Midpeninsula Regional
Open Space District

R-19-90
Meeting 19-18
July 10, 2019

AGENDA ITEM 8

AGENDA ITEM

Annual 2018 Calendar Year Report and Proposed Updates to the Integrated Pest Management Program

GENERAL MANAGER'S RECOMMENDATIONS

1. Approve the proposed changes to the Integrated Pest Management Program.

2. Approve the proposed changes to the Slender False Brome Program and associated partnership with the San Mateo County Resource Conservation District.

SUMMARY

On December 10, 2014 (R-14-34), the Board of Directors (Board) of the Midpeninsula Regional Open Space District (District) adopted the Final Environmental Impact Report (FEIR) for the Integrated Pest Management (IPM) Program (Program) and approved the IPM Guidance Manual and Policy. The Program requires a comprehensive annual report of past pest control activities, both chemical and non-chemical, on District lands. This report presents the results of the fourth year of pest management activities prescribed under the Program. The District treated 61 species, including 20 state-listed noxious weeds (plants defined as a pest by state law or regulation) using a variety of treatment methods. In total, the number of hours for IPM/resource management work increased from 2017 due to an increase in contractor and volunteer hours.

In 2018, the District performed a health assessment of three (3) active ingredients in insect repellents and the General Manager recommends adding them to the *List of Approved Pesticides.* This will allow the District to provide insect repellants to staff and volunteers to protect against insect vector-borne diseases. In addition, the District is revising the Slender False Brome (*Brachypodium sylvaticum*, SFB) Program with the San Mateo County Resource Conservation District (RCD) to shift the objective from eradication (no longer feasible) to control, outreach, and education, and expand the partnership to include additional invasive plant species of regional concern. The District will continue to manage populations of slender false brome on District lands.

DISCUSSION

Background
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.

As a component of the IPM Program, staff is required to present the Annual Report to the full Board. The Annual Report includes the following information for IPM-related work completed during the prior calendar year:

- Summary of pest problems encountered, and a comparison to past years;
- Summary of pest control treatments used;
- Qualitative assessment on the effectiveness of the 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 2018 Annual Report (Attachment 1) is the fourth annual report prepared for the Program and describes the quantitative IPM activities undertaken in 2018, as well as a qualitative assessment of the Program. IPM Annual Reports from 2015 (R-16-120), 2016 (R-17-50), and 2017 (R-18-81) are available for review. Listed below are the fourth year highlights of the Program.

Summary of Pest Problems and Comparison to Past Years
Of the 874 non-native species found within District boundaries, the District targeted 61 invasive plant species for the purpose of natural resource protection and long-term management. These species have the potential to invade natural areas, displace native species, and reduce biodiversity**.** In addition, the State of California considers 20 of these species as noxious weeds. The District's IPM Coordination Team identified seven (7) new pest control projects as a high priority for treatment on District lands. All seven new projects began in 2018.

The total number of hours for IPM-related work (Table 1) 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 depending on other annual competing priorities, including the number of scheduled Measure AA capital improvement projects under construction. Volunteer and contractor hours have increased since 2015. The hiring of a second Volunteer Program Lead in 2018 increased the capacity of volunteers for 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.

Table 1: Comparison of Hours by Crew Type and Year

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

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

Summary of District Pest Control Treatments
Table 2 presents a summary of hours for each treatment method expended by staff, contractors, and volunteers in 2018.

Table 2: Treatment Methods by Crew Type[2] for 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 %**		

Manual weed pulling remains the most common treatment method at 78% of all hours; herbicide use accounted for only 2% of all hours. 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 effectively reduced the cover of the target invasive species enough that follow up manual control is feasible. In a typical year, herbicide use accounts for approximately 10% of labor hours.

During the creation of the IPM Annual Plan, treatment methods are evaluated using the best available science in weed management. The IPM Annual Plan, which is finalized in January of each year, lays out the work plan for the new calendar year. Treatment methods have shifted across the four years of the Program, with the largest change in the reduction of hours spent applying herbicide (reduced from 60.8% to 2 %, with a relative reduction of 58.8%) and the largest increase in the percentage of hours spent hand pulling (increased from 35.5% to 78%, with a relative increase of 42.5%).

Pest Control Program Effectiveness
Structural pest control in 2018 (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.

Non-Structural Pest Control of high priority invasive plants in natural areas using both herbicidal and non-herbicidal methods is conducted to protect and restore 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.

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

Pesticide Use

Staff, contractors, and tenants report pesticide use on District lands to the IPM Coordinator. Table 3 summarizes the known use of pesticides on District lands, excluding PG&E and the Spartina Project, who are excluded from the District's IPM Program and have separate CEQA documentation. County Agricultural Departments require PG&E and the Spartina Project 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 Program. PG&E adheres to the District's herbicide Best Management Practices (BMP) and mitigation measures.

Table 3: Pesticide Use on District Lands

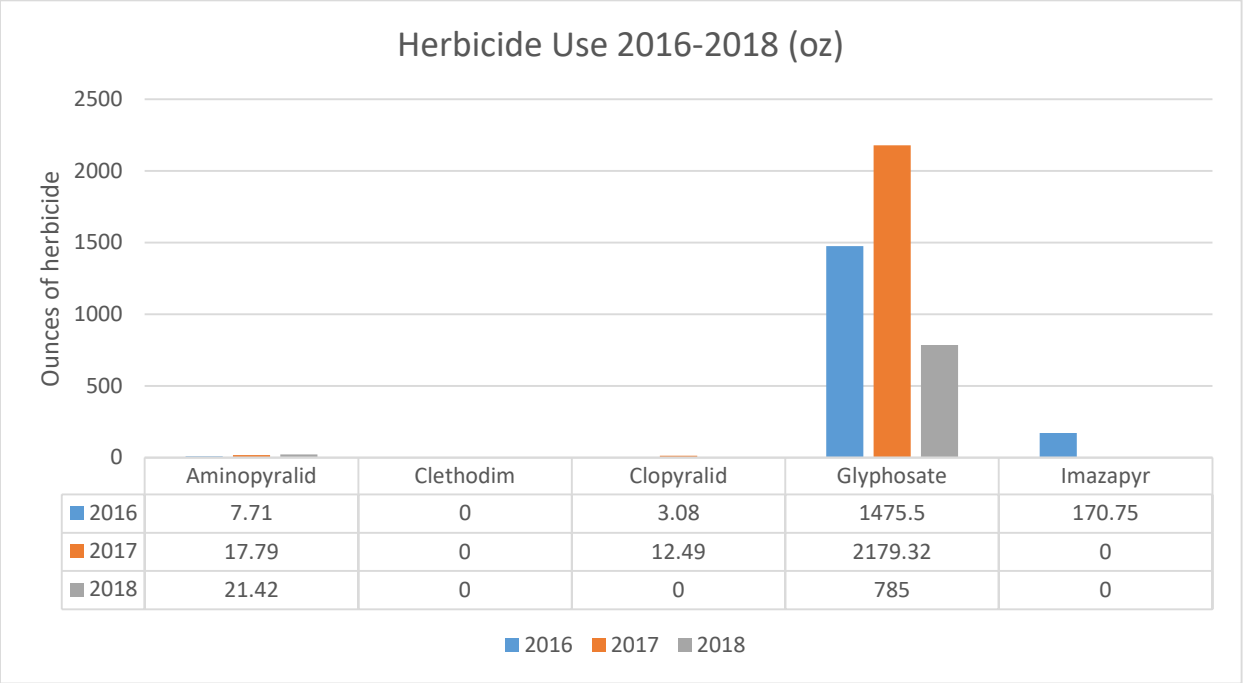
Pesticide	*Active Ingredient*	*Amount Used (ounces)*	*Acres Treated*	*Ounces/Acre*
Fungicide	Potassium salts of phosphorus acid	0[3]	-	-
Herbicide	Aminopyralid	21.42	25.27	0.85
	Clethodim	-	-	-
	Clopyralid	-	-	-
	Glyphosate	785.0	8.69	90.33
	Imazapyr	-	-	-
Insecticide	Prallethrin	72	-	-
Rodenticide	Cholecalciferol	-	-	-

Recommended application rates, as specified on the product label, vary by Active Ingredient (AI) and formulation of any particular pesticide product. For example, the specified application rate for Roundup® (glyphosate as the AI) ranges from 32 to 160 ounces (oz) per acre. The specified application rate for Milestone (aminopyralid as the AI) ranges from three to seven ounces per acre. Note that a Department of Pesticide Regulation's licensed Pest Control Advisor (PCA) provides the actual application rates per the District's BMPs and is available for consultation as an Invasive Species and Restoration Biologist.

Figure 1 (below) presents an analysis of herbicide use to control pest plant species. The main AI used is glyphosate, the active ingredient in Round-Up®. Herbicide use has decreased from 2017 levels when the District was conducting intensive invasive species work to prepare and open Bear Creek Redwoods Open Space Preserve (OSP) to public use. This initial knock down period within the Phase I area has largely transitioned to manual and mechanical treatment methods due to a drastic decrease in percent cover in previously treated areas. Intensive invasive species work focusing on the initial knockdown of large populations is shifting to the Phase II and III areas of the Preserve beginning in 2019 to prepare these new areas for future public use.

[3] District Researchers delayed the December 2018 fungicide treatments due to weather conditions until January 2019.

Figure 1: Herbicide Use 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

Glyphosate Assessment and IPM EIR Addendum

In 2018, public concerns prompted the District to undergo an in-depth assessment of glyphosate and its use. 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's 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.
2. Re-examine ongoing IPM projects to shift from glyphosate.
3. Add Garlon 4 Ultra and Capstone to the list of approved pesticides as additional options.
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.
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.

Public Notification and Inquiries

The District posts signs near treatment areas to alert people of pesticides use prior to, during, and after the application of a pesticide on District managed lands. All contractors notify the District before application on any property, and comply with requirements for notification and posting of

signs. In 2018, the District recorded six public inquiries relating to the Program. Inquiries ranged from sharing of District information with other agencies (i.e. RCD), the use and safety of herbicides, chemical weed control options, and general IPM practices. See Section 7.2 in Attachment 1 for more details.

Recommended Minor Modifications to the IPM Program

Compliance with the Guidance Manual
As the science of pest control advances and more effective, safer, and less harmful pesticides are developed, the District has updated the District's *List of Approved Pesticides*. As manufacturers update, discontinue, or substitute products, and as target pests change over time, recommended additions or deletions of approved products are made by the IPM Coordinator in consultation with the IPM Coordination Team.

Addition of Insect Repellents to the List of Approved Pesticides
Ticks and mosquitos are vectors for a number of diseases, including Lyme disease and West Nile Virus. Insect repellents are EPA-registered pesticides. Adding these products to the District's *List of Approved Pesticides* allows the District to provide repellants to protect staff health and safety when working on District lands by reducing the potential exposure to vector-borne diseases. The District conducted a toxicological assessment for human and environmental health (Attachment 2) on popular insect repellents that District staff have used in the past. Natural Resource staff assessed three (3) active ingredients: DEET, Picaridin, and Permethrin (Table 4). Through the assessment, DEET and Picaridin presented a reduced risk to human and environmental health as long as the user follows all guidelines and label requirements. District staff assessed and rejected the use of Permethrin due to both human and environmental health and safety concerns. To prevent any negative impacts to water quality from the use of insect repellents, District staff propose an additional BMP for the Program (Table 5). The IPM Coordination Team and the District's PCA reviewed the toxicological assessment and concur with its findings. Further environmental review was not warranted.

Table 4: Insect Repellents assessed for addition to the List of Approved Pesticides

Pesticide Category	*Active Ingredient*	*Product Formulations*	*Mode of Action*	*Purpose*
Insect Repellents	DEET	Various (Signal Word: CAUTION)	Disrupts L-lactic acid and carbon dioxide detection	Tick and mosquito repellent
	Picaridin	Various (Signal Word: CAUTION)	Disrupts detection of host cues	Tick and mosquito repellent
	~~Permethrin~~	~~Various~~	~~Disrupts sodium channels~~	~~Insecticide, Tick and mosquito repellent~~

Table 5: Proposed Best Management Practice (BMP) to protect water quality

37	Insect Repellents and Water Quality – To protect water quality and aquatic organisms, District Staff shall not come into contact with a water body when skin, boots or clothing is contaminated with insect repellents.

Redistributed Treatment Actions and Estimates within IPM Management Categories
Over the last few months, multiple fire agencies have requested the District to increase the number and scale of its fuels management projects as soon as possible. The current IPM FEIR allows for 140 acres of fuel treatment, which is inadequate to address the increasing requests from fire agencies. As discussed at the May 22, 2019 Board Meeting, the District is developing a Wildfire Resiliency Program that will address fuel management concerns and is expected to be implemented in the Fall of 2020 (R-19-69). During that meeting, staff recommended analyzing an administrative change to temporarily redistribute the acreage assigned to underutilized management actions from other IPM management categories that were analyzed under the IPM Program FEIR. This change allows the District to perform additional fuels management activities for the upcoming fire season without requiring additional CEQA analysis, bridging the gap until certification of the Wildland Fire Resiliency Program EIR. Temporary redistribution of treatment acreage is as follows:

- The FEIR analyzed the environmental impact of treating 580 acres within Recreational Facilities using tractors and brushcutters (mechanical control). Last year, the District treated approximately 282 acres. Staff recommend redistributing the remaining 125 acres to the Fuels Management Category.
- The FEIR analyzed the environmental impact of treating 725 acres within the Rangeland Category using tractors, brushcutters, and chainsaws (mechanical control). Last year the District treated approximately 270 acres. Staff recommend redistributing 100 acres to the Fuels Management Category.

Recommended Changes to the Slender False Program and Associated Partnership with the San Mateo County Resource Conservation District

In 2005, the District initiated the SFB Program for managing the noxious weed in San Mateo County to protect native redwood forests on its preserves and adjacent private lands (R-05-122). The goal of this program has been to eradicate or minimally contain SFB in San Mateo County based on limited populations found on District and surrounding lands. Since May of 2014, a significant component of this program has been a cooperative partnership with the RCD to manage SFB on neighboring private parcels with the potential for infesting District lands (R-14-48).

The regional infestation of SFB is now widely distributed, severely hampering the ability for the District to accomplish the original intent of the SFB Program. Despite intensive treatment efforts for over 10 years, SFB continues to expand its range throughout the Santa Cruz Mountains region, including the recent discovery of two large infestation near Highway 17. The initial objectives of the District's SFB Program of eradication and containment within San Mateo County are no longer realistic.

After conferring with the RCD, District staff proposes changing the emphasis of the regional SFB Program from eradication and containment to ongoing control, outreach, education, and mapping. Treatment would continue on District lands with the goal of protecting sensitive resources. The goal of treatment on critical private properties is to prevent further infestation on

District lands. Increasing outreach and partnerships with neighboring agencies and community groups is essential to keep the State-listed noxious weed under control. The District proposes to expand the partnership with the RCD to combat additional invasive species on private lands that threaten biodiversity on District Preserves. Additional projects may include *Carex pendula* (hanging sedge) removal in the vicinity of Purisima Creek Open Space Preserve, which the District's contractor Ecological Concerns, Inc., has been removing under contract (R-17-103). A continued partnership with an agency that can treat invasive species on nearby private lands will be a crucial component of the District's upcoming Early Detection/Rapid Response Program. For more information, see the SFB Technical Report (Attachment 3).

FISCAL IMPACT

Receipt of the 2018 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.

BOARD COMMITTEE REVIEW

The IPM Policy directs the General Manager to present annual IPM Program reports to the Board. This report presents the annual review for calendar year 2018.

PUBLIC NOTICE

Public notice was provided as required by the Brown Act. Public notice was also sent to 167 interested parties and tenants by postal or electronic mail.

CEQA COMPLIANCE

The Board approved the FEIR for the District's IPM Program on December 10, 2014 (R-14-148). The FEIR analyzed the vegetation management activities undertaken in 2018. On February 27, 2019, the Board unanimously voted to adopt a resolution to approve an Addendum to the Final EIR for the IPM Program (R-19-11). Staff have incorporated the associated mitigation measures and BMPs from both environmental review documents into the project.

The Program as described in this Annual Report remains consistent with the Final EIR and the 2019 Addendum. The proposed program modifications (inclusion of insect repellant and redistribution of treatment action to the Fuels Management Category) would not change the overall treatment actions and estimates. Upon review of the prior project impact analyses, mitigation measures, and BMPs in the FEIR and the Addendum, the District has determined that the existing environmental review documents still adequately address the potential environmental impacts of the Program.

In accordance with CEQA Guidelines section 15162(a), no new significant environmental effects, and no substantial increase in the severity of previously identified significant effects, would result from the changes to the Program described in this report.

NEXT STEPS

Staff will continue implementation of the 2019 Annual IPM Plan (Year 5 of the Program), consistent with the FEIR and subsequent 2019 Addendum of the IPM Program. In October 2019, staff will begin preparing the 2020 Annual IPM Plan to guide IPM work for calendar year 2020. District staff will evaluate and reprioritize natural and rangeland treatment areas to account for available staff time. Staff will continue to monitor and report to the Board both the science and associated policies in regards to the use of pesticides.

Attachments:

1. 2018 Annual IPM Report
2. Health Screening Assessment and Guidelines for Use of Insect Repellents at Midpeninsula Regional Open Space District
3. Slender False Brome Program Report
4. Public comments received

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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.

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.
- 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-

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

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.

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 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
- 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 5: 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 6: 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

4 Summary of Pest Control Treatments

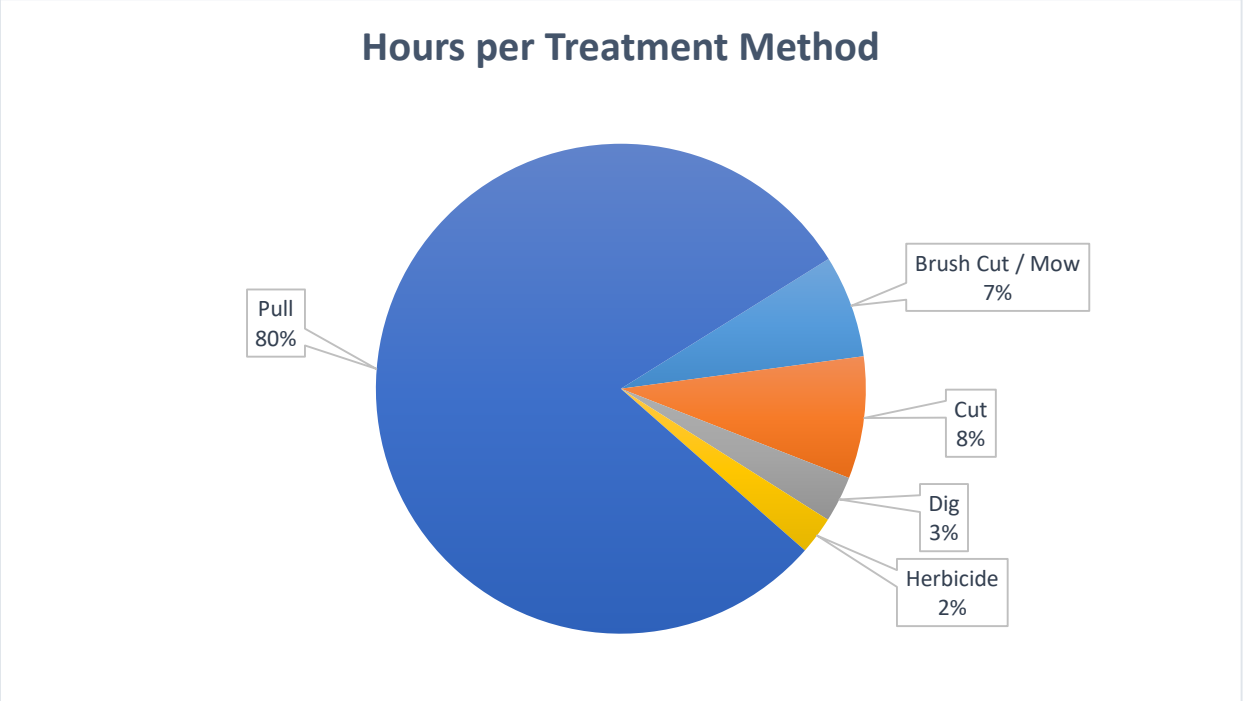
4.1 Type of Control with Cost per Acre

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 7: 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 1: 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 2: Resource Management by Crew Type

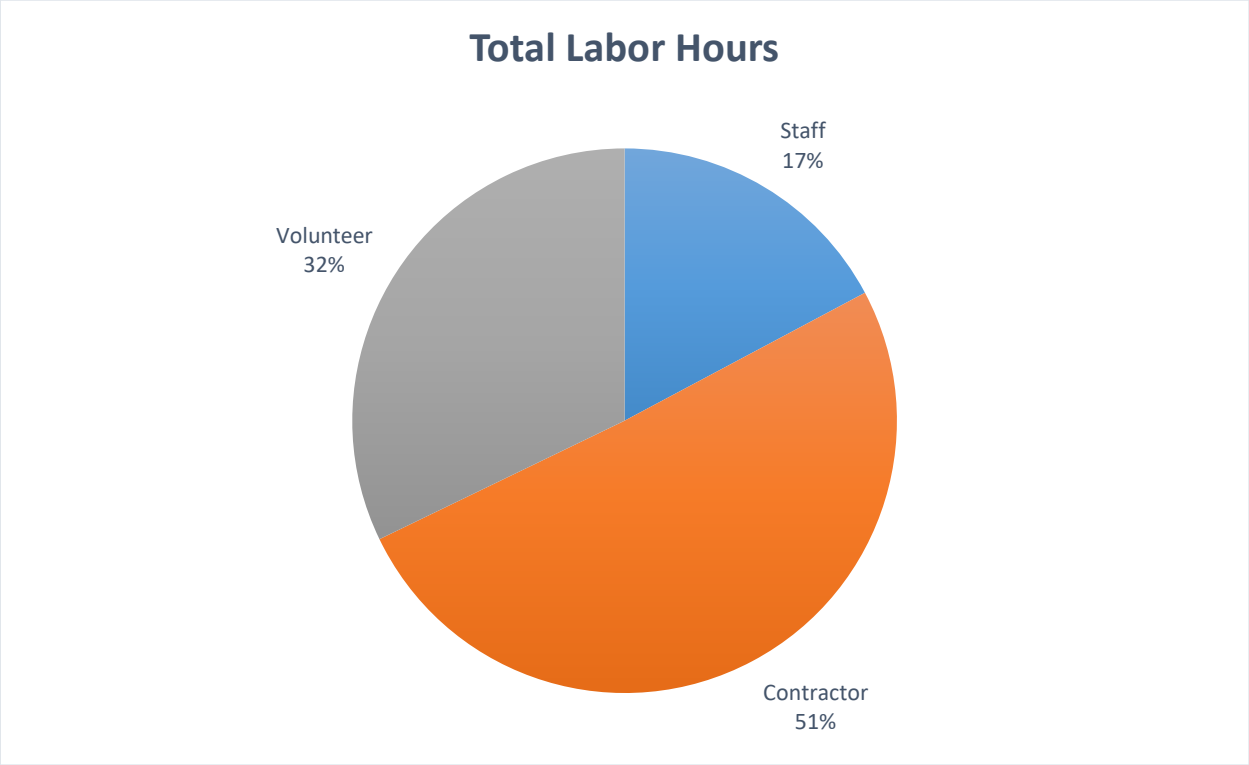
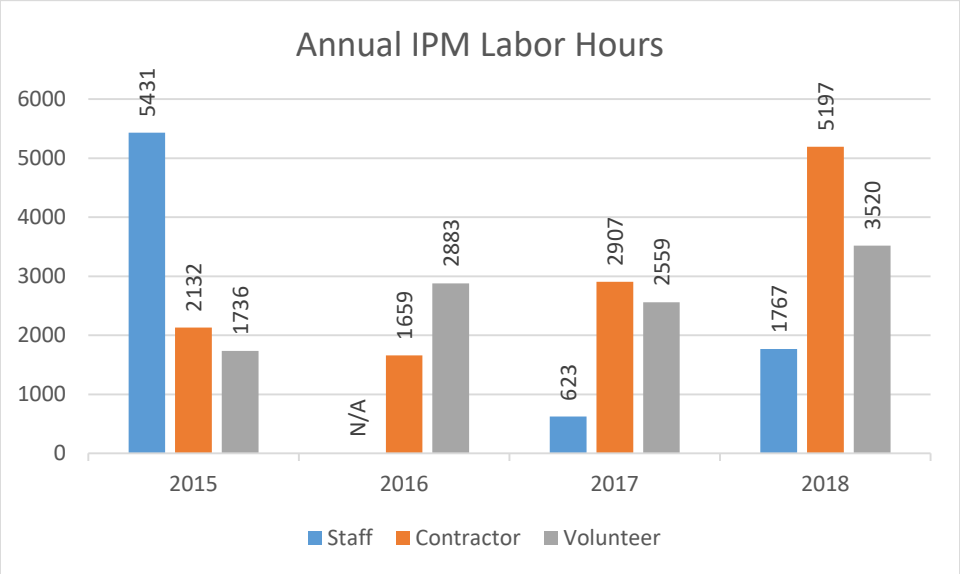


Table 8: Comparison of Hours by Crew Type and Year

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

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

Figure 3: Annual IPM Labor Hours.
2016 was a transitional year for staff data management, so the total labor hours for staff is unknown.

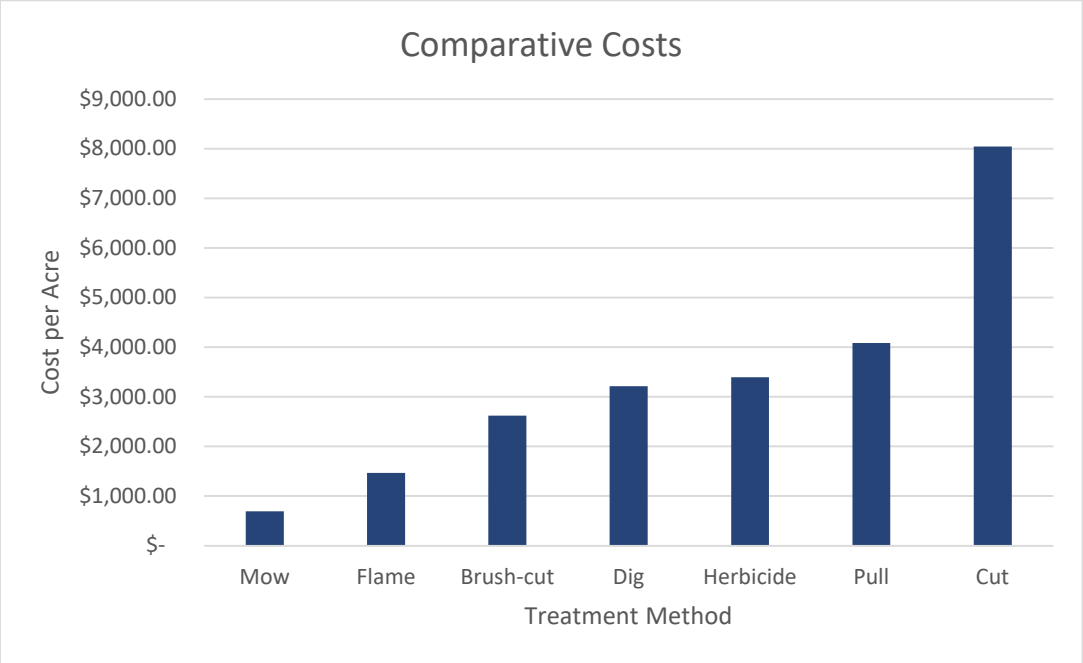


The total number of hours for IPM-related work (Table 8) has increased by 20% from 2015 levels. District field staff almost tripled the amount of work compared to last year. Field staff hours have fluctuated since 2015 based on other competing priorities, including the number of Measure AA capital improvement 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[2]

[2] 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 4: Treatment Cost per Acre.



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 9: 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[3]	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.

[3] 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.***

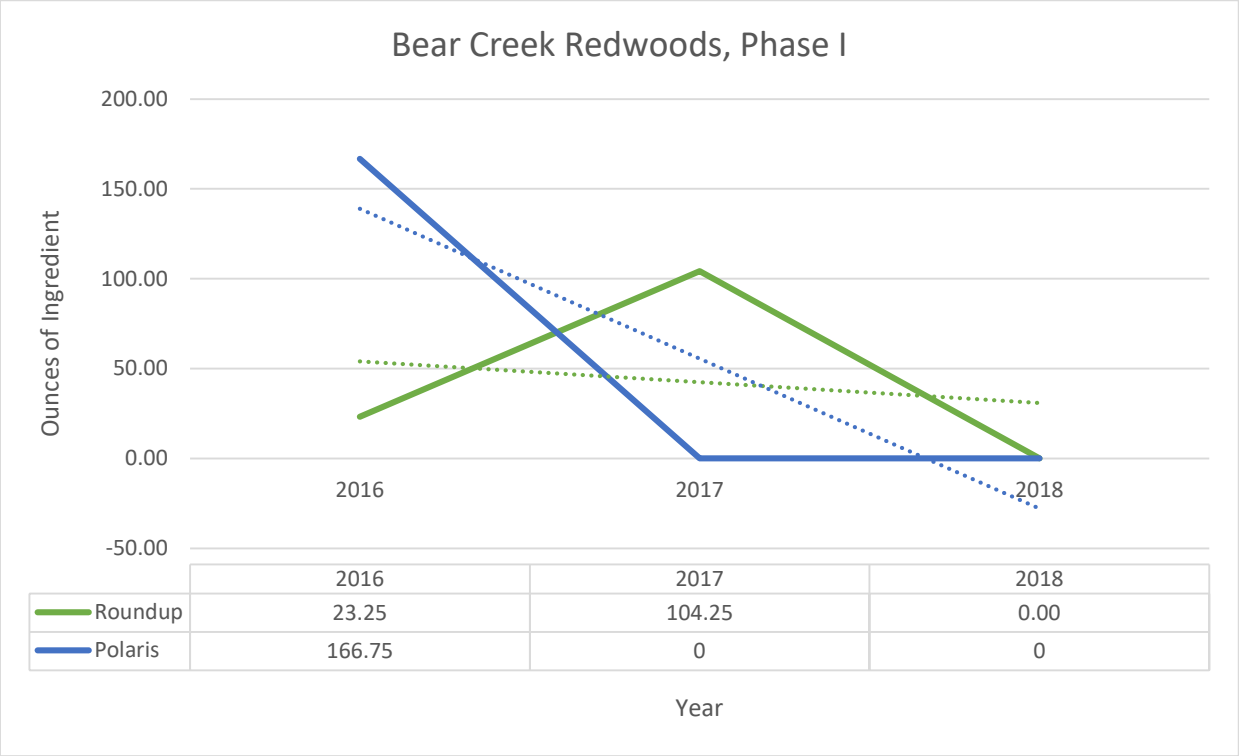
Table 10: Summary of Regression Analysis

Increasing	Decreasing	Trend Not Available
0	10	2

Table 11: Summary of Mann-Kendal Analysis

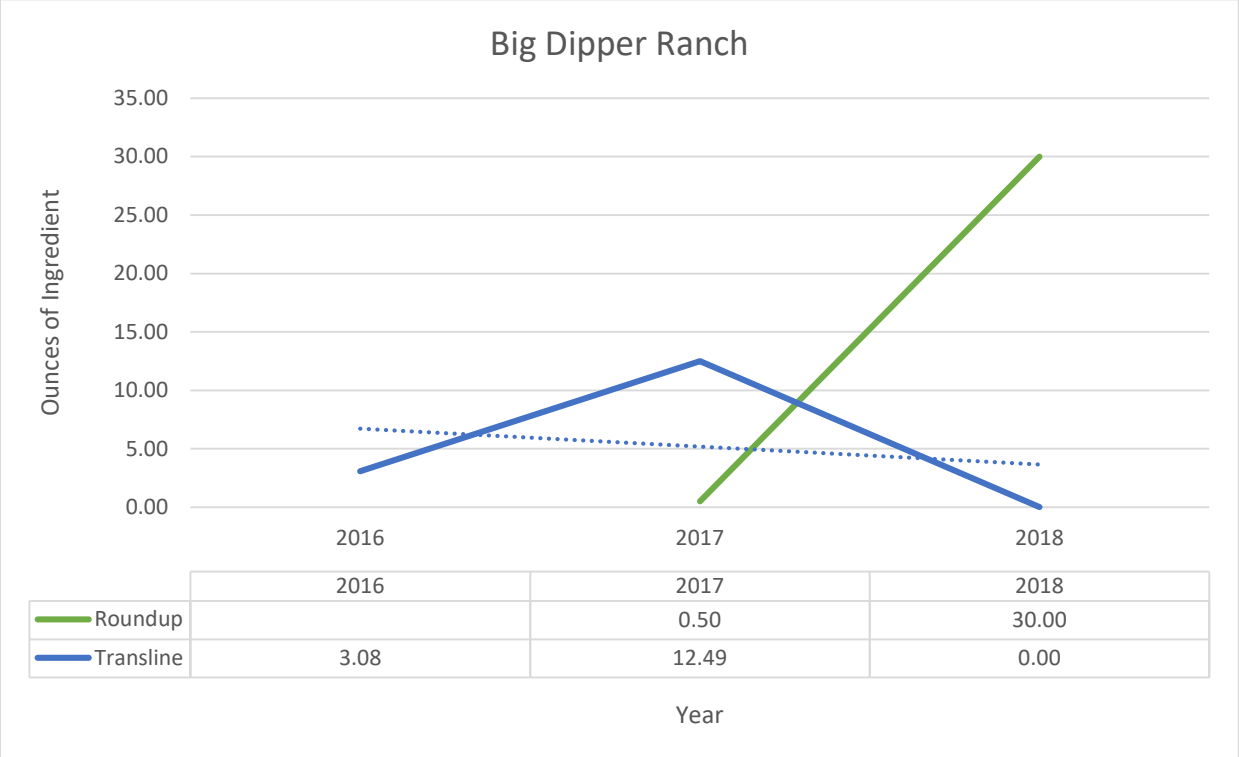
Increasing	No Trend (Non-Stable)	No Trend (Stable)	Decreasing	Trend Not Available
0	1	0	0	11

Table 12: Linear Regression Analysis at Bear Creek Redwoods, Phase I



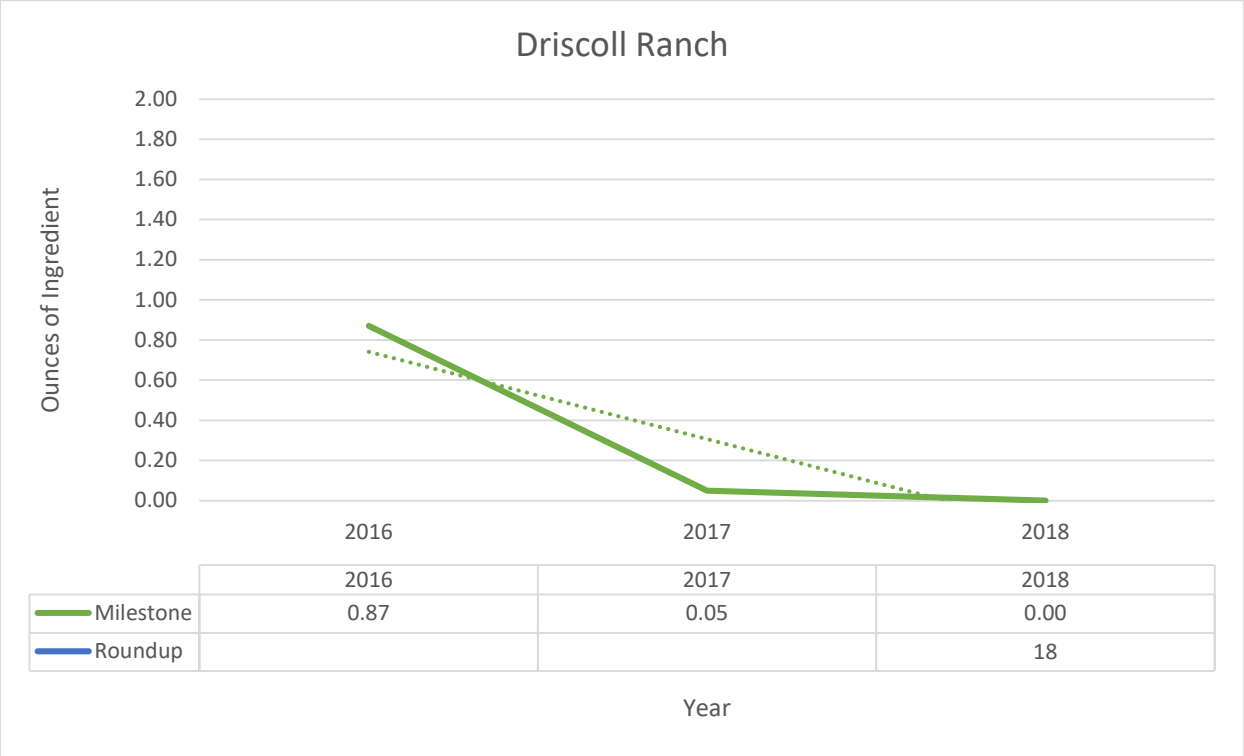
	2016	2017	2018
Roundup	23.25	104.25	0.00
Polaris	166.75	0	0

Table 13: Linear Regression Analysis at Big Dipper Ranch



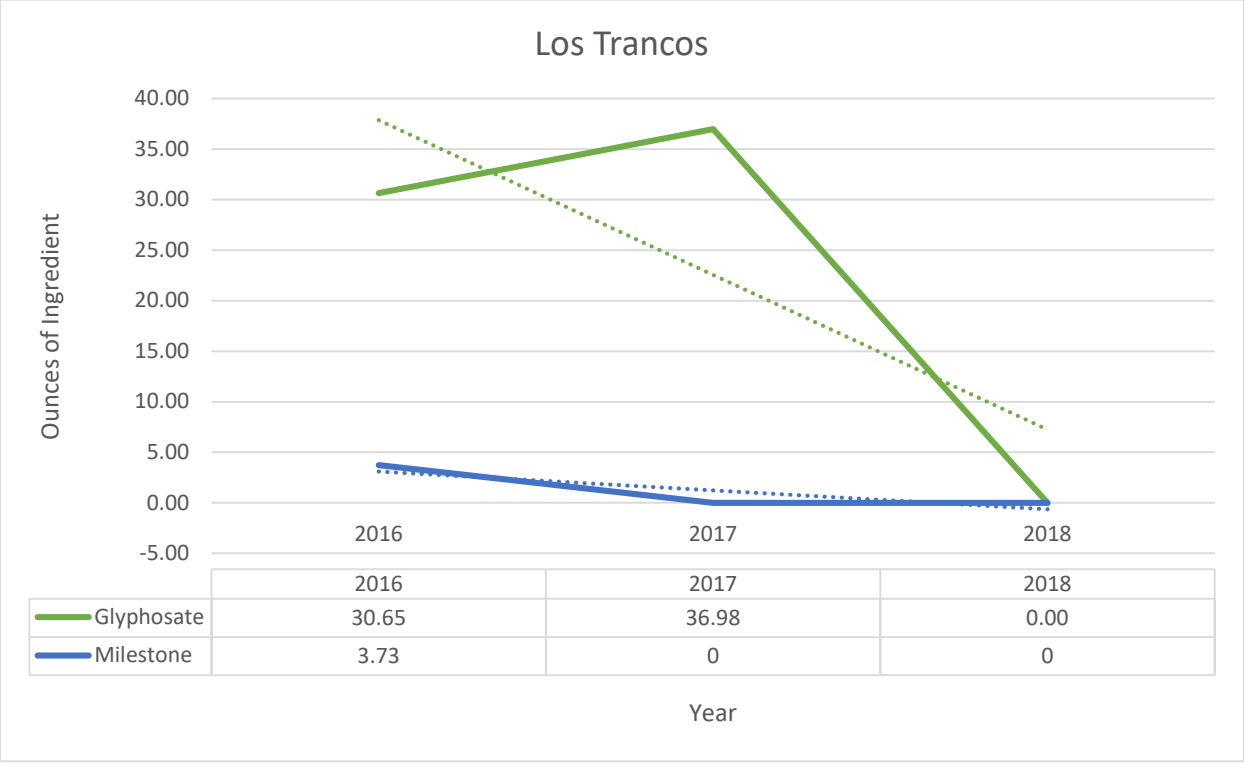
	2016	2017	2018
Roundup		0.50	30.00
Transline	3.08	12.49	0.00

Table 14: Linear Regression Analysis at Driscoll Ranch



	2016	2017	2018
Milestone	0.87	0.05	0.00
Roundup			18

Table 15: Linear Regression Analysis at Los Trancos



	2016	2017	2018
Glyphosate	30.65	36.98	0.00
Milestone	3.73	0	0

Table 16: Linear Regression Analysis at Mindego Hill

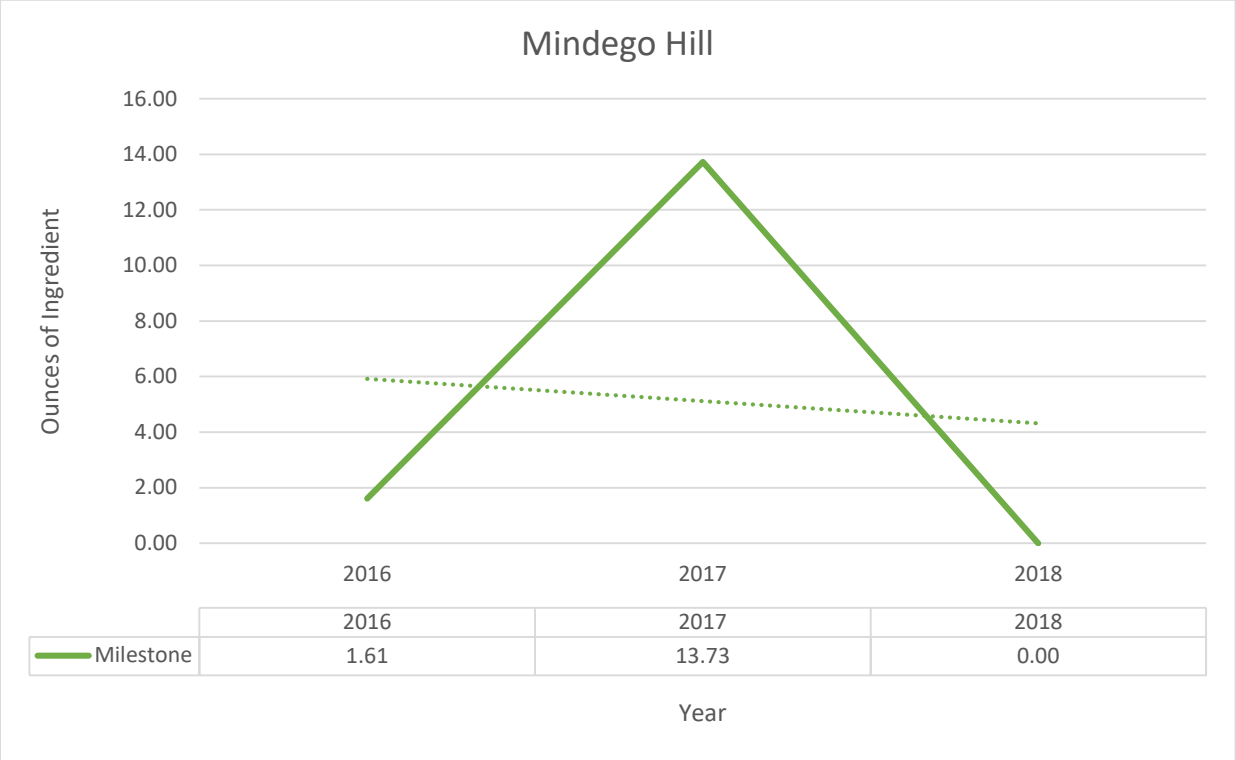


Table 17: Linear Regression Analysis of the Slender False Brome Program

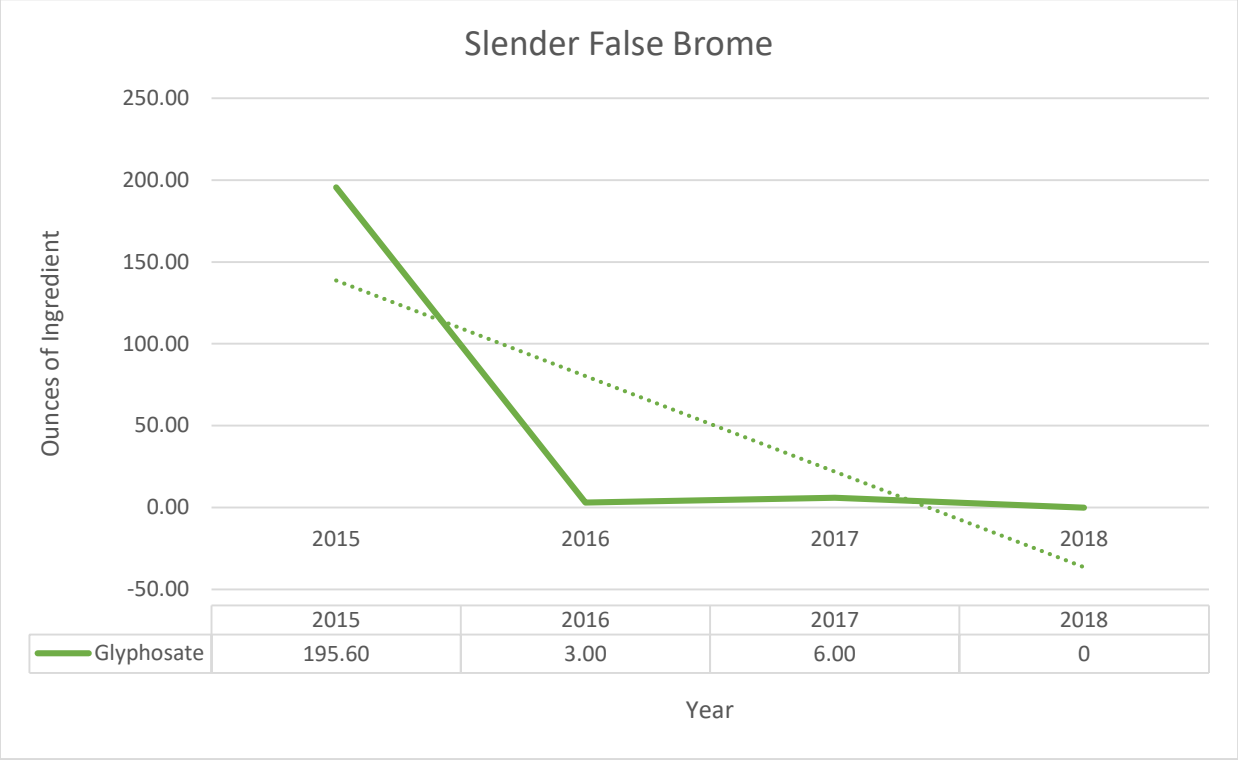


Table 18: Mann-Kendall Analysis of the Slender False Brome Program

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 19: 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 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 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.

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.

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 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 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.

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.

Midpeninsula Regional Open Space District
June 4, 2018 ·

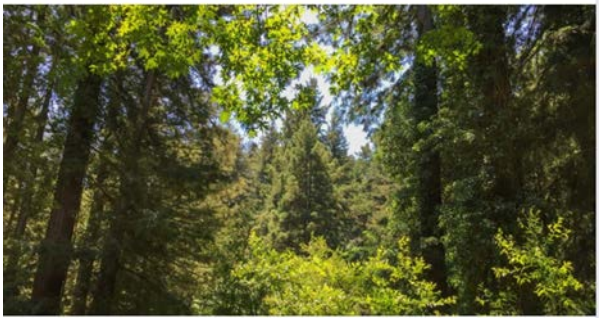
It's the start of California Invasive Species Action Week. Check out the recent USGS report that highlights the work Midpen has done to remove invasive species at Russian Ridge Preserve and improve the population of the endangered San Francisco gartersnakes.
#invasivespecies #endangeredspecies

U.S. Geological Survey (USGS) Like Page
May 29, 2018 ·

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 ·

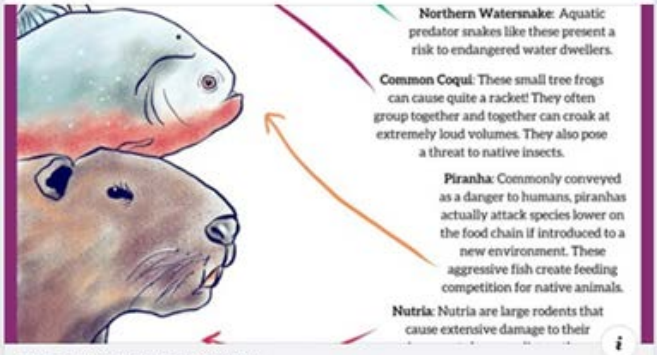
Recognize this plant? It's English ivy, a non-native plant being removed from Bear Creek Open Space Preserve for a healthier watershed thanks to a grant from Santa Clara Valley Water District. Replace any ivy in your yard with native wild ginger, or other non-invasive alternatives suggested here.

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

Don't Plant a Pest! – Californ
Council

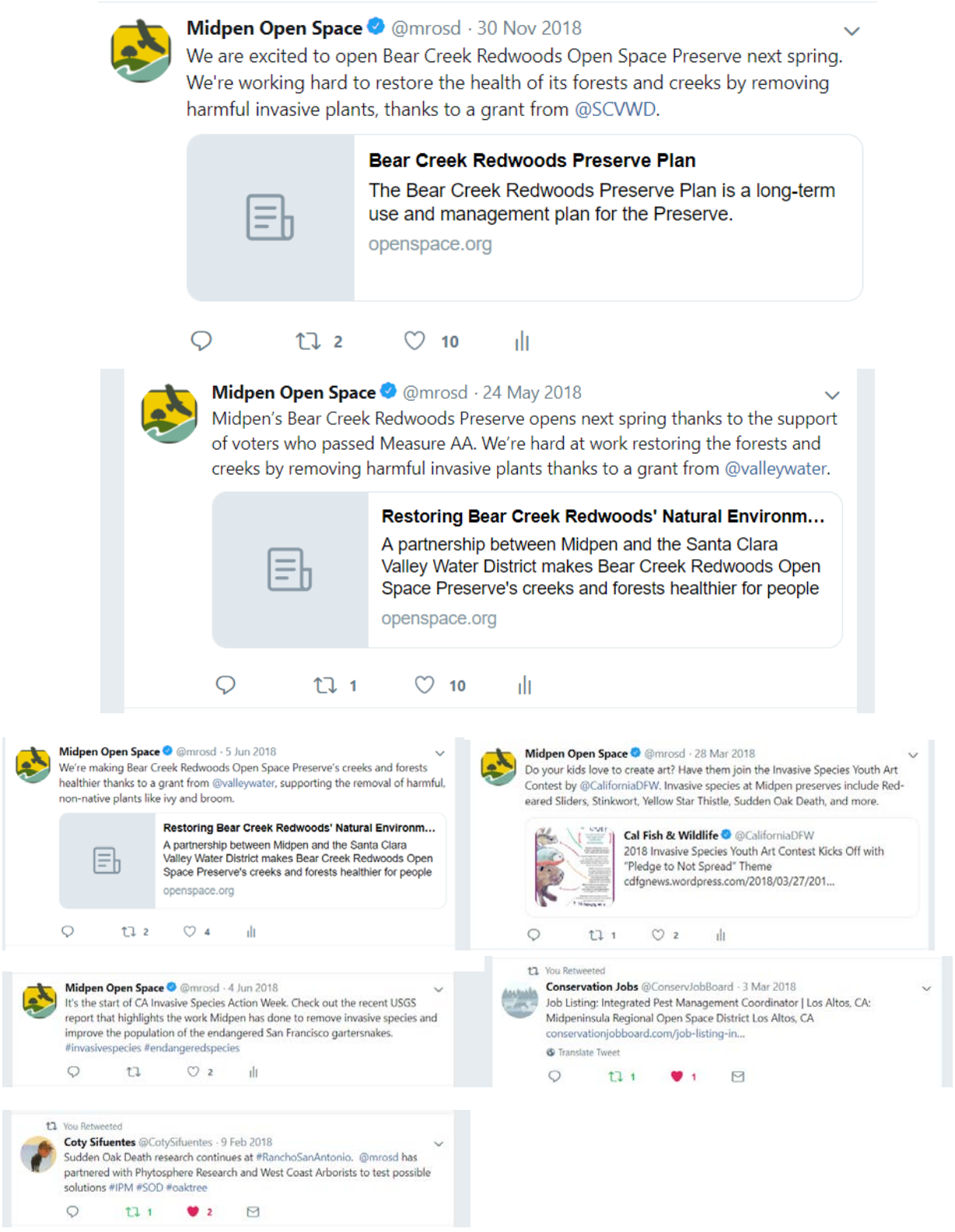
Midpeninsula Regional Open Space District
March 31, 2018 ·

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[4]	-	-	256 Oz.

Pesticide	Active Ingredient	Product Used (oz)	Acres Treated	Oz / Acre[5]	Max Legal Rate[6] (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

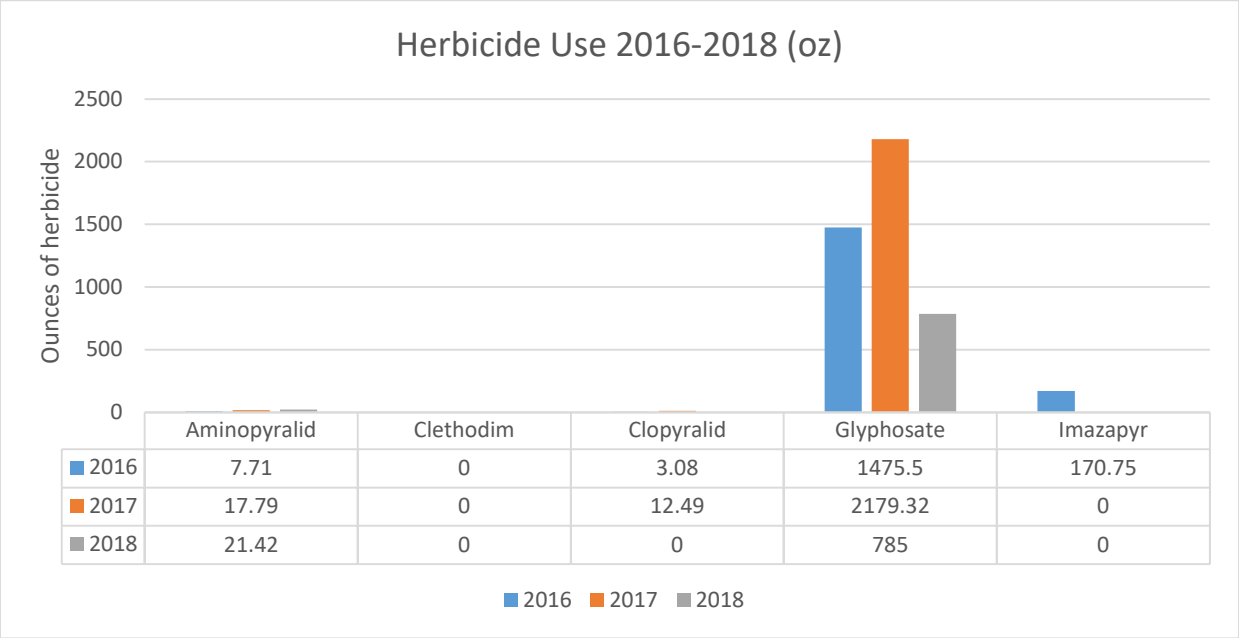
Pesticide	Active Ingredient	Product Used (oz)	Acres Treated	Oz / Acre
Insecticide	Prallethrin	171.5	-	-

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

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

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

Figure 5. 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 20: 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 21: 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.

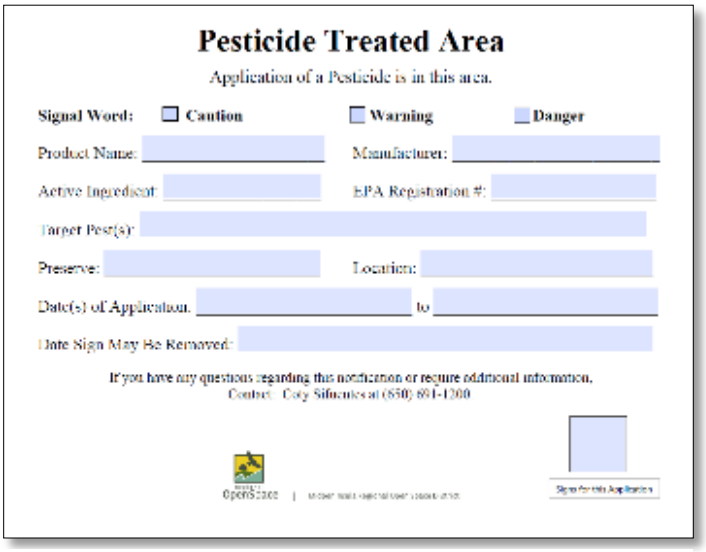


Figure 6: Pesticide Notification Sign

- 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	Naftali Moed, 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	Danny Kerfield, 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	Vanessa Buchanan, 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	Unknown visitor	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	Richard Youatt	Email	Concern regarding glyphosate usage at RSA	Response sent, Mr. Youatt 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~~	

- 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

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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
French broom	*Genista monspessulana*
English ivy	*Hedera helix*
Vinca	*Vinca major*
Yellow starthistle	*Centaurea solstitialis*
Purple star thistle	*Centaurea calcitrapa*
Stinkwort	*Dittrichia graveolens*
Cape ivy	*Delairea odorata*
Italian thistle	*Carduus pycnocephalus*
Blue gum	*Eucalyptus globulus*
Smooth distaff thistle	*Carthamus creticus*
Wild teasel	*Dipsacus fullonum*
Slender false brome	*Brachypodium sylvaticum*
Spanish broom	*Spartium junceum*
Goatgrass	*Aegilops triuncialis*
Hanging sedge	*Carex pendula*
Coyote brush[7]	*Baccharis pilularis*
Poison hemlock	*Conium maculatum*
Rose clover	*Trifolium hirtum*
Bullthistle	*Cirsium vulgare*
California burclover	*Medicago polymorpha*
Bermuda grass	*Cynodon dactylon*
Slender flowered thistle	*Carduus tenuiflorus*
Medusa head	*Elymus caput-medusae*
Upright veldt grass	*Ehrharta erecta*
Milk thistle	*Silybum marianum*
Indian teasel	*Dipsacus sativus*
Fennel	*Foeniculum vulgare*
Poison oak	*Toxicodendron diversilobum*
Slim oat	*Avena barbata*
Tocalote	*Centaurea melitensis*
Monterey pine	*Pinus radiata*
Blackwood acacia	*Acacia melanoxylon*
Andean pampas grass	*Cortaderia jubata*

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

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

Coastal heron's bill	*Erodium cicutarium*
Jointed goatgrass	*Aegilops cylindrica*
Mustard	*Hirschfeldia incana*
Big heron bill	*Erodium botrys*
Ripgut brome	*Bromus diandrus*
Italian rye grass	*Festuca perennis*
Common groundsel	*Senecio vulgaris*
Smilo grass	*Stipa miliacea var. miliacea*
Red seeded dandelion	*Taraxacum officinale*
Peruvian lily	*Alstroemeria* sp.
Algerian sea lavender	*Limonium ramosissimum*
Smooth cats ear	*Hypochaeris glabra*
Silver wattle	*Acacia dealbata*
Juniper	*Juniperus* sp.
Soft chess	*Bromus hordeaceus*
Camphor tree	*Cinnamomum camphora*
Hairy cats ear	*Hypochaeris radicata*
Field hedge parsley	*Torilis arvensis*
Tall oatgrass	*Arrhenatherum elatius*
Vineyard onion	*Allium vineale*
Bird's foot trefoil	*Lotus corniculatus*
Canary island date palm	*Phoenix canariensis*
Himalayan blackberry	*Rubus armeniacus*
Red-seeded dandelion	*Taraxacum erythrospermum*
Bur chevril	*Anthriscus caucalis*
Common velvetgrass	*Holcus lanatus*
Scotch broom	*Cytisus scoparius*
Woolly distaff thistle	*Carthamus lanatus*
Harding grass	*Phalaris aquatica*
White horehound	*Marrubium vulgare*
Gorse	*Ulex europaeus*
Black locust	*Robinia pseudoacacia*
Gopher plant	*Euphorbia lathyris*

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

Health Screening Assessment and Guidelines for Use of Insect Repellents at Midpeninsula Regional Open Space District

March 2019

Purpose of this Assessment

Insect repellents are EPA-registered pesticides, and are subject to all relevant policies, laws and regulations. The District did not research or analyze the human and environmental health and safety of any pesticides for tick and mosquito prevention during the development of the IPM Program. This document will serve as a cursory assessment of these pesticides to better understand the risks of each pesticide and select the least toxic insect repellents for use within the District.

The insect repellents that are assessed in this document are products that have been used historically by staff in the District. Active ingredients assessed in this document are:

- DEET
- Picaridin
- Permethrin

Additional low-toxicity insect repellents, will be assessed in the future as needed.

General Guidelines for Using Insect Repellents

Insect repellents are intended for sparing and infrequent use, but are unique as pesticides because they are often meant to be applied directly to the skin. Some general guidelines for safe application of insect repellents (U.S. EPA, n.d.):

- **Read and follow the label directions** to ensure proper use; be sure you understand how much to apply.
- Apply repellents only to exposed skin and/or clothing. Do not use under clothing.
- Do not apply near eyes and mouth, and apply sparingly around ears.
- When using sprays, do not spray directly into face; spray on hands first and then apply to face.
- Never use repellents over cuts, wounds, or irritated skin.
- Do not spray in enclosed areas.
- Avoid breathing a spray product.
- Do not use it near food.
- As with all pesticides, “the label is the law”, meaning that users must read the entire product label prior to use, and safe use must comply with label requirements.

Monitor application sites for rashes or other signs of dermatitis. Different people have varying levels of sensitivity and may react differently to different products.

Recommendations

Picaridin and DEET are low-risk insect repellents that are relatively safe to use when all label instructions are followed. There is a wide array of consumer product formulations available of each of these chemicals. Different product formulations can have different rates of the active ingredient as well as inactive ingredients which may contribute to the human or environmental toxicity of a product.

In lieu of assessing each consumer product separately, the District will instead rely on the signal word that the U.S. EPA has assigned each product. **The District recommends that only repellents with the active ingredients Picaridin and DEET and the signal word CAUTION should be used in the District**. Insect repellents that have already been purchased by the District with the signal word WARNING, may be used until empty, but no new repellents with the signal word WARNING or DANGER may be purchased without approval from the IPM Coordination Team.

Due to the potential for carcinogenicity, acute impacts to the human nervous system, and toxicity to non-target organisms, permethrin is not recommended for use as an insect repellent on District lands.

District funds should only be used to purchase approved insect repellents. If employees wish to purchase other repellents using personal funds for personal use they may do so.

Table 1. Insect Repellents selected to add to the District's Approved Pesticide List

Pesticide Category	Active Ingredient	Product Formulations	Mode of Action	Purpose
Insect Repellents	DEET	Various (Signal Word: CAUTION)	Disrupts L-lactic acid and carbon dioxide detection	Tick and mosquito repellent
	Picaridin	Various (Signal Word: CAUTION)	Disrupts detection of host cues	Tick and mosquito repellent

Table 2. Additional BMP proposed for use of insect repellents

37	Insect Repellents and Water Quality – To protect water quality and aquatic organisms, District Staff shall not come into contact with a water body when skin, boots or clothing is contaminated with insect repellents.

Table 3. Products currently in use at District Field Offices

Product Name	Active Ingredient	Concentration	Signal Word	Recommendation
Repel Tick Defense	Picaridin	15%	CAUTION	Approve
Cutter Advanced Sport Insect Repellent	Picaridin	15%	CAUTION	Approve
Sawyer Maxi Deet	DEET	98%	WARNING	Use until empty
Johnson Off! Deep Woods	DEET	35%	CAUTION	Approve
Permethrin products	Permethrin	-	-	Reject

Health Assessment of Insect Repellent Active Ingredients

1. DEET

- **Human Toxicity**: Low toxicity when used sparingly according to label instructions. Eye and skin irritation can occur.
- **Ecological Toxicity**: Slightly toxic to birds, fish, bees and aquatic organisms
- **Water Pollution Potential**: Does not readily break down in water, and can be found in waterways and wastewater treatment plants.
- **Other Considerations**: DEET can be damaging to some types of fabric.

Basic Use Information

Typical target pests: Mosquitos, ticks, gnats.

Every DEET formulation is different, and signal words vary from CAUTION to DANGER. The signal word is reflective of the entire formulation of inactive or other ingredients. Formulations with 20-30% DEET are proven to be effective against ticks, mosquitos and other insects, without posing significant risk to the user.

Exposure Considerations

When DEET and alcohol are applied to the skin, more DEET is taken into the skin compared with DEET alone. Drinking alcohol may also cause more DEET to be absorbed through the skin. Sunscreen products that contain DEET may cause more DEET to be taken into the body through the skin. Product labels should be read carefully before applying DEET with sunscreen. DO NOT apply DEET underneath clothing. DEET is meant to use periodically as needed. Daily use can lead to increased impacts to human and environmental health.

Human Toxicity

Acute toxicity

Mild skin irritation, contact dermatitis, exacerbation of preexisting skin disease as well as generalized urticarial may result from the use of DEET. DEET is very irritating to the eyes but generally does not cause long-term damage. Excessive use on the skin can lead to rashes and blisters.

DEET is readily absorbed into the skin and is readily found in blood streams after application. Simultaneous use of sunscreen and sunscreen products formulated with DEET are absorbed at a higher rate than DEET alone. Products containing alcohol, or an applicator who has recently consumed alcohol dermally absorb DEET at a higher rate. DEET has been found in human blood streams up to 12 hours following initial application, but is expected to be mostly excreted within 24 hours.

Chronic toxicity

At this time, no major chronic effects have been attributed to DEET, however, use of DEET on children has been attributed to rare cases of seizures.

Researchers have not found any evidence that DEET causes cancer in animals or humans. DEET has been classified by the Unites States Environmental Protection Agency (U.S. EPA) as "not classifiable as a

human carcinogen", which means that there is not enough evidence to say that it does or does not cause cancer.

Ecological Toxicity

DEET has been found to degrade some soil bacterium, but has also been found to be metabolized by some species of soil fungi. DEET is slightly toxic to all birds, fish and aquatic invertebrates.

Physical Properties/ Environmental Fate and Transport

DEET is moderately mobile in soil. In water, DEET does not readily break down and is often found in waterways after being washed off skin and clothing. DEET can exist as a vapor in ambient air, with a half-life of 15 hours.

Water Pollution Potential

DEET is practically insoluble in water, and it is often found in the aquatic environment. When DEET is washed off of a person's skin or clothing, it can make its way into gray water and waste water treatment plants. Humans excrete absorbed DEET, and it can be found in sewage.

2. Picaridin

- **Human Toxicity**: Low toxicity when used sparingly according to label instructions. Eye and skin irritation can occur. Slightly toxic if ingested orally but practically non-toxic through inhalation. Picaridin is not likely to be a carcinogen.
- **Ecological Toxicity**: Picaridin is considered non-toxic to birds. Picaridin is moderately toxic to fish and may have the ability to bioaccumulate in some species. No information is currently available on effects to terrestrial invertebrates.
- **Water Pollution Potential**: Picaridin is rapidly degraded by bacteria in water, but readily adsorbs to suspended sediment within the water.
- **Other Considerations**: Picaridin is a lower risk pesticide than DEET.

Exposure Considerations

Picaridin is absorbed into the skin at different rates based on dosage, and percent active ingredient in the product. DO NOT apply under clothing, follow all label instructions.

Human Toxicity

Acute Toxicity

Has been shown to be slightly toxic if ingested orally. Picaridin is considered a mild skin irritant, but rarely causes dermatitis. Some people can be more sensitive to Picaridin or other ingredients in a formulation and develop an allergic reaction or dermatitis.

Chronic Toxicity

Some minor effects have been observed after subchronic exposure, including increase in kidney and liver size, skin irritation, and scabbing. These data come from animal studies, as no human data are available for chronic effects of picaridin. Animal studies have not shown any evidence of carcinogenicity, and the EPA has classified picaridin as "not likely to be carcinogenic to humans". Animal studies using gestating rats showed a minor increase in liver size, but no other major effects to the rat or fetus.

Ecological Toxicity

No information on the effect of picaridin on plants was found. Picaridin is considered to be non-toxic to birds. Picaridin is moderately toxic to fish and may have the ability to bioaccumulate in some species. No information is currently available on effects to terrestrial invertebrates.

Physical Properties/ Environmental Fate and Transport

Picaridin is expected to be moderately mobile in soil. It is not expected to volatilize from soil surfaces, but otherwise has a high potential for volatilization, Picaridin can exist as a vapor in the atmosphere with a half-life of around 2.3 hours.

Water Pollution Potential

Picaridin has a low potential to volatilize from water. There is no information on its ability to contaminate groundwater. Picaridin is stable in hydrolysis, meaning it does not readily break down in water. It is rapidly degraded by bacteria in water, but it is has been discovered in small concentrations at wastewater treatment plants.

3. Permethrin

- **Human Toxicity**: Permethrin is a neurotoxin and can cause effects such nausea, vomiting, abdominal pain, headache, dizziness, anorexia, and hypersalivation. Permethrin is considered "likely to be carcinogenic to humans", and will be assessed as an endocrine disruptor
- **Ecological Toxicity**: Permethrin is highly toxic to insects, fish and other aquatic organisms. It is has low acute toxicity to birds and mammals.
- **Water Pollution Potential**: Permethrin is not likely to pollute groundwater because it readily forms tight binds with the soil. Most permethrin will bind to sediment in water, which can persist in the water column for more than a year.
- **Other Considerations**: Permethrin is a neurotoxic insecticide that is also used as an insect repellent. When used on broad areas, it is considered a restricted use pesticide. Permethrin is not recommended for use as an insect repellent within the District.

Exposure Considerations

Clothing can be purchased with permethrin embedded into the fabric. Generally this is considered safe, but leads to increased exposure

Human Toxicity

Acute Toxicity

Permethrin is generally thought to have low-moderate toxicity when exposed orally and low to very low when in other exposure pathways. In animal tests, eye and skin irritation was cleared 3-7 days after exposure. Dermal exposure in humans can cause tingling and pruritus with blotchy erythema on exposed skin. In humans, acute effects observed subsequent to ingestion of permethrin included nausea, vomiting, abdominal pain, headache, dizziness, anorexia, and hypersalivation.

Chronic Toxicity

No human carcinogenicity data exists, but based in studies in rats, U.S. EPA has classified permethrin as "likely to be carcinogenic to humans" by ingestion. In animal tests, effects of pesticide poisoning were observed in the highest doses, including increased liver weights and negative neurological effects

including tremors. In reproductive animal studies, permethrin has been shown to reduce fetal weights and contribute to birth defects.

Permethrin is on the list of chemicals to be screened under the U.S. EPA Endocrine Disruptor Screening Program.

Ecological Toxicity

Permethrin is highly toxic to all insects and other invertebrates, and is used as a contact insecticide in addition to a repellent. Mammals are affected by permethrin, but generally has minimal impact due to larger body size and faster metabolism. Permethrin has a low toxicity to birds. Some other ingredients in some formulations can be more toxic to birds.

Fish/Aquatic Life: Highly toxic to fish and other aquatic life. Permethrin that settles in aquatic sediments can impact invertebrates that come into contact with the sediment.

Physical Properties/ Environmental Fate and Transport

Permethrin degrades slowly in the soil, with an average half-life of 39.5 days. It can bind tightly to soils, and is eventually broken down by microbes and the sun. Permethrin has a low potential to volatilize, but has the potential to drift during applications.

Water Pollution Potential

Permethrin is not likely to pollute groundwater because it readily forms tight binds with the soil. Most permethrin will bind to sediment in water, which can persist in the water column for more than a year.

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Attachment 3

2019

Slender False Brome Program Report

RECOMMENDATIONS FOR CHANGES TO THE PROGRAM

TOM REYES & COTY SIFUENTES-WINTER

MIDPENINSULA REGIONAL OPEN SPACE DISTRICT | Natural Resources Department

Summary

The Midpeninsula Regional Open Space District (District) initiated a program for managing *Brachypodium sylvaticum* (slender false brome) in San Mateo County to protect native redwood forests on its preserves and adjacent private lands. The goal of this program was to eradicate or contain *B. sylvaticum* in San Mateo County based on limited populations found on District and surrounding lands. Since May of 2014, a significant component of this program has been a cooperative partnership with the San Mateo County Resource Conservation District (RCD) to manage *B. sylvaticum* on neighboring private parcels that had the potential for infesting District lands.

Despite intensive treatment efforts for over 10 years, *B. sylvaticum* continues to expand its range throughout the Santa Cruz Mountains region, including the recent discovery of two large infestation near Highway 17. The initial objectives of the District's program of eradication and containment within San Mateo County are no longer realistic. The Natural Resource staff proposes changing the emphasis of the regional Slender False Brome Program (Program) from eradication and containment to control, outreach, education, and mapping. Treatment would continue on District lands with the goal of protecting sensitive resources. The goal of treatment on only critical private properties would be to prevent further infestation to District lands. The regional infestation is now widely distributed, severely hampering the ability for the District to accomplish the original intent to eradicate *B. sylvaticum*. Increasing outreach and partnership with neighboring agencies and community groups is essential to keep the noxious weed under control.

Program History

The District has a long history of *B. sylvaticum* management. On December 14, 2005, the District's Board of Directors (Board) approved a ten-year plan to control SFB in Thornewood Open Space Preserve and the surrounding Woodside neighborhoods (R-05-122). During this time, a part-time contingent employee with the assistance of a part-time intern managed the District's Program. The District expanded the Program on March 26, 2014, when the Board approved a three year Cooperative Agreement (Agreement) with the RCD to coordinate with neighbors and manage SFB on private properties in the Woodside area (R-14-48).

On March 9, 2016, staff presented to the Board a Ten-year Status Report and recommended the "Continuation of a Slender False Brome Integrated Pest Management Program" (R-16-21). The Board voted 7-0 to continue the Program on District preserves and nearby private parcels for an approximate program cost of $1,250,000 over the next ten years ($1,000,000 on private parcels and $250,000 on District lands). With this authorization, in 2017 the District extended the Agreement with the RCD to manage the program for up to three more years(R-17-78). Tasks assigned to the RCD include communicating with the private property owners, surveying their properties, treating *B. sylvaticum* therein, conducting post-treatment surveys, and submitting progress reports to the District. The District has funded treatment of *B. sylvaticum* on District Preserves and on nearby private properties.

Research

In addition to, and as part of the Agreement, the RCD has been a partner in a joint research study with Santa Clara University and the District. One of the focus of the Principal Investigator's lab (Dr. Virginia Matzek) at Santa Clara University is research examining the ecology of invasive species and how pest species management relates to ecosystem service provision. The aim of the joint research is to quantify the efficacy of non-chemical treatment methods of *B. sylvaticum* and determine the seed bank longevity. Preliminary results are showing a greater than 90% reduction in germination of *B. sylvaticum* using wood chips as a mulch.

Natural Resource staff expect a final report of the research in December of 2019 and will share the results with the Board as part of the 2019 Annual IPM Report. As part of the agreement, Matzek will present the findings of the research to a professional society, such as the California Invasive Species Counsel symposium. In addition, a joint paper written by Matzek and the District's Senior Resource Management Specialist (Coty Sifuentes-Winter) will be submitted to a scientific journal of publication.

Treatment History

Since 2015, crews (made up of District staff, contractors, volunteers, and private homeowners) have treated *B. sylvaticum* on at least 105 private properties and across a total of 106 acres. Treatments have consisted of hand removal, covering with black plastic, and/or targeted application of glyphosate (for mature plants) or Envoy Plus (for seedlings). Surveys and treatment on private lands occurred within a 7,000 foot buffer around District preserves known to have *B. sylvaticum* infestations. These preserves include Thornewood, El Corte de Madera, and La Honda Creek Open Space Preserves (OSP). The RCD has surveyed an additional 34 properties in critical areas of the infestation, consisting of 1,243 acres, and found them free of *B. sylvaticum*.

TABLE 1: SUMMARY OF RCD COORDINATED *B. SYLVATICUM* TREATMENTS ON PRIVATE LANDS

Year	Acres Surveyed	Acres Treated	Parcels Treated
2014	106	86	52
2015	84.2	57	89
2016	72	62	88
2017	87	79	71
2018	4.8[1]	66.5	70

Some properties have been a part of the Program for many years and have shown significant decreases in *B. sylvaticum* cover. Monitoring of *B. sylvaticum* since the initiation of treatment shows a 57% average reduction in *B. sylvaticum* for participants who have been in the program for up to 5 years, while those who have been participating in the program for longer have seen an average reduction of 74%. Due to treatment challenges, only a small percentage of private properties have seen these reductions in percent cover.

Treatment Challenges

Coordination of surveys, treatments, and monitoring across more than 100 private properties is a difficult task, exacerbated by turnover in property ownership and absentee or unresponsive homeowners. For long-term management to be successful, consistent annual follow-up must occur until the crews have exhausted the seedbank, estimated at 6 years. Additionally, without 100% participation in the Program in any given community, eradication is not possible. Untreated properties can serve as a seed source to re-infest treated properties, and undermine previous successes. Reductions in percent cover of *B. sylvaticum* have been achieved in individual parcels that have undergone consistent treatment. However, because this infestation crosses many jurisdictional boundaries, it is important to assess overall success at a wider scale. While some gains may be lost by scaling back treatments on private lands, shifting resources towards surveys will provide crucial information to develop a more successful regional strategy in the future.

In 2006, the District worked with the California Department of Food and Agriculture (CDFA) to help list SFB as a state-listed noxious weed, which gives County Agricultural Commissioners the discretion to mandate weed abatement on private properties. Mandatory abatement is unlikely at this stage of the infestation. However, had it been pursued at a much earlier stage of the infestation, the likelihood of eradication would have increased drastically.

Slender False Brome Expansion in the Region

In 2009, staff estimated the total net area of land infested with *B. sylvaticum* to be 100 acres (40 acres of District land and 60 acres of adjacent private lands) with varying percent cover from 1% to 38%. This assessment underestimated the extent of the *B. sylvaticum* infestation, as surveys were not conducted

[1] A change in the 2018 Scope of Services reduced survey frequency on private properties from every year to every three years to align with the Best Management Practices associated with the District's IPM Program. In previous years, all sites were surveyed prior to treatment in a given year rather than on a 3-year cycle.

outside of the Woodside area prior to 2015. Staff now estimate the San Mateo County *B. sylvaticum* infestation to be at least 196 acres (40 acres of District land and 156 acres of adjacent private lands) due to an increase in the search area of adjacent private lands. Although the estimated 40 acres on District land has not decreased, the percent cover and work hours treating *B. sylvaticum* has decreased over time. For example, at El Corte de Madera OSP, treatment hours have reduced from a high of 66 hours to 24 hours to cover the same area.

In 2017 and 2018, a high regarded botanist affiliated with the University of California, Santa Cruz identified two large populations of *B. sylvaticum* near Hwy 17 on private land during a review of a timber harvest plan. The estimated area infested is approximately 12 acres with a plant population size of 5,000 individuals. The discovery of a healthy and robust population well outside of the area of focus for the Program suggests that there are currently unmapped seed sources and vectors (most likely trucks and equipment) that are contributing to the expansion of the *B. sylvaticum* population in the Santa Cruz Mountains.

In addition to *B. sylvaticum* being present on District preserves and nearby private properties, it is important to note that *B. sylvaticum* is known to infest other public lands, including Wunderlich County Park, California Water Service lands in Woodside, and near Big Basin State Park. These infestations have not been addressed as a part of the Program, and in some cases have continued to expand unchecked. With the alteration in *B. sylvaticum* strategy, the District and RCD aim to work more closely with other land management agencies to coordinate cross-boundary surveys and treatments. With the continued expansion of *B. sylvaticum* on private parcels well outside of the original boundaries, neither eradication nor containment is possible.

Conclusions

It has become apparent that eradication, as well as containment, is not possible due to a number of factors discussed in this report. Staff recommends modifying the objective of the project to place additional focus on outreach, education, and mapping. Some small-scale treatments on private lands would continue in strategic locations determined by the District and RCD, and focus on locations with the greatest resource value and high chances of long-term success.

The District and the RCD have regular meetings every two to three months to give project updates and discuss priorities and strategies. To date, the RCD has focused outreach and treatment efforts on a 7,000 foot buffer around infested District preserves. Due to the spread of S *B. sylvaticum* well beyond the 7,000 foot buffer, the District and RCD are continuing to work together to develop a strategy to gain a better understanding of the full regional extent of *B. sylvaticum*. Under the recommended change in program objectives, the RCD would focus on unsurveyed parcels regardless of ownership in key watersheds that are likely to harbor *B. sylvaticum* infestations. These watersheds include El Corte de Madera Creek, Tunitas Creek, and Bull Run Creek (see Attachment 2). Conducting surveys at the watershed level are critical due to the capacity for *B. sylvaticum* to use riparian systems to disperse their seed.

The RCD would also prioritize outreach to the larger Santa Cruz Mountains community to increase awareness of *B. sylvaticum* and advocate for more mapping and treatment throughout the region. Outreach would include regional coordination with the Santa Cruz Mountains Stewardship Network, Weed Management Areas, neighboring RCDs, and land management agencies within San Mateo, Santa Clara, and Santa Cruz counties. Due to the growing expansion of *B. sylvaticum* in the region, increased regional collaboration is imperative to prevent a widespread infestation.

Some increases in regional outreach are already underway. The District and RCD presented on the Program at the Santa Cruz Mountains Stewardship Network's Invasives Workshop on April 11, 2019. Through this workshop, the District hopes to raise awareness of the spread of *B. sylvaticum*, and discuss opportunities for the various agencies and land managers to work on *B. sylvaticum* control collaboratively. Additionally, the RCD has worked with San Mateo County Parks to submit a grant application that would include survey and treatment into Wunderlich County Park, which would add a much needed component to the Program.

Acknowledgements

Name	Organization	Title
ARMS	Midpeninsula Regional Open Space District	Volunteers
Dickey, Kathleen	San Mateo County Resource Conservation District	Conservation Program Coordinator (Former)
Gartside, Ellen	Midpeninsula Regional Open Space District	Volunteer Program Lead
Matzek, Virginia, PhD	Santa Clara University	Associate Professor
Mills, Amanda	Midpeninsula Regional Open Space District	Resource Management Specialist II
Preserve Partners	Midpeninsula Regional Open Space District	Volunteers
Reyes, Tom	Midpeninsula Regional Open Space District	IPM Coordinator
Sifuentes-Winter, Coty	Midpeninsula Regional Open Space District	Senior Resource Management Specialist
Tuday, Cleopatra	San Mateo County Resource Conservation District	Conservation Program Coordinator

TO: **Coty Sifuentes-Winter** **DATE: June 9, 2019**
MROSD Senior Resource Management Specialist
[redacted]
Tom Reyes
MROSD Integrated Pest Management Coordinator
[redacted]

FROM: Louise Addis, Kathi Olsen & others (see below), Grandview/Espinosa Neighborhood

CC: Selena Brown [redacted]

SUBJECT: Slender False Brome (SFB), another fire hazard

1. BACKGROUND:

We are part of the Grandview/Espinosa neighborhood of 37 properties located on the up hill border of MROSD's Thornewood Open Space in Woodside.

One of us, Kathi Olsen has been the de facto neighborhood organizer of some small volunteer efforts to help hand pull the noxious invasive Slender False Brome grass along our two roads. But, though several of us have gotten down and dirty pulling by hand, the major control has come via the **MROSD/SMCCD contractor and reimbursement program**.

Almost everyone in our neighborhood has worked directly with the SFB coordinators: first, Ellen Gartside from MROSD who got us going, and now Cleo Tuday from San Mateo County who has provided wonderful ongoing coordination and help.

And, almost everyone now understands the negative impact of uncontrolled SFB as it displaces native plants, ruins pasture (nothing grazes it), suppresses forest regeneration, degrades wildlife habitat, and **increases fire risk by building up heavy layers of thatch.**

As you know from the Coordinator reports, the project to eliminate infestations of SFB from local properties has been quite successful but will require ongoing efforts in the future. And, unfortunately, there are still a few properties with major infestations.

2. HOPES FOR CONTINUATION OF THE SFB ERADICATION PROGRAM:

We have been most grateful to MROSD for their role in funding & ongoing sponsorship of this important eradication program & are hoping that it will continue beyond the original 10-year timeline.

It is clear to us that property owners alone trying to keep up the work started by contractors would be inadequate, especially where the growth has been dense or treatment not yet authorized. And for the several key property owners who require non-herbicide control, it is particularly important that the program continue to include a hand pulling option. Also as properties are sold, new owners need education and help.

After all the hard work, we don't want lose the significant progress we've made against this subtly aggressive grass. And we realize that any lack of control in our neighborhood will directly impact Thornewood below us as seed drifts downstream thru the watershed, an effect already seen this spring.

3. FIRE RISK

We are especially concerned now that we realize what a fire hazard the established clumps of SFB perennial grass and dry thatch can become in just a few seasons of neglect.

4. SUMMARY

Please keep up the good work and continue to support the Contractor and Reimbursement Program to control, and even eradicate, SFB in the Grandview/Espinosa area and its surrounds!

5. SUPPORT - The following Grandview/Espinosa neighbors have asked that their names be included in support of this letter to MROSD:

Louise Addis
[redacted] Grandview

Ryan and Lindsay Amos
[redacted] Espinosa

Joe Androlowicz
[redacted] Grandview

Oliver Bock
[redacted] Espinosa

Roger Choplin & Carol Mone
[redacted] Grandview

Rob & Lisa Cochran
[redacted] Grandview

Michael & Hagar Dickman
[redacted] Grandview

Joan Donath
[redacted] Espinosa

David & Susie Dubbs
[redacted] Espinosa

William Fender & Kathi Olsen
[redacted] Grandview

Ned & Katy Fluet
[redacted] La Honda Rd.

Don Gustavson & Margie Lee
[redacted] Grandview

Tim & Clair Johnson

[redacted] Espinosa

Matt & Kristin Davis
[redacted] Grandview

Don & Sherry Langrock
[redacted] Grandview

Terilynn Langsev
[redacted] Grandview

Scott Larson
[redacted] Grandview

Heath & Carrie Lukatch
[redacted] Grandview

Linda Schweizer
[redacted] Grandview

Pam Stratton & Greg Cardoza
[redacted] Espinosa

Ella van Gool & Charlie Watt
[redacted] Espinosa

Dmetriy & Nataliya Voloshin
[redacted] Espinosa