San Mateo County Parks Department
Integrated Pest Management (IPM) Program
2023 Annual Report

Prepared by:
County of San Mateo, Parks Department
455 County Center, 4th Floor
Redwood City, CA 94063

Overview

The San Mateo County Parks Department (County Parks) utilizes science-based Integrated Pest Management (IPM) practices to improve habitat quality, protect biodiversity, mitigate the risk of wildfire, and ensure safe recreation opportunities within the County parks system. IPM is an effective ecosystem-based stewardship strategy that focuses on the efficient and long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, and modification of cultural practices **(UCANR, 2024)**. Chemical treatments (i.e. herbicides are only used when the above techniques are found to be either ineffective or infeasible. Chemical treatments are always conducted in accordance with established regulations and guidelines, and are done so with the goal of only removing target organisms. Herbicides are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.

County Parks' IPM program supports the department's mission of preserving the County's natural and cultural treasures and providing safe, accessible parks, recreation, and learning opportunities that enhance the community's quality of life. Through vegetation management projects, County Parks maintains ecosystem health and function; controls the spread of invasive species; enhances and restores habitat for rare plant and wildlife species, and other sensitive natural resources; maintains park infrastructure such as trails; and improves public safety by mitigating the threat of wildfire by reducing fuel loads.

Of note, invasive plant species have greatly altered many of California's natural plant communities. The Intergovernmental Platform on Biodiversity and Ecosystem Services has identified invasive species as a major threat to nature and nature's contributions to people and good quality of life, highlighting that invasive species have contributed up to 60% of global extinctions **(IPBES, 2023)**. Because they have not co-evolved with native organisms, invasive plants are generally less susceptible to predation and diseases of our region. Invasive plants are extremely adaptable and can thrive in a wide range of conditions. They can grow quickly, reproduce early, produce many long-lasting seeds, and tolerate disturbance. These non-native species reduce native biodiversity by gradually crowding out or competing with native plants for water, nutrients, and sunlight, and by reducing or modifying habitat for native wildlife. Dense stands of invasive plant species can also create significant wildfire threats across California landscapes, increasing the threat of catastrophic wildfires in our region.

Without actively managing the landscape to protect native biodiversity and habitat values, the department risks losing sensitive species such as the Coast Yellow leptosiphon, found only in a single isolated location on the San Mateo coast, or the Mission blue butterfly and San Bruno Elfin whose populations reach their highest numbers in San Mateo County parks. In total, there are 118 rare, threatened, and endangered species (66 plant and 52 wildlife) that are found in the San Mateo County parks system. The health of these populations relies on County Parks' active and effective stewardship. Moreover, there are numerous residential communities that depend on the department to improve public safety by mitigating the threat of wildfire.

In accordance with the department's IPM program, County Parks uses a variety of treatment methods, often in combination, to increase efficacy. These methods include mechanical and physical controls, cultural controls, biological controls, and chemical controls.

- *Mechanical controls* include the use of hand tools to dig or pull weedy plants, mowing and brushing using hand-held or heavy equipment, mastication, felling, and pruning.
- *Cultural controls* include altering human behavior to prevent and reduce the spread of pests with tools such as boot brushes at park trail heads, and using tarps or mulch to suppress weeds before they sprout. Additional examples of cultural practices that the Department is currently exploring include prescribed fire (with approval from CalFire, local fire agencies, and all other relevant regulatory agencies) and grazing with goats and cattle.
- *Biological controls* are organisms that have naturally evolved with a pest organism in its native range and reduce the population of that pest. These "natural enemies" are approved by the US Department of Agriculture prior to release **(USDA, 2024)**. For example, a pilot release of Cape Ivy shoot-tipped galling flies has been trialed in our parks in an attempt to reduce the spread of Cape Ivy which is an invasive vine that suppresses native riparian vegetation, especially along the San Mateo Coast.
- *Chemical controls* include herbicides listed as effective in *Weeds of California and Other Western States* (**DiTomaso and Healy 2007**), a University of California Agriculture and Natural Resources publication, or by the California Invasive Plant Council. Any herbicides used within County Parks are approved for use by all levels of federal, state, and local regulation.

In accordance with County Parks' IPM program and California law, the department's Natural Resource Management Division (NRM) works with a state-licensed Pest Control Advisor (PCA) with expertise in wildland IPM to receive written pest control recommendations (PCRs) before the application of any herbicides. Pest Control Advisors are licensed through the California Department of Pesticide Regulation (CDPR), which requires the PCA to meet minimum qualifications and pass qualifying examinations (Laws, Regulations, Basic Principles, and the appropriate pest control

category). Prior to writing a recommendation, the PCA and NRM staff will discuss possible treatment options (including non-chemical treatment), the effectiveness of previous treatments, and any options for treatment modifications based on newly available research, the PCAs knowledge of past treatments within the County Park system, and/or strategies from other local agencies facing similar pest issues. The PCRs used in County Parks projects represent the most appropriate treatment method based on project specifications and include descriptions of the site(s) where treatment will occur, target pests, materials, and material mixing ratios. The PCRs also include precautions that must be observed to avoid negative impacts to people and non-target species through drift or runoff, the interval after which people and pets may be allowed to re-enter the treatment area, application method, and other information on how to apply the pesticide in a way that minimizes negative environmental impacts. In some cases, a PCR is written for small-scale trials (pilots) of methods that have shown success elsewhere but have not previously been used in County parks. All PCRs must be renewed by the PCA on an annual basis.

This report describes the vegetation management IPM activities conducted by County Parks staff, contractors, and volunteers in 2023. Projects include those conducted with a focus on wildfire fuel management, habitat enhancement, parks operations, and volunteer opportunities.

2023 Summary

In 2023, using the County Parks Integrated Pest Management (IPM) program as a guide, the department conducted vegetation management activities across 929 acres of parkland and 129 miles of trail, hosted 36 volunteer weeding events which accounted for more than 2,082 volunteer-hours, and performed large-scale fuel reduction projects in five county parks (**Appendix A, B**). Major goals of the department's IPM work included wildfire fuel management, habitat enhancement of native ecosystems, management of invasive species, and maintenance work for park operations including trails and facilities. County Parks staff, volunteers, and contractors utilized the full spectrum of treatment strategies within the IPM toolbox, including mechanical control using hand tools, power tools, and heavy machinery; cultural control strategies such as mulching, tarping, and preventative decontamination strategies for equipment and boots; and chemical control involving the targeted use of herbicides. No biological controls were used in the parks in 2023.

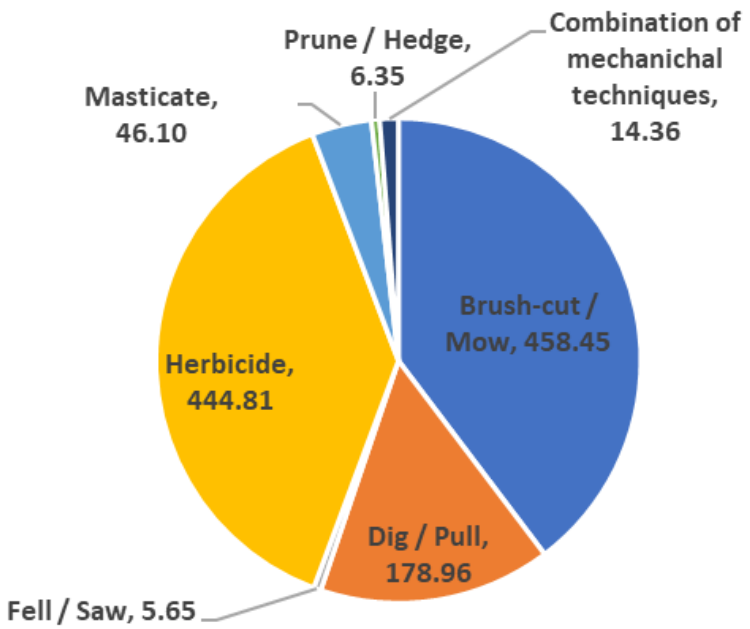

Figure 1. County Parks 2023 IPM vegetation management projects broken down by primary treatment type. In this figure, acreage represents gross acres rather than infested acres. Gross acres are a representation of the entire area that was scoped and treated for a pest infestation, and overestimates the exact area where treatment was required. For example, if 1.0 gross acre of an invasive vegetation pest was treated using hand pulling techniques and the pest species represented 40% cover of the acre, then only 0.4 (infested) acres were hand pulled. Please note, this will be represented as 1.0 gross acre in the charts. Moreover, if an acre had ten (10) Eucalyptus trees that were treated using the cut-stump application method, that will be represented as 1.0 gross acre in the charts despite the fact that only ten trees were treated. For clarity on how herbicides are applied during chemical treatment, please see **Figure 3**. All herbicide treatments are targeted and do not involve broadcast application of materials on the landscape. Volunteer weeding is not included in the acreage here as these projects are not mapped, however volunteers contributed an additional 2,082 hours of hand weeding work in our parks.

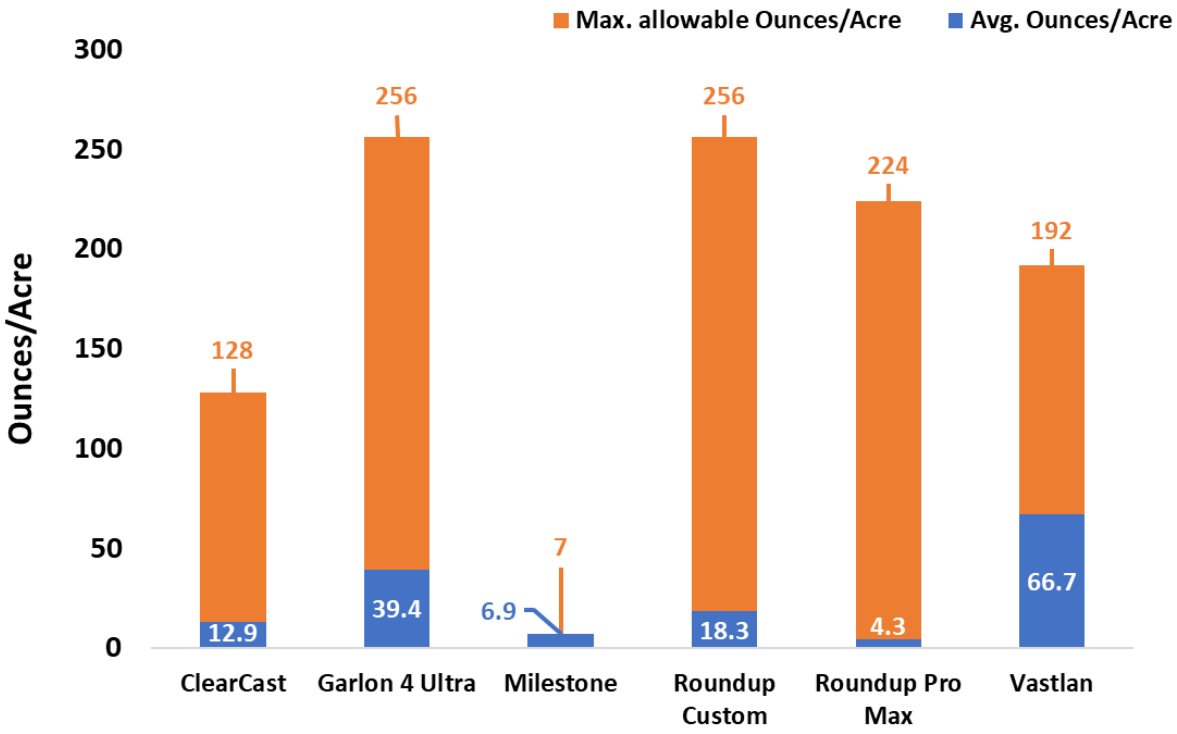

Figure 2. The average ounces/acre of herbicides used for County Parks IPM treatments within the San Mateo County Park system in 2023. Blue (dark) bars represent actual use averages, while orange (light) bars represent the maximum allowable rate according to the label. In some cases, the label has multiple maximum rates, depending on the land use type. In these instances, the lowest maximum use rate is represented, regardless of the land use type of application locations. While the herbicide Polaris was used to treat a small area of English Ivy in Junipero Serra Park in 2023, this chemical is not included in the chart as less than one acre was treated and an average per acre could not be calculated. For the Polaris treatment, 42 ounces of herbicide was used (the maximum allowable rate per acre is 96 ounces).

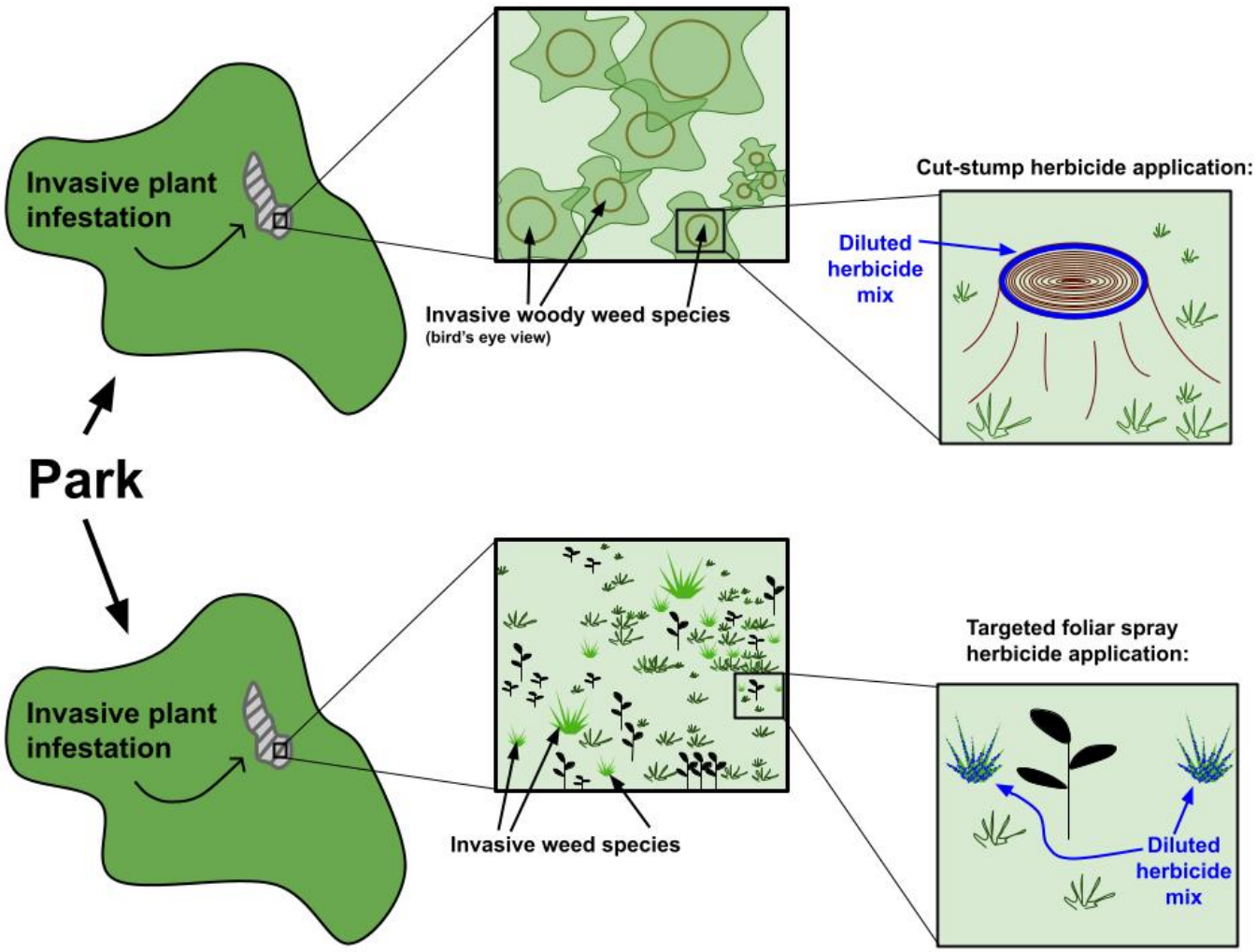

Figure 3. Visual examples of the two herbicide application techniques used by County Parks. The top example is a cut-stump technique in which an herbicide mix is applied directly to the cambium of the exposed stump after woody vegetation is removed. This technique prevents the stump from re-sprouting and is an important tool for managing woody species that are not killed by the initial cut such as Eucalyptus or Broom species. The bottom example is a targeted foliar application. In this technique, herbicide is only applied to the pest species and any natives or species desired for retention within the infested area are not treated. If a pest species and native species are overlapping, the applicator can use a shield to prevent any application to the native species. Or in some cases, the department may choose to skip treatment of these pest individuals. Another technique to prevent treatment of non-pest species in this instance is to apply herbicide only to the side of the plant which is away from the desired species at a higher (but still allowable) mix rate.

IPM Best Practices for Natural Resource Management

Using conservation and ecological principles and practices grounded in science, County Parks' Natural Resource Management (NRM) Division manages the land, water, soil, plant and animal resources within the County parks system to achieve healthy ecosystems. The primary objectives of NRM's IPM work are (i) to conserve and enhance habitat for rare plant and wildlife species and (ii) to maintain ecosystem function and resilience to stressors such as climate change, drought, disease, and wildfire. NRM accomplishes these objectives through early detection and rapid response to new weed infestations and careful identification, prioritization, and implementation of vegetation management projects to manage existing weed infestations and protect native species and high-value habitat.

Responsible for protecting the ecological health of County parks, NRM conducts regular field visits and assessments and coordinates closely with operations staff and Friends groups to identify, prioritize, and scope vegetation management projects. NRM uses three factors to evaluate whether and how to prioritize management of a plant pest:

1) Does the pest population pose a significant threat to ecosystem health, ecological function, or sensitive natural resources including native plants, wildlife, or cultural resources?

2) Does the pest population create or exacerbate wildfire hazard on the landscape?

3) Does the pest population impact visitor use of the parks?

NRM also utilizes a decision-making system that prioritizes habitat enhancement projects based on the weed species and location of the infestation. For example, if the pest is located within habitat for a federally or state-listed threatened or endangered species, a sensitive ecological community such as serpentine grassland or coastal prairie, a dispersal corridor with a high potential to spread seed, or an ongoing restoration area, NRM prioritizes control efforts above other projects in recognition of the heightened sensitivity of these areas. Additionally, wildlife fuel management projects are prioritized based on fuel density, topography, potential fire behavior characteristics, Wildland Urban Interface areas, fire hazard severity zones, access and evacuation routes, landscape connectivity to other beneficial projects, and ecosystem benefits.

Once projects have been prioritized, NRM evaluates which treatment method(s) is/are most appropriate based on the species and site conditions. County Parks only considers methods grounded in conservation science and approved for use by the appropriate regulatory bodies such as the U.S. Environmental Protection Agency (EPA), California Department of Pesticide Regulation (DPR), U.S. Department of Agriculture (USDA), Cal Fire, local fire protection districts, the San Mateo County's Agricultural Commissioner's office, U.S. Fish and Wildlife Service (USFWS), and California Department of Fish and Wildlife (CDFW).

When evaluating which treatment method/s is/are most appropriate, NRM takes into account characteristics and phenology of the weed species being managed, the size of the infestation, environmental context, and any treatment constraints such as site accessibility or restrictions on activities that can be carried out in endangered species habitat. All non-chemical treatment options are evaluated before herbicide is considered as a treatment option. This evaluation process utilizes knowledge from prior treatments in the County parks system, work performed by other agencies, and treatments trialed or compared in scientific literature. The department also consults with other practitioners, researchers, and experts to determine which treatment techniques should be ruled out. If a new weed species is discovered, the department works with our Pest Control Advisor to trial treatment methods based on literature or regional experience from the control of similar or genetically related species. If non-chemical treatment methods are available and equally or more effective at controlling the target pest species within an appropriate management timeframe, the Department will select a non-chemical treatment method.

In accordance with County Parks' IPM program and California law, the department's Natural Resource Management Division (NRM) works with a state-licensed Pest Control Advisor (PCA) with expertise in wildland IPM to receive written pest control recommendations (PCRs) before the application of any herbicides. Pest Control Advisors are licensed through the California Department of Pesticide Regulation (CDPR), which requires the PCA to meet minimum qualifications and pass qualifying examinations (Laws, Regulations, Basic Principles, and the appropriate pest control category). Prior to writing a recommendation, the PCA and NRM staff will discuss possible treatment options (including non-chemical treatment), the effectiveness of previous treatments, and any options for treatment modifications based on newly available research, the PCA's knowledge of past treatments within the County Park system, and/or strategies from other local agencies facing similar pest issues. The PCRs used in County Parks projects represent the most appropriate treatment method based on project specifications and include descriptions of the site(s) where treatment will occur, target pests, materials, and material mixing ratios. The PCRs also include precautions that must be observed to avoid negative impacts to people and non-target species through drift or runoff, the interval after which people and pets may be allowed to re-enter the treatment area, application method, and other information on how to

apply the pesticide in a way that minimizes negative environmental impacts. All PCRs must be renewed by the PCA on an annual basis.

The allowable rate use for all herbicides utilized by County Parks IPM projects in 2023 are shown in **Figure 2**. In all cases, County Parks ensures our projects stay below this rate limit.

Wildfire Fuel Management

In 2023, County Parks staff coordinated or implemented five large-scale wildfire fuel management projects throughout the San Mateo County parks system and managed several other smaller wildlife fuel threats. Physical and mechanical treatment methods used included mastication of small-diameter trees using heavy equipment, cutting of small-diameter trees and vegetation by hand, and felling of medium- and large-diameter trees deemed a hazard by qualified arborists. Resulting debris was either removed off site, chipped on site, lopped and scattered, or incinerated in air curtain burners. Through the department's wildfire fuel management work, County Parks is able to improve ingress and egress for first responders, create defensible space for fire fighters to stage equipment and conduct fire suppression activities, and disrupt the spread of fire by breaking the horizontal and vertical continuity of fire fuels.

Initial treatment of wildfire fuel management areas involved either physical and mechanical control methods (for woody species that do not re-grow after being cut), or the cut-stump application of herbicides to the cambium of Eucalyptus after hand work. Utilization of the cut-stump application method is necessary because this species aggressively re-sprouts at a rate of approximately six feet per year.

Maintenance efforts utilized a combination of mechanical and chemical techniques to treat re-sprouting woody vegetation along with the control of any invasive herbaceous species that spread into the understory of the forest. Treatment of herbaceous invasive species included a combination of brush cutting, hand pulling, targeted herbicide application, mastication, and mowing techniques depending on the location, topography, and biology of the target species.

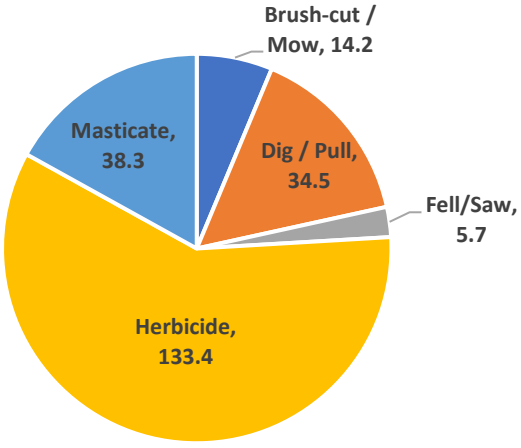

Figure 4. 2023. County Parks fuels reduction project acreage broken down by primary treatment type. Although cut-stump treatments use a combination of mechanical and herbicide techniques, they are included in the 'herbicide' category of this figure as the application of herbicide is what kills the tree. See **Figure 3** for a visual representation of targeted herbicide techniques.

In total, the department treated: 33 acres of understory fire fuels and hazard trees at Memorial County Park, 5.7 acres of understory fire fuels and hazard trees within the non-native Monterey pine stand at Pillar Point Bluff, 13.5 acres of Eucalyptus at Quarry Park, 9.5 acres of hazard Eucalyptus removals at Mirada Surf, 1.1 acres of Eucalyptus fuel break maintenance at San Bruno Mountain, and an additional 163 acres of follow-up fuels management work across the County Park system including the treatment of French broom, gorse, Jubata grass, poison hemlock, cotoneaster, and Eucalyptus saplings and re-sprouts (**Figures 4,5**).

Fuels projects are recorded in gross acres as the treatment plan (i.e. prescription) includes the removal of all species meeting certain size or hazard-level criteria within the project footprint. Therefore, the entire acreage is considered managed even if the initial species cover is a smaller portion of the overall footprint. For example, if an acre had ten (10) Eucalyptus trees that were treated using the cut-stump application method, that will be represented as 1.0 gross acre in the charts despite the fact that only ten trees within the acre were treated. The gross acreage in **Figure 5** represents the entire area scoped and treated for the species represented. The Memorial County Park shaded fuel break project focused on the removal of all woody species under 8-inch diameter at breast height, so this project is shown as “various” species in the pie chart.

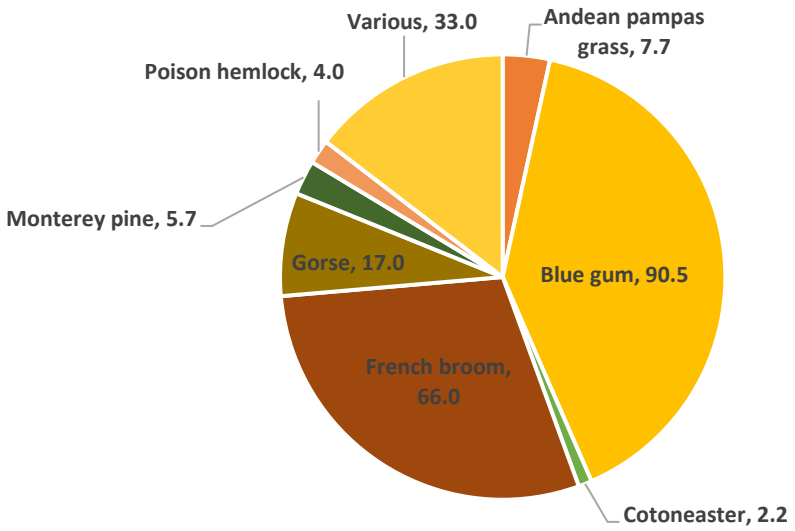

Figure 5. 2023. County Parks' fuels reduction project acreage categorized by target species. Values are in gross acres.

Two large-scale wildfire fuel management projects completed in 2023 in which physical, mechanical, and chemical methods were required to achieve project objectives include the creation and maintenance of shaded fuel breaks along strategic fire roads within Quarry Park and a project to manage large woody debris and hazard trees in Mirada East that were windthrown during the winters of 2022-23 and 2023-24. Both projects were managed by the San Mateo Resource Conservation District (RCD) and took place within stands of invasive Eucalyptus (*Eucalyptus globulus*), which vigorously re-sprouts from stumps when the cuts are left untreated. If proper efforts are not made to control the re-sprouting of felled trees, the trees will re-grow, compromising the efficacy of the fuel break and fire road, and returning a significant fire threat. *Weed Control in Natural Areas in the Western United States*, a widely used resource authored by experts from the western U.S., states that following initial cutting of a blue gum eucalyptus tree, it can take four or more years of cutting back shoots, which can grow at a rate of approximately six feet a year, before the tree is killed (**DiTomaso et al., 2013**). Given slopes, access constraints, environmental impacts, and other factors, this is infeasible for many locations and projects within the County parks system.

For the Quarry Park and Mirada Surf East treatments, it was determined that the most effective and scalable treatment method was the cut-stump application of herbicide due to the large scale of the projects and the steep terrain in Quarry Park that is inaccessible to equipment. Cut-stump treatment is a combination of mechanical and chemical controls in which trees or brush are first cut and then herbicide is applied directly to the cambium of the stump to prevent re-growth (**Figure 3**). The Quarry Park shaded fuel break project is a multi-phase effort with project footprint expansion each year of implementation. Without proper maintenance, vegetation will regrow compromising the efficacy of the fuel break and fire road, and returning a significant fire threat.

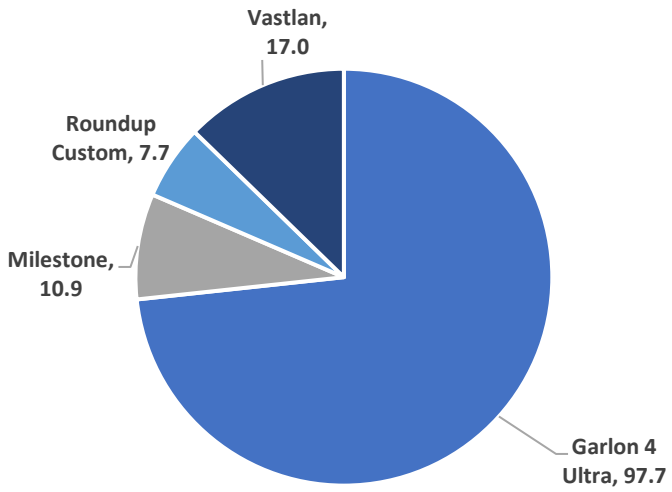

Figure 6. 2023. County Parks wildfire fuel reduction project acreage broken down by product name for all projects involving the use of herbicides, including both initial and follow-up treatments. Values are in gross acres. See **Figure 3** for a visual representation of targeted herbicide techniques. See **Appendix B** for the locations of all herbicide treatments.

Habitat Enhancement

In 2023, County Parks implemented and managed IPM habitat enhancement projects that targeted at least 25 species across more than 458 gross acres (more than 23 infested acres), which accounted for 6,161 —staff-hours of labor including those performed by staff, contractors, and volunteers (**Figure 7**). Gross treatment acres refer to the total number of acres that were traversed in search of the main target species, whereas infested treatment acres refer to the area covered only by the target species. The species most targeted for control by gross acreage were Andean pampas grass (*Cortaderia jubata*) and Bermuda buttercup (*Oxalis pes-caprae*), both of which commonly invade coastal scrub and coastal prairie communities that serve as habitat for wildlife. If not controlled, these species will outcompete native species for resources and degrade habitat quality for wildlife. The species represented by the highest infested acres treated was coyote brush (**Figure 7**). Although coyote brush is a native species, it is rapidly expanding into highly sensitive habitats such as coastal prairie and other grassland habitat throughout California due to the exclusion of periodic ecological disturbances such as low intensity fires. This scrub encroachment, especially on San Bruno Mountain, is an imminent threat to sensitive butterfly species and native wildflower communities, among other species which rely on grassland habitat. Without active control, this sensitive habitat will degrade.

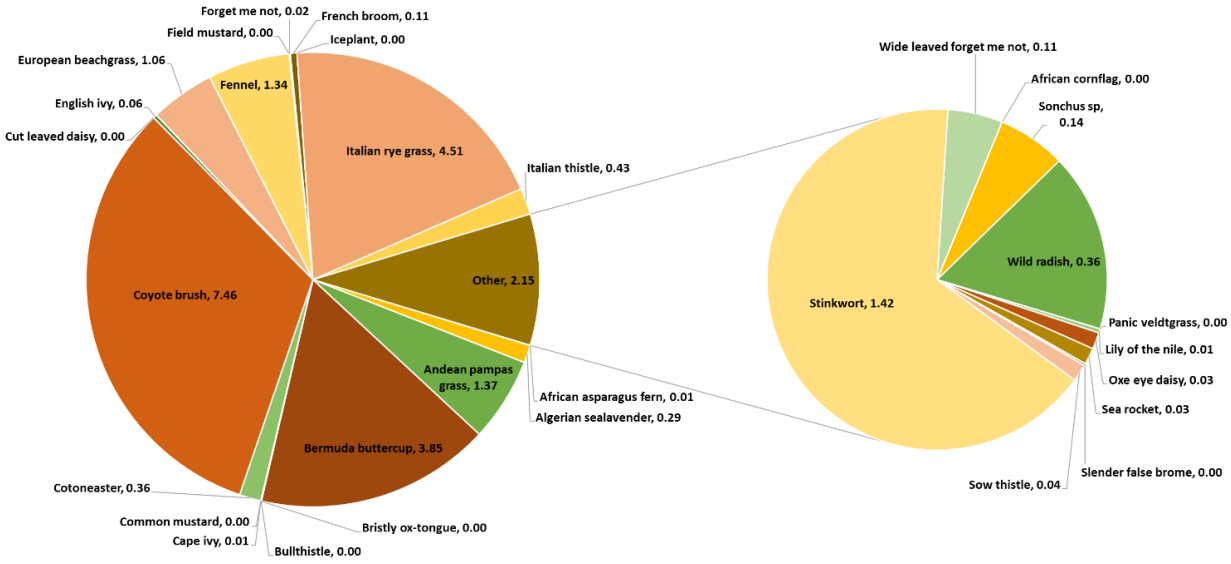

Figure 7. Infested acres managed during our 2023 habitat enhancement IPM projects, broken down by target species. Infested acres are calculated by multiplying the gross treatment acres by the percent cover of the target species to reflect the actual area treated. If a species is followed by “0.00”, this means the area of the population managed was very small and mapped as a point rather than a polygon. For these species, acreage could not be calculated but was minimal.

For the majority of habitat enhancement IPM projects conducted by County Parks in 2023—approximately 13 infested acres—targeted herbicide application was the most appropriate method of treatment. Additional methods used include mechanical treatment methods such as brush-cutting, mowing, and the removal of the target species via hand techniques such as digging or pulling (**Figure 8**).

Given County Parks' focus on highly invasive weed species in sensitive habitats, non-chemical treatment methods are not always feasible either because they are ineffective at controlling these highly aggressive species (Bermuda buttercup, mature Broom, etc.), or due to restrictions on ground disturbance in butterfly habitat, steep slopes, or near streams and waterways. For example, the species with the most gross acres treated, Jubata grass, often grows on very steep embankments, where it is unsafe for workers to dig out the roots to fully kill the plants and where ground disturbance may cause significant erosion and even slope failure. The species with the second-most gross (and infested) acres treated, Bermuda buttercup, has bulbs that grow deep below the soil surface. Removing only the aboveground biomass of the plant does not provide effective long-term management for this species. In addition, the largest Bermuda buttercup infestations are located in San Bruno Mountain State and County Park, where the species forms dense monocultures that rapidly out-compete the host and nectar plants of the federally threatened and endangered butterfly species that make their home there. These butterfly species are host specific and if their host plants are lost due to pressure from competition, the butterflies will also be extirpated from the site. Because these species' larvae go into diapause (a period of suspended development) in the leaf litter of their host plants or underground, ground disturbance when Bermuda buttercup is visible (winter and spring) is inappropriate due to the potential for take of listed species. Hand pulling Bermuda buttercup is also only effective in extremely small patches where each bulb and root can be carefully and delicately removed. Even with careful hand removal, the thin roots will often break and leave small bulbs in the soil, which will develop the following winter.

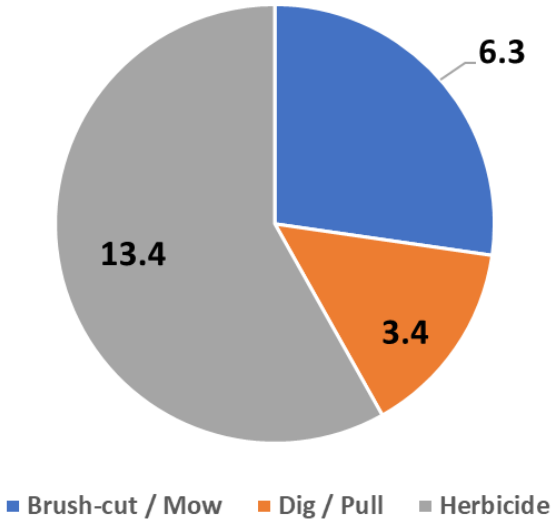

Figure 8. The total infested acres managed during County Parks' 2023 habitat enhancement IPM projects, broken down by treatment method. “Dig/pull” includes any hand removal technique, including the use of various hand tools. “Herbicide” includes targeted foliar applications and cut-stump applications. See **Figure 3** for a visual representation of targeted herbicide techniques.

For chemical treatments conducted during the 2023 habitat enhancement work, the most used product in terms of infested acres managed (**Figure 9**) was Competitor (California registration number 2935-50173), which is a modified vegetable oil that assists with absorption of the active ingredient in herbicide mixes. The second-most used product was Garlon 4 Ultra, which is an herbicide with the active ingredient triclopyr (EPA registration number 62719-527, signal word of Caution). This product is used to treat broad-leaved pest species (including blue gum eucalyptus, fennel, and coyote brush, among others) and was applied as either a targeted foliar or cut-stump treatment. The third most-used product was Clearcast, which is an herbicide with the active ingredient ammonium salt of imazamox (EPA registration number 241-437-67690, signal word of Caution). In 2023, this herbicide was only used to treat Bermuda buttercup.

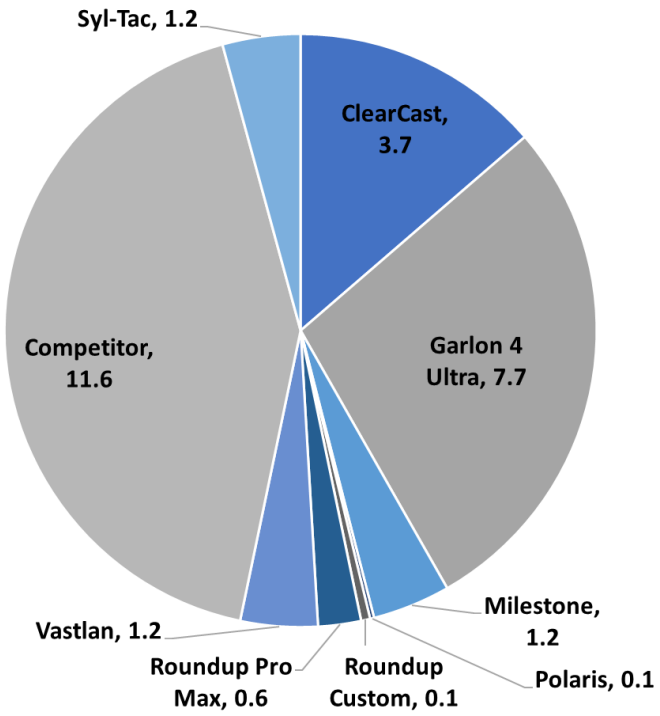

Figure 9. 2023. County Parks' habitat enhancement project acreage (infested) broken down by product name for all projects involving the use of herbicides. Some products such as Competitor and Syl-Tac are additives used in herbicide mixtures to assist with application or absorption by the target species. Because these products were used in conjunction with herbicides, some acreage is double or triple counted in this figure. In a few instances, two herbicides were used in the same mix to increase efficacy, so these treatment acreages are also double counted. See **Appendix B** for information about all herbicide treatments. See **Figure 3** for a visual representation of targeted herbicide techniques.

Appendix B includes more information regarding all herbicide applications carried out by County Parks in 2023, including patch identity number, target species, gross area treated, chemical treatment method used, the name and amount of each product used, start and end dates for the treatments, and latitude and longitude for the treatment location.

Park Operations

County Parks Operations, which includes park rangers and maintenance staff, conducts IPM activities on an annual basis to maintain safe and accessible parks for visitors and the surrounding communities. The objectives of these projects include reducing the public's risk of making contact with poison oak, ticks, or snakes, maintaining park facilities, and enhancing public safety by reducing wildfire fuel load and hazards from unmanaged landscapes (**Figure 10**). When selecting the most appropriate treatment technique for a given project, efficiency, effectiveness, safety, and the environmental context are all considered and evaluated.

In total, Operations managed non-native, invasive, or otherwise weedy species across 471 gross acres and 129 miles of trail, accounting for 10,772 staff-hours of effort. Most of the off-trail work (projects conducted on the interior of parks) was conducted with mowing and brush-cutting equipment (**Figure 11**) both of which are effective ways of (i) preventing invasive seed spread, (ii) allowing short-statured native plants to compete with surrounding non-native species, and (iii) reducing fire fuel load from invasive annual grass thatch buildup. The trailside IPM work included brush cutters and string trimmers used to reduce non-native vegetation growing along trails and fire roads and to prevent the spread of those seeds, while also allowing for safe access to the parks for hikers by pruning back safety hazards such as poison oak and brushing back vegetation to reduce the likelihood of encountering ticks or snakes.

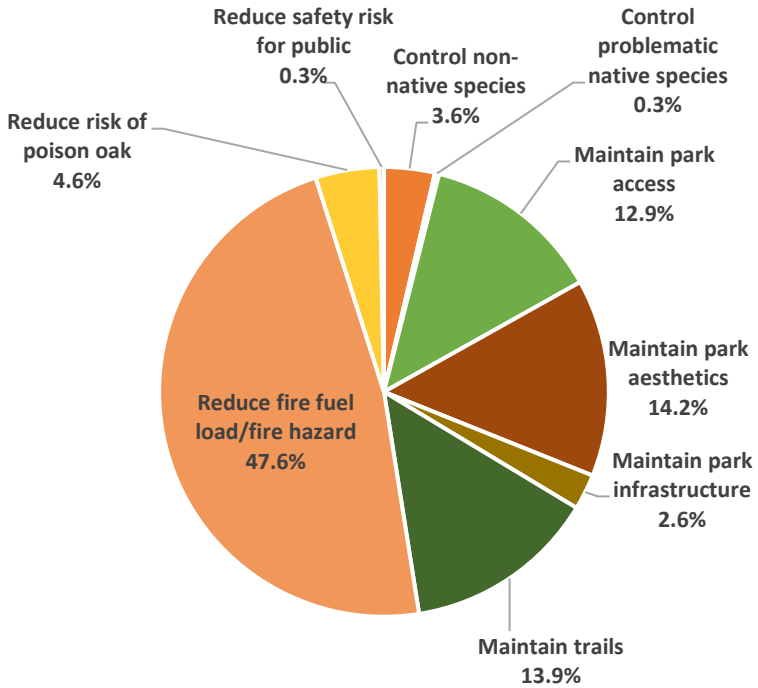

Figure 10. 2023. The percentage of gross acres treated by the County Parks Operations IPM program, aggregated by project objectives. Many of the IPM projects have multiple objectives. In this figure, the data represents primary, secondary, and tertiary objectives of the projects, therefore some projects are represented multiple times if they have two or more goals for treatment. A total of 471 gross acres, including 129 trail miles were managed by our Operations program in 2023.

In 2023, County Parks Operations' IPM projects included the management of vegetation at 25 parks, trails, and facilities, including the Alpine Trail, the Cowell-Purissima Trail, Coyote Point Recreation Area and Marina, the Crystal Springs Regional Trail, the Devil's Slide Trail, Edgewood Park and Natural Preserve, Fitzgerald Marine Reserve, Flood Park, Huddart Park, Junipero Serra Park, Memorial Park, the Midcoast Multimodal Trail, Mirada Surf Park, Moss Beach Park, Pescadero Creek Park, Pigeon Point Overlook, Pillar Point Bluff Park, Quarry Park, Sam McDonald Park, San Bruno Mountain State and County Park, San Pedro Valley Park, the Sanchez Adobe, the Sheep Camp Trail, and Wunderlich Park.

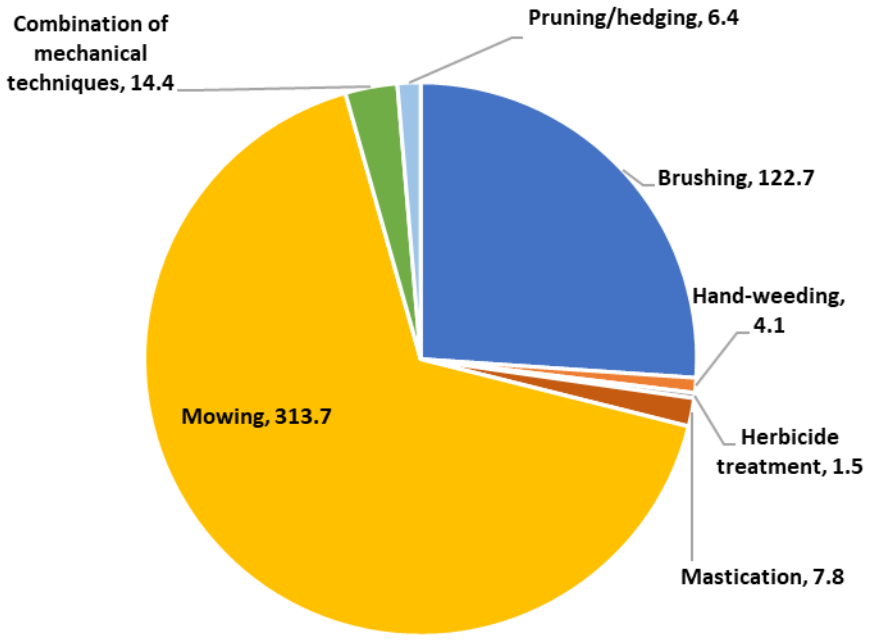

Figure 11. 2023. Gross acreage of County Parks operations IPM projects, represented by treatment type. A total of 10,772 staff-hours were logged to manage 471 acres. See **Appendix B** for the locations of herbicide treatments.

Park Operation's IPM management techniques included mowing, brushing, hand-weeding, mastication, pruning, hedging, and chemical treatments. The "combination of mechanical techniques" category represented in **Figure 11** represents projects in which various hand-held equipment was used for the same project, such as brush cutters and hedge trimmers or chain saws and loppers. In 2023, ranger staff carried out one limited and targeted foliar application of the herbicide RoundUp ProMax (EPA reg #524-579) at Coyote Point Recreation Area, with the goal of reducing a variety of invasive species and their seed spread along dispersal corridors. A total of 0.07 gallons of herbicide was used across 1.45 acres, averaging 0.048 gallons per acre which is less than 2% of the allowable rate per year (**Appendix B, Figure 2**).

Volunteer Stewardship

The County Parks Volunteer Stewardship Program is another important component of County Parks' habitat enhancement work and accounts for the majority of hand-weeding hours each year. Goals of the program include habitat restoration, early detection and rapid response of small weed infestations (EDRR), and prevention of seed dispersal to adjacent lands. In 2023, volunteers carried out 2,082 hours of weeding in nine County parks (Coyote Point Recreation Area and Marina, Edgewood Park and Natural Preserve, Fitzgerald Marine Reserve, Huddart Park, Junipero Serra Park, Memorial Park, Quarry Park, San Pedro Valley Park, and Wunderlich Park) (**Figure 12**).

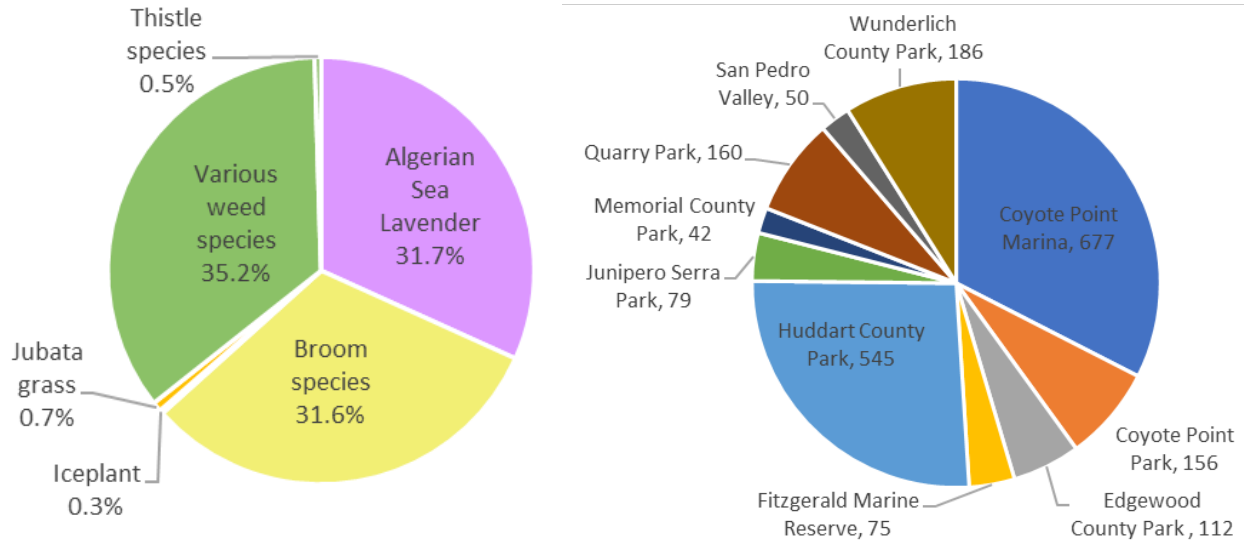

Figure 12. 2023. The number of County Parks volunteer weeding hours broken down by i) target species and ii) park. A total of 2,082 volunteer-hours were logged during 36 weeding events, accounting for hand weeding activities during every month, except August of 2023. 'Various weed' species refers to volunteer programs in which volunteers scoped and removed several weed species from a site.

The primary target species for these projects included Algerian sea lavender (31.7% of volunteer hours) and broom species (31.6% of volunteer hours) (**Figure 12**). Both species are appropriate for hand-pulling during their early growth stages as the entire plant can be easily removed with the root system, preventing their re-growth if seed has not yet developed. However, some broom species (such as French, Scotch, and Portuguese broom) become difficult to remove once the plants have matured past their seedling stage as these perennial woody species develop a deep tap root within a couple years. Other species managed in part by volunteers in 2023 include thistles, ice plant, and jubata grass seedlings. Similarly to broom, once jubata grass has matured past its seedling stage, the plants become extremely difficult to remove with hand tools, though volunteers can help delay the spread of seed by removing the tall seed heads if the plants are in accessible locations.

Without effectively controlling the spread of species like Jubata grass and broom, native plants and habitat are at risk of being outcompeted for resources because of the species' aggressive growth which can lead to natural vegetation communities being entirely replaced. Invasive species are also sometimes avoided by wildlife which can cause an increase in pressure on native plants.

In addition to volunteer programs managed by County Parks staff, the department works with many partner organizations who host volunteer weeding activities on park lands. Partner organizations include the California Native Plant Society (CNPS), Friends groups, and San Bruno Mountain Watch. While we value the commitment and dedication of our Friends organizations, their hours and activities are not included in this report.

References

1. California Department of Food and Agriculture. (2021, June 22). *CDFA Weed Pest Ratings and CCR 4500 Noxious Weeds*.
2. California Invasive Plant Council. (2024). *The Cal-IPC Inventory*. https://www.cal-ipc.org/plants/inventory/
3. DiTomaso, J. M., & Healy, E. A. (2007). Weeds of California and other western states (Vol. 3488). UCANR Publications.
4. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. (2023, September 4). *Media Release: IPBES Invasive Alien Species Assessment*. Media Release: IPBES Invasive Alien Species Assessment | IPBES secretariat
5. University of California Agriculture and Natural Resources. (2024). *What Is Integrated Pest Management (IPM)?* Statewide Integrated Pest Management Program. https://ipm.ucanr.edu/what-is-ipm/#gsc.tab=0
6. U.S. Department of Agriculture. (n.d.). *Integrated Pest Management.* https://www.usda.gov/oce/pest/integrated-pest-management#ipm.
7. U.S. Department of Agriculture Animal and Plant Health Inspection Services. (2024, March 25). *Biological Control Program*. https://www.aphis.usda.gov/plant-pests-diseases/biocontrol#:~:text=Biological%20control%20(biocontrol)%20involves%20the,easy%20and%20safe%20to%20use https://www.cdfa.ca.gov/plant/ipc/encycloweedia/pdf/CaliforniaNoxiousWeeds.pdf

Appendix A – 2023 County Parks volunteer weeding hours

Month	Park	1st Target Species	2nd Target Species	Volunteers	Person-hours
January	Coyote Point Marina	Algerian Sea Lavendar		12	36
January	Junipero Serra Park	Various weed species		15	45
February	Coyote Point Park	Various weed species		9	18
February	Wunderlich County Park	Broom species		24	120
February	Quarry Park	Broom species		90	160
February	Junipero Serra Park	Various weed species		16	24
March	Coyote Point Park	Various weed species		25	50
March	Coyote Point Marina	Algerian Sea Lavendar		17	51
March	Wunderlich County Park	Broom species		22	66
April	Junipero Serra Park	Various weed species		4	10
April	San Pedro Valley	Various weed species		12	35
April	Coyote Point Marina	Algerian Sea Lavendar		22	66
April	Coyote Point Marina	Algerian Sea Lavendar		9	36
May	Coyote Point Marina	Algerian Sea Lavendar		27	81
May	Coyote Point Marina	Algerian Sea Lavendar		10	30
May	Huddart County Park	Broom species		11	33
May	Fitzgerald Marine Reserve	Various weed species		25	75
June	Coyote Point Marina	Algerian Sea Lavendar		39	156
June	Coyote Point Marina	Algerian Sea Lavendar		40	120
July	Huddart County Park	Various weed species		18	90
July	Huddart County Park	Various weed species		15	75
July	Huddart County Park	Various weed species		22	110
September	Edgewood County Park	Various weed species		17	58
September	Huddart County Park	Broom species		45	90
September	San Pedro Valley	Jubata grass		5	15
September	Edgewood County Park	Various weed species		17	54
October	Coyote Point Marina	Algerian Sea Lavendar	Thistle species	10	20
October	Coyote Point Park	Various weed species		24	48
October	Coyote Point Marina	Algerian Sea Lavendar		5	15
October	Coyote Point Park	Various weed species		5	10
October	Coyote Point Park	Various weed species		15	30
November	Coyote Point Marina	Iceplant		2	6
November	Huddart County Park	Broom species		25	75
November	Huddart County Park	Broom species		24	72
December	Coyote Point Marina	Algerian Sea Lavendar		24	60
December	Memorial County Park	Broom species		14	42

Appendix B – 2023 County Parks herbicide treatments

Patch ID	Park	Project Type	Target Species	Percent Cover	Gross Area	Chemical Method	Product 1	Ounces	Product 2	Ounces	Product 3	Ounces	Start Date	End Date	Latitude	Longitude
io81760	San Pedro Valley	Habitat enhancement	Cotoneaster	6 - 10 %	19164.4 Square Meters	Cut-stump	Garlon 4 Ultra	5.51	Competitor	16.53			2023-01-17	2023-01-27	37.58010	-122.46993
io81757	San Pedro Valley	Habitat enhancement	French broom	<1 %	11172.9 Square Meters	Spot Spray	Garlon 4 Ultra	15	Competitor	6			2023-01-26	2023-01-26	37.58039	-122.46968
io83007	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	1 - 5 %	376.8 Square Meters	Spot Spray	ClearCast	3.75	Competitor	3			2023-02-06	2023-02-06	37.68559	-122.41499
io83003	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	<1 %	2498.1 Square Meters	Spot Spray	ClearCast	7	Competitor	5			2023-02-07	2023-02-07	37.68987	-122.43933
io83004	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	1 - 5 %	751.5 Square Meters	Spot Spray	ClearCast	4	Competitor	3			2023-02-07	2023-02-07	37.68858	-122.43679
io83005	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	6 - 10 %	1952.1 Square Meters	Spot Spray	ClearCast	19.2	Competitor	15			2023-02-07	2023-02-07	37.68515	-122.43490
io83006	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	1 - 5 %	51186.1 Square Meters	Spot Spray	ClearCast	129	Competitor	104			2023-02-07	2023-02-08	37.68240	-122.40811
io83002	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	1 - 5 %	111794.8 Square Meters	Spot Spray	ClearCast	116.50	Competitor	91			2023-02-07	2023-02-10	37.68111	-122.42794
io85876	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	51 - 60 %	> ~50 Square Meters (mapped as point)	Spot Spray	ClearCast	3	Competitor	3			2023-02-08	2023-02-08	37.67051	-122.42934
io85877	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	51 - 60 %	> ~50 Square Meters (mapped as point)	Spot Spray	ClearCast	2	Competitor	3			2023-02-08	2023-02-08	37.67064	-122.42938
io85875	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	1 - 5 %	195053.1 Square Meters	Spot Spray	ClearCast	684	Competitor	547			2023-02-08	2023-03-31	37.67290	-122.42826
io85879	San Bruno Mountain	Habitat enhancement	Bermuda buttercup	1 - 5 %	16241.5 Square Meters	Spot Spray	Garlon 4 Ultra	40	Competitor	32			2023-02-21	2023-02-21	37.67294	-122.42416
io84934	Pillar Point Bluff	Habitat enhancement	Bermuda buttercup	1 - 5 %	181369.7 Square Meters	Spot Spray	ClearCast	596	Competitor	466			2023-03-01	2023-03-03	37.51198	-122.50418
io84935	Fitzgerald Marine Reserve	Habitat enhancement	Bermuda buttercup	1 - 5 %	5462.9 Square Meters	Spot Spray	ClearCast	161	Competitor	126			2023-03-16	2023-03-16	37.53012	-122.51713
io85881	Quarry County Park	Fuel management	French broom	11 - 20 %	44179.9 Square Meters	Spot Spray	Milestone	120	Competitor	480			2023-03-22	2023-04-12	37.50213	-122.46067
mg240580	Edgewood Park	Habitat enhancement	Bermuda buttercup	11 - 20 %	0.6 Acres	Spot Spray	ClearCast	18	Competitor	11.7			2023-04-04	2023-04-05	37.46310	-122.27565
mg240582	Edgewood Park	Habitat enhancement	Bermuda buttercup	1 - 5 %	3837.8 Square Meters	Spot Spray	ClearCast	4	Competitor	2.6			2023-04-05	2023-04-10	37.46817	-122.27532
mg240581	Edgewood Park	Habitat enhancement	Bermuda buttercup	1 - 5 %	15105.9 Square Meters	Spot Spray	ClearCast	48	Competitor	31.2			2023-04-10	2023-04-11	37.47081	-122.27726
mg240583	Edgewood Park	Habitat enhancement	Bermuda buttercup	31 - 40 %	125.7 Square Meters	Spot Spray	Garlon 4 Ultra	2	Competitor	1.3			2023-04-17	2023-04-17	37.47209	-122.27879
mg240585	Edgewood Park	Habitat enhancement	Bermuda buttercup	41 - 50 %	102.5 Square Meters	Spot Spray	Garlon 4 Ultra	2	Competitor	1.3			2023-04-17	2023-04-17	37.47224	-122.27883
mg240586	Edgewood Park	Habitat enhancement	Lily of the nile	11 - 20 %	230.5 Square Meters	Spot Spray	Garlon 4 Ultra	4	Competitor	2.6			2023-04-17	2023-04-17	37.47243	-122.27905
mg240584	Edgewood Park	Habitat enhancement	Bermuda buttercup	41 - 50 %	1044.4 Square Meters	Spot Spray	ClearCast	24	Competitor	15.6			2023-04-17	2023-04-18	37.47248	-122.27872
io86486	San Bruno Mountain	Habitat enhancement	Fennel	1 - 5 %	49131.2 Square Meters	Spot Spray	Garlon 4 Ultra	530	Competitor	172			2023-04-17	2023-04-19	37.67245	-122.41257
io92339	San Bruno Mountain	Habitat enhancement	Fennel	1 - 5 %	114336.8 Square Meters	Spot Spray	Garlon 4 Ultra	1444	Competitor	578			2023-04-20	2023-05-11	37.67307	-122.39919
N/A	Coyote Point Park	Park operations	Italian thistle	varies	1.5 Acres	Spot Spray	Roundup Pro Max	9					2023-05-11	2023-05-11	37.58848	-122.32237
io92341	San Bruno Mountain	Habitat enhancement	Fennel	1 - 5 %	12208.8 Square Meters	Spot Spray	Garlon 4 Ultra	99.8	Competitor	40			2023-05-11	2023-05-12	37.69485	-122.42318
io92340	San Bruno Mountain	Habitat enhancement	Fennel	1 - 5 %	2044 Square Meters	Spot Spray	Garlon 4 Ultra	28.8	Competitor	11.5			2023-05-12	2023-05-12	37.69573	-122.42674
io92342	San Bruno Mountain	Habitat enhancement	Fennel	1 - 5 %	33104.2 Square Meters	Spot Spray	Garlon 4 Ultra	140	Competitor	56			2023-05-12	2023-05-12	37.67092	-122.42593
mg229285	Quarry County Park	Fuel management	Gorse	41 - 50 %	6.4 Acres	Spot Spray	Vastlan	748	Competitor	507			2023-05-16	2023-06-08	37.70316	-122.43463
io94326	Quarry County Park	Fuel management	French broom	6 - 10 %	4888.7 Square Meters	Spot Spray	Garlon 4 Ultra	97.3	Competitor	38			2023-06-05	2023-06-05	37.50345	-122.45689
io94267	Quarry County Park	Fuel management	Andean pampas grass	6 - 10 %	22131.3 Square Meters	Spot Spray	Roundup Custom	474	Competitor	120			2023-06-05	2023-06-07	37.50224	-122.46061
io94268	Quarry County Park	Fuel management	Blue gum	<1 %	142378.1 Square Meters	Cut-stump	Garlon 4 Ultra	122	Competitor	365			2023-06-05	2023-06-08	37.50323	-122.45812
io94327	Quarry County Park	Fuel management	French broom	6 - 10 %	24297.4 Square Meters	Spot Spray	Garlon 4 Ultra	317	Competitor	124			2023-06-07	2023-06-08	37.50558	-122.45372
mg229286	Quarry County Park	Fuel management	Gorse	61 - 70 %	10.5 Acres	Spot Spray	Vastlan	862	Competitor	585			2023-06-13	2023-08-17	37.70255	-122.43181
N/A	Quarry County Park	Fuel management	Blue gum	varies	13.5 Acres	Cut-stump	Garlon 4 Ultra	1,568	Competitor	1,568			2023-08-01	2023-09-01	37.50796	-122.45858
mg240706	Huddart County Park	Habitat enhancement	Stinkwort	11 - 20 %	23673.2 Square Meters	Spot Spray	Milestone	11.6	Vastlan	80	Syl-Tac	30	2023-08-07	2023-08-08	37.43916	-122.28928
mg240708	Huddart County Park	Habitat enhancement	Stinkwort	1 - 5 %	2.4 Acres	Spot Spray	Milestone	1.86	Vastlan	12.8	Syl-Tac	4.8	2023-08-15	2023-08-15	37.42890	-122.30428
mg240856	Wunderlich County Park	Habitat enhancement	Stinkwort	21 - 30 %	0.9 Acres	Spot Spray	Milestone	5.6	Vastlan	38.4	Syl-Tac	14.4	2023-08-23	2023-08-15	37.40937	-122.25928
io110339	Quarry County Park	Fuel management	Blue gum	1 - 5 %	55537 Square Meters	Cut-stump	Garlon 4 Ultra	21	Competitor	84			2023-08-29	2023-08-29	37.50242	-122.45354
io110340	Quarry County Park	Fuel management	Andean pampas grass	1 - 5 %	3297.7 Square Meters	Spot Spray	Roundup Custom	18	Competitor	7			2023-08-30	2023-08-30	37.51447	-122.46069
io110342	Quarry County Park	Fuel management	Blue gum	1 - 5 %	70839.3 Square Meters	Cut-stump	Garlon 4 Ultra	179	Competitor	716			2023-08-30	2023-09-01	37.51482	-122.46018
io110341	Quarry County Park	Fuel management	Andean pampas grass	6 - 10 %	3194.6 Square Meters	Spot Spray	Roundup Custom	25	Competitor	10			2023-08-31	2023-08-31	37.50709	-122.46104
io110338	Quarry County Park	Fuel management	Andean pampas grass	1 - 5 %	2666.7 Square Meters	Spot Spray	Roundup Custom	10	Competitor	4			2023-09-01	2023-09-01	37.51158	-122.45638
N/A	Mirada Surf	Fuel management	Blue gum	varies	9.5 Acres	Cut-stump	Garlon 4 Ultra	1,184	Competitor	1,184			2023-09-01	2023-11-01	37.49999	-122.45888
io113747	San Bruno Mountain	Habitat enhancement	Coyote brush	31 - 40 %	3588.6 Square Meters	Cut-stump	Garlon 4 Ultra	75.3	Competitor	226			2023-09-05	2023-09-06	37.69254	-122.44127
io113751	San Bruno Mountain	Habitat enhancement	Coyote brush	41 - 50 %	2097.3 Square Meters	Cut-stump	Garlon 4 Ultra	40.2	Competitor	160.7			2023-09-05	2023-09-06	37.69295	-122.44141
io113745	San Bruno Mountain	Habitat enhancement	Coyote brush	41 - 50 %	340.5 Square Meters	Spot Spray	Garlon 4 Ultra	10.8	Competitor	4.3			2023-09-06	2023-09-06	37.69274	-122.44257
io113748	San Bruno Mountain	Habitat enhancement	Coyote brush	41 - 50 %	2232.1 Square Meters	Spot Spray	Garlon 4 Ultra	75.6	Competitor	15.1			2023-09-06	2023-09-06	37.69297	-122.44139
io113749	San Bruno Mountain	Habitat enhancement	Coyote brush	41 - 50 %	278.8 Square Meters	Cut-stump	Garlon 4 Ultra	16.4	Competitor	49			2023-09-06	2023-09-06	37.69274	-122.44254
io113752	San Bruno Mountain	Habitat enhancement	Coyote brush	51 - 60 %	3175.3 Square Meters	Spot Spray	Garlon 4 Ultra	113.4	Competitor	22.7			2023-09-06	2023-09-06	37.69258	-122.44131
io113744	San Bruno Mountain	Habitat enhancement	Coyote brush	21 - 30 %	5063.8 Square Meters	Cut-stump	Garlon 4 Ultra	179.2	Competitor	537.6			2023-09-07	2023-09-08	37.69936	-122.42306
io113743	San Bruno Mountain	Habitat enhancement	Coyote brush	31 - 40 %	4516.8 Square Meters	Spot Spray	Garlon 4 Ultra	0.06	Competitor	0.012			2023-09-08	2023-09-08	37.69925	-122.42317
io113750	San Bruno Mountain	Habitat enhancement	Coyote brush	61 - 70 %	19294.4 Square Meters	Cut-stump	Garlon 4 Ultra	299.5	Competitor	898.6			2023-09-11	2023-09-13	37.67301	-122.40091
io113754	San Bruno Mountain	Habitat enhancement	Coyote brush	41 - 50 %	5014.2 Square Meters	Cut-stump	Garlon 4 Ultra	108.8	Competitor	326.4			2023-09-14	2023-09-14	37.67679	-122.41369
io113746	San Bruno Mountain	Habitat enhancement	Coyote brush	31 - 40 %	2397.6 Square Meters	Cut-stump	Garlon 4 Ultra	89.6	Competitor	268.8			2023-09-15	2023-09-15	37.69923	-122.42579
io113870	Pillar Point Bluff	Habitat enhancement	Andean pampas grass	<1 %	109371.8 Square Meters	Spot Spray	Roundup Custom	107.5	Competitor	43			2023-09-22	2023-09-22	37.51409	-122.50470
mg229647	Junipero Serra Park	Habitat enhancement	English ivy	51 - 60	44.6 Square Meters	Spot Spray	Polaris	14	Competitor	2.6			2023-09-22	2023-09-22	37.61077	-122.42498
mg229646	Junipero Serra Park	Habitat enhancement	English ivy	71 - 80 %	284.5 Square Meters	Spot Spray	Polaris	28	Competitor	5.2			2023-09-26	2023-09-26	37.61197	-122.42492
io113853	Pillar Point Bluff	Habitat enhancement	Andean pampas grass	1 - 5 %	5253.8 Square Meters	Spot Spray	Roundup Pro Max	35.8					2023-10-06	2023-10-06	37.50423	-122.49803
io114460	San Pedro Valley	Habitat enhancement	Andean pampas grass	<1 %	190249.5 Square Meters	Spot Spray	Roundup Pro Max	174					2023-10-12	2023-10-12	37.57877	-122.46822
mg232618	San Bruno Mountain	Habitat enhancement	Andean pampas grass	6 - 10 %	6803.9 Square Meters	Spot Spray	Roundup Pro Max	6					2023-11-08	2023-11-08	37.69232	-122.44795
mg232619	San Bruno Mountain	Habitat enhancement	Andean pampas grass	1 - 5 %	20219.8 Square Meters	Spot Spray	Roundup Pro Max	4					2023-11-08	2023-11-08	37.69017	-122.44402
mg232621	San Bruno Mountain	Habitat enhancement	Andean pampas grass	6 - 10 %	3911.5 Square Meters	Spot Spray	Roundup Pro Max	12					2023-11-08	2023-11-08	37.68488	-122.43477
mg232622	San Bruno Mountain	Habitat enhancement	Andean pampas grass	6 - 10 %	2555.5 Square Meters	Spot Spray	Roundup Pro Max	9					2023-11-08	2023-11-08	37.68873	-122.43834
N/A	San Bruno Mountain	Fuel management	Blue gum	varies	1.1 Acres	Cut-stump	Garlon 4 Ultra	12.2	Competitor	12.2			2023-12-01	2024-02-01	37.69832, 37.70214	-122.457242, -122.44589
mg240981	Junipero Serra Park	Habitat enhancement	Cape ivy	11 - 20 %	0.06 Acres	Spot Spray	Milestone	0.23	Syl-Tac	0.6			2023-12-04	2023-12-04	37.61025	-122.42535