-	-	256 Oz.

Pesticide	Active Ingredient	Product Used (oz)	Acres Treated	Oz / Acre[6]	Max Legal Rate[7] (Oz/Acre)
Herbicide	Aminopyralid	21.42	147.29	0.12	7.0
	Clethodim	-	-	-	26
	Clopyralid	-	-	-	10.7
	Glyphosate	785.0	8.69	90.33	224
	Imazapyr	-	-	-	48

Pesticide	Active Ingredient	Product Used (oz)	Acres Treated	Oz / Acre
Insecticide	Prallethrin	171.5	-	-

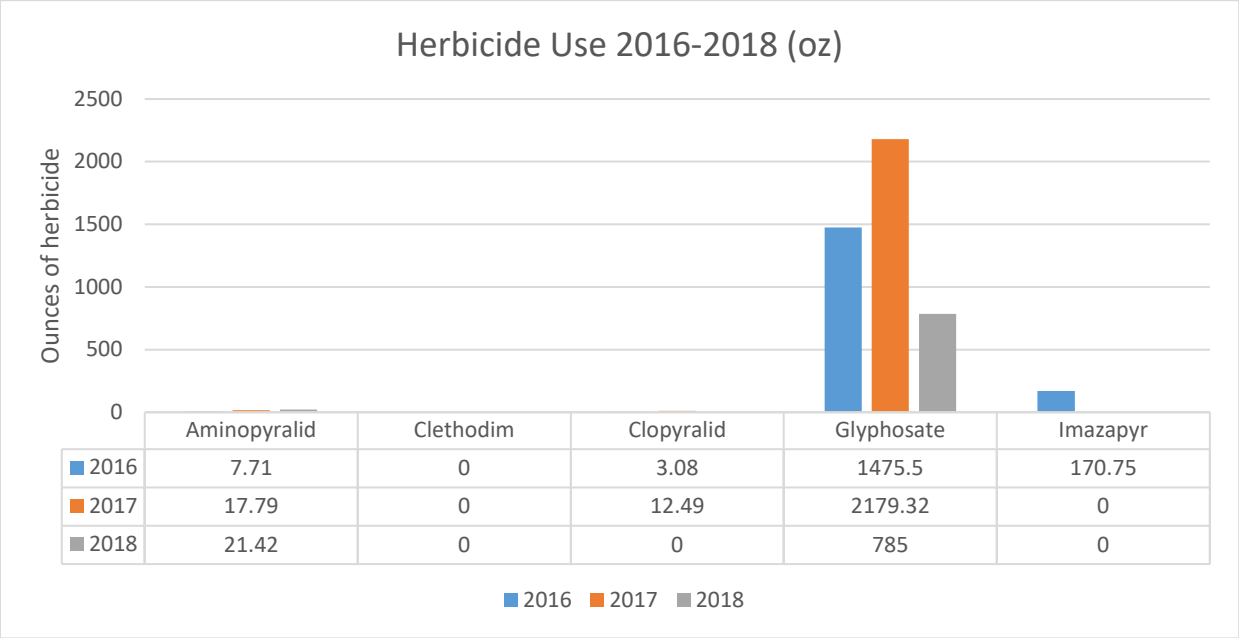
Pesticide	Active Ingredient	Product Used (oz)	Acres Treated	Oz / Acre
Rodenticide	Cholecalciferol	-	-	-

[5] Fungicide treatments originally scheduled for December 2018 were delayed because treatment conditions were not ideal until January 2019.

[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.

Figure 13. Herbicide use from 2016-2018



	Aminopyralid	Clethodim	Clopyralid	Glyphosate	Imazapyr
2016	7.71	0	3.08	1475.5	170.75
2017	17.79	0	12.49	2179.32	0
2018	21.42	0	0	785	0

Table 21: Total herbicide used by species

Target Species	Pesticide Trade Name	Total Ounces Used
Brachypodium sylvaticum	Roundup Pro Max	21
Carthamus creticus	Milestone	19.5
Centaurea calcitrapa	Milestone	1.9
Centaurea solstitialis	Roundup Pro Max	30
Eucalyptus globulus	Roundup Pro Max	28
Genista monspessulana	Roundup Pro Max	706

Table 22: Total herbicide used by Preserve

Preserve	Herbicide	Total Ounces Used
Bear Creek Redwoods	Roundup Pro Max	38
Coal Creek	Roundup Pro Max	268
La Honda Creek	Roundup Pro Max	156
La Honda Creek	Milestone	1.55
Pulgas Ridge	Roundup Pro Max	10
Purisima Creek Redwoods	Roundup Pro Max	180
Rancho San Antonio	Roundup Pro Max	0.1
Russian Ridge	Milestone	19.868
Skyline Ridge	Roundup Pro Max	30
Thornewood	Roundup Pro Max	21
Windy Hill	Roundup Pro Max	120

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.

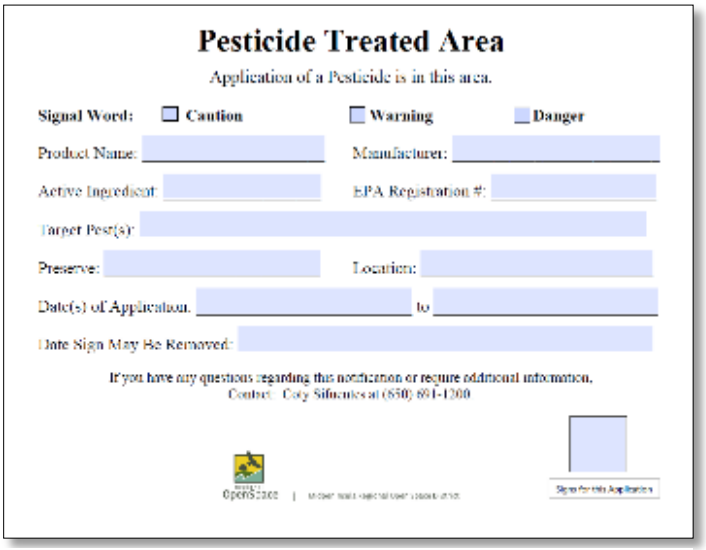


Figure 14: Pesticide Notification Sign

- 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.
- 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 2018 concerning the IPM Program. This list does not include public comments received at IPM-related Board meetings.

Date	Staff	Inquirer	Contact Method	Request/Comment	Response
7/10/2018	Tom Reyes	San Mateo RCD	E-Mail	Request for BMPs and Mitigation Measures related to CRLF and SFGS	BMPs and Mitigation Measures sent
7/23/2018	Tom Reyes	Western ECI/PG&E	Email	Request to use Garlon for tree removal along power lines on District lands	Request denied. Shared approved pesticide list and suggested use of glyphosate or imazapyr.
8/1/2018	Tom Reyes	SFO Ranger	Email	Concerned about effects of pesticide use (including wasp freeze) on pollinators-specifically butterflies	Shared Mitigation Measures and BMPs related to invertebrate protection, and information on rare butterflies and host plants within the District. Encouraged reporting these species in iNaturalist and CalFlora
8/13/2018	Tom Reyes	District User	Phone	Inform the District about recent high-profile glyphosate court case	District is aware, stays on top of current scientific findings, and is looking into ways to reduce glyphosate use
8/28/2018	General Info	District User	Email	Concern regarding glyphosate usage at RSA	Response sent, person was added to the Invasive Plant notification list.

No changes to District protocol were made due to public comments in 2018, however, public concerns did prompt the District to undergo an in-depth assessment of glyphosate and its use within the Districts IPM Program. This assessment was presented to the Planning and Natural Resources (PNR) committee on October 9, 2018 (R-18-112), with the conclusion that given careful District use of the herbicide, use of personal protective equipment, diligent adherence to the District's IPM BMPs and Mitigation Measures, and ongoing monitoring by the District's IPM Coordinator, District use of glyphosate poses a very low risk to staff, visitors, and the environment. Moreover, over the last year, Natural Resources staff identified six (6) additional new recommendations aimed at further reducing glyphosate use and increasing worker and visitor safety, which the full Board approved on February 22, 2019 (R-19-11) as a part of the IPM EIR Addendum. These recommendations are being incorporated into the IPM program beginning in the 2019 field season, and are summarized below:

1. Increase Field Crew Training
    a. Ensure all District field crew who perform herbicide treatments have specialized experience and training in pesticide safety, IPM principles, and special status species.
    b. Evaluate the suitability of securing Qualified Applicator Certificate (QAC) certifications for additional field staff, and implement as appropriate.
2. Re-examine ongoing IPM projects
    a. Identify suitable sites to shift treatment methods away from glyphosate.
    b. Ensure that all projects are performed at the time of year and phenological window for maximum effectiveness, thereby increasing efficiency of current pesticide treatments.
3. Add Garlon 4 Ultra and Capstone to the list of approved pesticides
    a. Garlon is more effective at controlling woody vegetation than glyphosate
    b. Capstone is more effective at controlling some broadleaf weed species than glyphosate
4. Assess the availability of an alternative pesticide to replace glyphosate. This herbicide would be the safest available, broad-spectrum, post-emergent herbicide with minimal residual soil activity
5. Expand the BMPs that reduce staff and visitor exposure to pesticides.
    a. Establish no-spray trail buffers where no herbicides can be sprayed within 5-feet of trails, trailheads, or parking lots UNLESS a 24-hour trail closure is put into place.
    b. Define "Spare-the-Air" days as a no-spray day due to the likely possibility of an inversion layer being present.
6. Implement an annual pesticide literature review of all newly published toxicological research and court proceedings related to pesticides on the "Approved Pesticides List" to inform updates to the IPM Program.

8 Consultants and Contractors

8.1 Blankinship & Associates - $52,011

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 Ecological Concerns, Inc. - $360,414

Treatment of invasive species District wide.

8.4 Phytosphere Research - $11,677

Treatment of Sudden Oak Death in three (3) District Preserves.

8.5 San Mateo County RCD - $61,793

Treatment of slender false brome on private properties that have the potential to infest District lands.

8.6 Santa Clara University - $679

Research into non-chemical treatment options for slender false brome.

8.7 Shelterbelt Builders, Inc. - $3,750

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

9 Compliance with Guidance Manual

9.1 Updates to the IPM Program

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 winter 2019-20.

9.3 Changes to Guidance Manual

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. District staff completed a CEQA analysis for three pesticides, which was presented to and subsequently approved by the Board in February 2019.

Pesticide Category	Product Formulation	Active Ingredient	Purpose
Herbicide	Garlon 4 Ultra (Dow AgroSciences)	Triclopyr BEE	Selective post-emergent woody plant, broadleaf weed, and tree control
	Capstone (Dow AgroSciences)	Triclopyr TEA	Selective pre- and post-emergent broadleaf weed, woody plant, and tree control
Insecticide	PT Wasp-Freeze II (BASF)	Prallethrin	Stinging insects
	~~Python Dust (Y-Tex)~~	~~Zeta-Cypermethrin~~	~~Stinging insects~~
		~~Piperonyl Butoxide~~	

10 List of Preparers and Contributors

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Susan Weidemann, Property Management Specialist II

Appendix A – Invasive Plant Treatment List

Ongoing and general maintenance plant pest species that were treated in 2018 sorted by total treatment hours:

Common Name	Scientific Name	Rating	Alert	State Noxious Weed	Hours
French broom	*Genista monspessulana*	High		X	3197.1
English ivy	*Hedera helix*	High			2967.3
Vinca	*Vinca major*	Moderate			456.6
Yellow starthistle	*Centaurea solstitialis*	High		X	434.7
Purple star thistle	*Centaurea calcitrapa*	Moderate		X	395.9
Stinkwort	*Dittrichia graveolens*	Moderate	Alert	X	289.2
Cape ivy	*Delairea odorata*	High		X	221.3
Italian thistle	*Carduus pycnocephalus*	Moderate		X	201
Blue gum	*Eucalyptus globulus*	Limited			160
Smooth distaff thistle	*Carthamus creticus*	High		X	158
Wild teasel	*Dipsacus fullonum*	Moderate			151.5
Slender false brome	*Brachypodium sylvaticum*	Moderate	Alert		149.8
Spanish broom	*Spartium junceum*	High		X	141.9
Goatgrass	*Aegilops triuncialis*	High		X	118.4
Hanging sedge	*Carex pendula*	Watch			108
Coyote brush[8]	*Baccharis pilularis*	Not Listed			100
Poison hemlock	*Conium maculatum*	Moderate			98
Rose clover	*Trifolium hirtum*	Limited			96
Bullthistle	*Cirsium vulgare*	Moderate		X	79.7
California burclover	*Medicago polymorpha*	Limited			79.2
Bermuda grass	*Cynodon dactylon*	Moderate			76
Slender flowered thistle	*Carduus tenuiflorus*	Limited		X	76
Medusa head	*Elymus caput-medusae*	High		X	75.4
Upright veldt grass	*Ehrharta erecta*	Moderate			71.4
Milk thistle	*Silybum marianum*	Limited			63.8
Indian teasel	*Dipsacus sativus*	Moderate			54.6
Fennel	*Foeniculum vulgare*	Moderate			52
Poison oak	*Toxicodendron diversilobum*	Not Listed			50
Slim oat	*Avena barbata*	Moderate			35.7
Tocalote	*Centaurea melitensis*	Moderate		X	35.5
Monterey pine	*Pinus radiata*	Moderate[9]			34
Blackwood acacia	*Acacia melanoxylon*	Limited			30.2
Andean pampas grass	*Cortaderia jubata*	High		X	29.3

[8] Coyote brush is a native species, but it is sometimes managed to maintain Recreational Facilities and Rangeland resources.

[9] This rating and all District treatment is of the non-native cultivar of Monterey Pine

Coastal heron's bill	*Erodium cicutarium*	Limited			29
Jointed goatgrass	*Aegilops cylindrica*	Watch		X	27.5
Mustard	*Hirschfeldia incana*	Moderate			25.5
Big heron bill	*Erodium botrys*	Not Listed[10]			17.2
Ripgut brome	*Bromus diandrus*	Moderate			17
Italian rye grass	*Festuca perennis*	Moderate			7.5
Common groundsel	*Senecio vulgaris*	Not Listed			4.2
Smilo grass	*Stipa miliacea var. miliacea*	Limited			4
Red seeded dandelion	*Taraxacum officinale*	Not Listed			3
Peruvian lily	*Alstroemeria* sp.	Not Listed			2.6
Algerian sea lavender	*Limonium ramosissimum*	Limited			2.5
Smooth cats ear	*Hypochaeris glabra*	Limited			2.2
Silver wattle	*Acacia dealbata*	Moderate			2
Juniper	*Juniperus* sp.	Not Listed			2
Soft chess	*Bromus hordeaceus*	Limited			2
Camphor tree	*Cinnamomum camphora*	Not Listed			2
Hairy cats ear	*Hypochaeris radicata*	Moderate			2
Field hedge parsley	*Torilis arvensis*	Moderate			2
Tall oatgrass	*Arrhenatherum elatius*	Not Listed			1.3
Vineyard onion	*Allium vineale*	Not Listed			1
Bird's foot trefoil	*Lotus corniculatus*	Not Listed			1
Canary island date palm	*Phoenix canariensis*	Limited			1
Himalayan blackberry	*Rubus armeniacus*	High			1
Red-seeded dandelion	*Taraxacum erythrospermum*	Not Listed			1
Bur chevril	*Anthriscus caucalis*	Not Listed			1
Common velvetgrass	*Holcus lanatus*	Moderate			1
Scotch broom	*Cytisus scoparius*	High		X	1
Woolly distaff thistle	*Carthamus lanatus*	High		X	0.5
Harding grass	*Phalaris aquatica*	Moderate			0.1
White horehound	*Marrubium vulgare*	Limited			0.1
Gorse	*Ulex europaeus*	High			0.1
Black locust	*Robinia pseudoacacia*	Limited			0.1
Gopher plant	*Euphorbia lathyris*	Watch			0.1

[10] Some species that would be considered low priority in wildland situations are treated in restoration sites and in particularly sensitive areas.