MARIN COUNTY PARKS
OPEN SPACE DISTRICT

VEGETATION & BIODIVERSITY MANAGEMENT

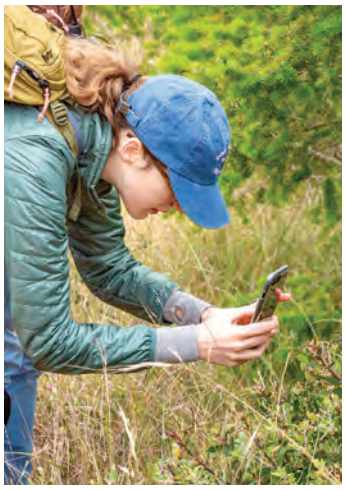
ANNUAL REPORT AND PROJECT LIST

2018 - 2019

Mission

Marin County Parks is dedicated to educating, inspiring, and engaging the people of Marin in the shared commitment of preserving, protecting, and enriching the natural beauty of Marin's parks and open spaces, and providing recreational opportunities for the enjoyment of all generations.

Overview



Roy's Redwoods bioblitz

Marin County Parks manages 16,000 open space acres. Our management practices are based on science, field work, and continuous innovation.

Marin County is a regional and national leader in ecologically sound open space vegetation management. We have an organic first philosophy. Our goal regarding herbicide use is "getting to zero." That means taking steps to bring invasive infestations in our preserves to a stage where there is a feasible, long term organic maintenance alternative. More than 90% of the staff time spent controlling invasive plants focuses on non-chemical solutions. We apply limited and targeted herbicide only in carefully considered critical use situations, as a means for bringing infestations under control so we can effectively manage the site organically over the long term

Adaptive stewardship adjusts to changing natural conditions, while working toward multiple goals. We work to control invasive species, reduce fire risk, and restore native habitat, adjusting tactics and plans based on science, research, and observations from the field. We aim to encourage the positive natural processes that will support diversity throughout open space ecosystems, from healthy soil to thriving plant and wildlife communities.

Nature doesn't draw lines at property boundaries. Marin County Parks works closely with other regional land managers, County and regional fire agencies, community leaders, local organizations, and residents. In collaboration with One Tam we are part of the inter-agency effort to map vegetation county-wide, assessing fire risk, the impacts of climate change, and the spread of diseases like Sudden Oak Death. Ongoing consultation with fire agencies helps us develop strategies and tactics to reduce wildfire risk across thousands of acres, Our organic first approach requires many hours of hands on field work, provided in part by Conservation Corps North Bay and many teams of local volunteers.

As we face new challenges, we embrace new technologies to optimize the effectiveness of our efforts. Participants at bioblitz events use the iNaturalist phone app, created by the California Academy of Sciences, to document field observations, adding to a crowd-sourced database of location-based species identification. Calflora's online database offers a comprehensive compendium of California plants, both native and invasive, to aid research and education. The One Tam County-wide vegetation mapping project utilizes digitized aerial photography and high-resolution LIDAR data, along with field surveys, to create the most accurate and detailed view of regional vegetation. These tools are helping us work smarter and more efficiently, even as we face new and uncertain challenges in managing Marin's wildlands.

Open Space Preserve Governance

A seven-member Parks and Open Space Commission advises the MCOSD Board.

Two governing bodies provide guidance and oversight for the Marin County Open Space District vegetation management program. A seven-member Parks and Open Space Commission advises the Marin County Open Space District Board of Directors on policy regarding the 34 County preserves, totaling over 16,000 acres throughout Marin. These preserves border residential areas, providing Marin County residents with access to some of the most treasured landscapes in northern California.

In November 2016, the MCOSD Board of Directors voted to continue current practice, using the proposed Vegetation and Biodiversity Management Plan as an information resource when making decisions about controlling invasive plants, protecting sensitive habitats, managing fire fuel hazards, and safeguarding public health. The open space preserves are managed for habitat preservation and safety, as well as recreation.

Note: Marin County IPM (Integrated Pest Management) is not covered in this report. The County IPM program covers county parks, structures, ornamental landscapes, and traffic medians. Marin County IPM is governed by the nine-member Integrated Pest Management Commission. For more information about the IPM program visit marincountyparks.org.

Parks and Open Space Commission

Open Space Preserve Governance

The Measure A Community Oversight Committee monitors Measure A expenditures in open space.

A new bridge and habitat restoration in Loma Alta Preserve created a sustainable, multiuse trail.

The Community Wildfire Protection Plan (CWPP) reduces wildfire threat in Marin.

Wildfire poses a great risk to human life and property in Marin County's densely populated wildland urban interface (WUI). To address the risk of fire, Marin County fire agencies, county officials, county, state, and federal land management agencies, and local community members created the Community Wildfire Protection Plan.

Under the guidance of the Community Wildfire Protection Plan, the Marin County Open Space District vegetation management work plan aims to reduce fire risk in Marin.

Marin County Open Space District (MCOSD) partners with county and local fire service agencies to accomplish the key goals of the CWPP. Recent work includes:

- collaborating with fire service agencies on fuel reduction planning and project implementation through FIRESafe MARIN
- collecting and storing natural resource data with help from One Tam
- increasing awareness through annual fire preparedness letters sent to adjacent open space neighbors, conducting site visits, and participating in community wildfire prevention events

To download the CWPP plan visit: http://www.readysetgomarin.org/cwpp.

69,000 living units border open spaces in Marin, making wildfire a serious threat.

The Vegetation & Biodiversity Management Plan (VBMP) guides decision-making.

The Vegetation and Biodiversity Management Plan for Marin County preserves provides comprehensive, long-term guidance for a science-based approach to vegetation management that will maintain the natural biodiversity of the vegetation within the preserves, maintain patrol, emergency and public access, and manage fuel loads to reduce the threat of natural and human-caused fires.

The VBMP identifies the characteristics of each open space preserve. It also documents best practices for maintaining ecosystem health, controlling invasive plants, and reducing the risk of fire fuel. It details a comprehensive approach to vegetation management, in order to reach these goals:

- Establish, prioritize, and standardize vegetation management actions to increase public safety.
- Manage vegetation for the preservation and protection of native habitats and native species, to ensure that preserves can withstand environmental change over time.
- Coordinate vegetation and fire management actions to reduce fire risk, eliminate priority invasive plant infestations, increase public safety, and protect native habitats and native species.
- Provide the public with opportunities to engage in stewardship of the MCOSD lands through participation in volunteer vegetation management activities.
- Ensure the funding, support, and capacity necessary for the achievement of the other goals.

To download the VBMP visit: http://www.marincountyparks.org.

Goals

Our goal is to maintain biodiversity and reduce fire risk across 34 preserves spanning 16,000 acres.









Protecting biodiversity is our responsibility; there are over 100 rare species in Marin County Open Space District preserves, including 22 endangered and/or threatened, and at least 7 species found only in Marin.

Adaptive stewardship equals multiple benefits, encourages biodiversity, and reduces wildfire risk. We work to enrich the open space lands that support the plants, wildlife, and people.

Goats graze 100 acres behind homes and in fuelbreaks at Terra Linda / Sleepy Hollow Preserve.

Goats graze the defensible space zone behind homes to improve wildfire preparedness in Terra Linda.

Regional partnership between fire agencies, public and private landowners, brings 800 goats and sheep to the region.

Grazing areas included defensible space zones near homes and strategic fuel reduction areas along fire roads and ridgelines. The goats also helped prevent the spread of one of our worst weeds, barbed goatgrass, by eating the grass before seeds could form.

Partnership is key. Sleepy Hollow Fire Protection District and FIRESafe Marin coordinated with Marin County Parks and adjacent private property owners to share herds and move them across boundaries. By working together, the partners were able to maximize benefits for the region and provide cost-sharing opportunities. One cost-share was between Marin County Parks and White Hill School to graze 10-acres around the school buildings, including some Open Space lands. Now the area is safer if students need to shelter in place during a wildfire event.

Goats helped maintain a fuelbreak and create art. The herd went on clear brush in a fuelbreak on Terra Linda Ridge. Grazing is part of our Integrated Pest Management (IPM) plan for ongoing management in the area. Following the goats, hand crews thinned larger fuels from the eucalyptus grove. Woody stems were recycled to create the “Spirit Nest” sculpture, an intersection of environmental art, invasive species, and fuel reduction that was used to engage the community in discussion about wildfire safety

Goats paved the way for crews to reduce fuel and build art that would engage the community about wildfire preparedness.

The Tamalpais fire crew conducts fuels management on invasive Acacia that threatens homes and habitat.

A partnership with Marin County Fire created defensible space to protect homes while reducing the threat of invasive species to endangered Tiburon Jewelflower habitat at Old St. Hilary's Preserve.

Crew removes invasive broom, then chips dead trees and branches to reduce fire hazard in Cascade Canyon.

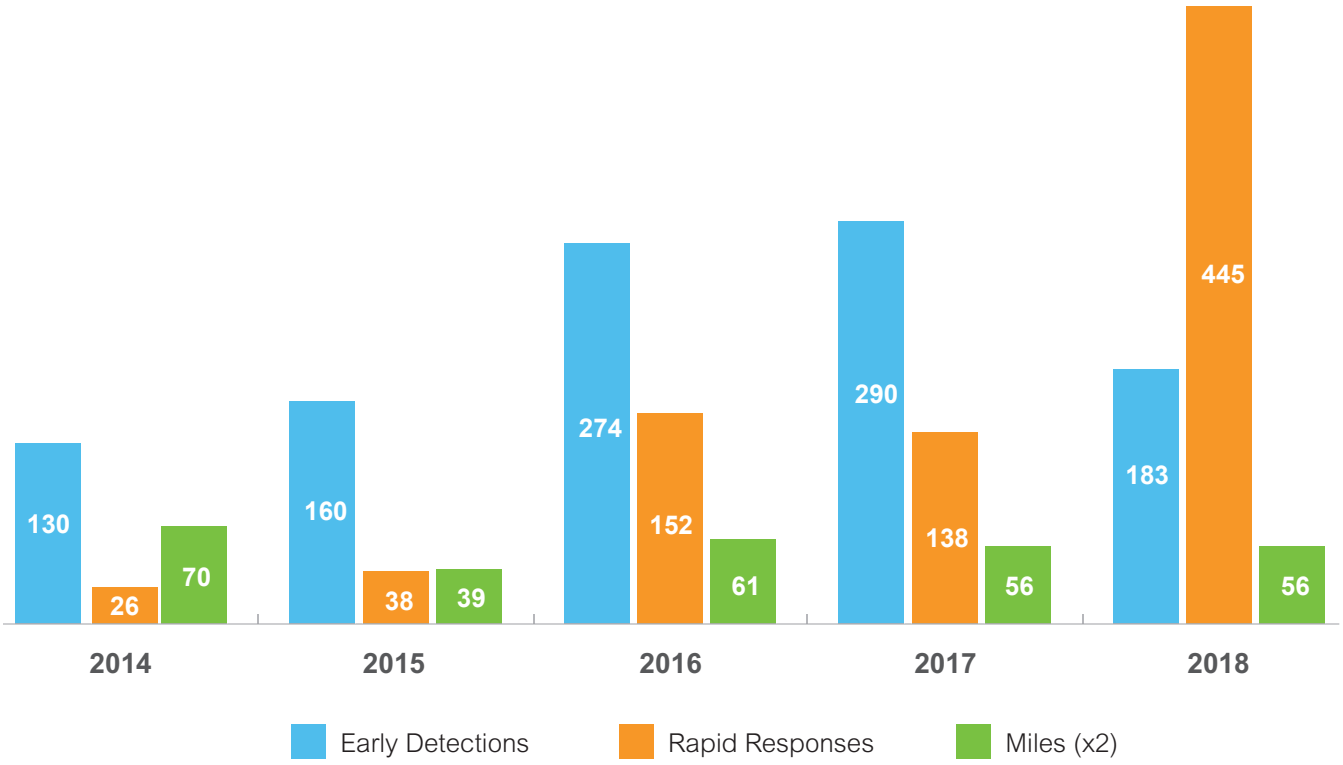
A chipper is used to dispose of dead wood along Toyon Fire Road; additional dead material was chipped at the main preserve entrance.

Invasive Plant Inventory: Early Detection & Rapid Response (EDRR)

"Early detection and rapid response (EDRR) is a management approach that capitalizes on our ability to most effectively eradicate invasive plant populations when they are small. By detecting a new invasive plant before it has a chance to spread or build a large seed bank, managers can respond early enough in the invasion process to fully eradicate the species from a given area. Through EDRR, well-informed surveillance can avoid costly long-term control efforts. - California Invasive Plant Council

The Marin County Parks EDRR Program began in 2014 with the support of Measure A funds. Surveys for invasive plants are conducted on a **3 year cycle** so that a third of our preserves are surveyed each year while implementing follow-up treatments for all previously-treated sites. **The same areas are surveyed twice each year** in order to detect both early- and late-developing plants.

During surveys, we determine if a potentially invasive plant is not well-established in an area. Survey crews will treat high-priority, small populations when manageable by one person with hand tools; otherwise, the location and data are recorded so that future treatments can be planned.



"Plants Out of Place": Setting Early Detection Priorities

Group 1 plants below are primary targets during early detection and rapid response survey work. These species are known threats to Marin habitats, but are not yet well-established.

Andean tussockgrass (*Stipa manicata*)

Buffalo berry (*Solanum rostratum*)

Butterfly bush* (*Buddleja davidii*)

Cape ivy (*Delairea odorata*)

Cape weed* (*Arctotheca calendula*)

Goatgrass (*Aegilops triuncialis/A. cylindrica*)

Gorse* (*Ulex europaeus*)

Invasive sea lavenders (*Limonium ramosissimum/duriusculum*)

Japanese knotweed* (*Fallopia japonica*)

Leafy spurge* (*Euphorbia virgata*)

Mayten (*Maytenus boaria*)

Myrtle leaf milkwort (*Polygala myrtifolia*)

Old man's beard* (*Clematis vitalba*)

Purple star thistle (*Centaurea calcitrapa*)

Rattlebox (*Sesbania punicea*)

Rosemary grevillea (*Grevillea rosmarinifolia*)

Russian knapweed (*Acroptilon repens*)

Salt water cord grass (*Spartina alterniflora x foliosa*)

Smilo grass *(Stipa miliacea)*

Stinkwort (*Dittrichia graveolens*)

Thoroughwort (*Ageratina adenophora*)

Tree of heaven (*Ailanthus altissima*)

Woolly distaff thistle (*Carthamus lanatus*)

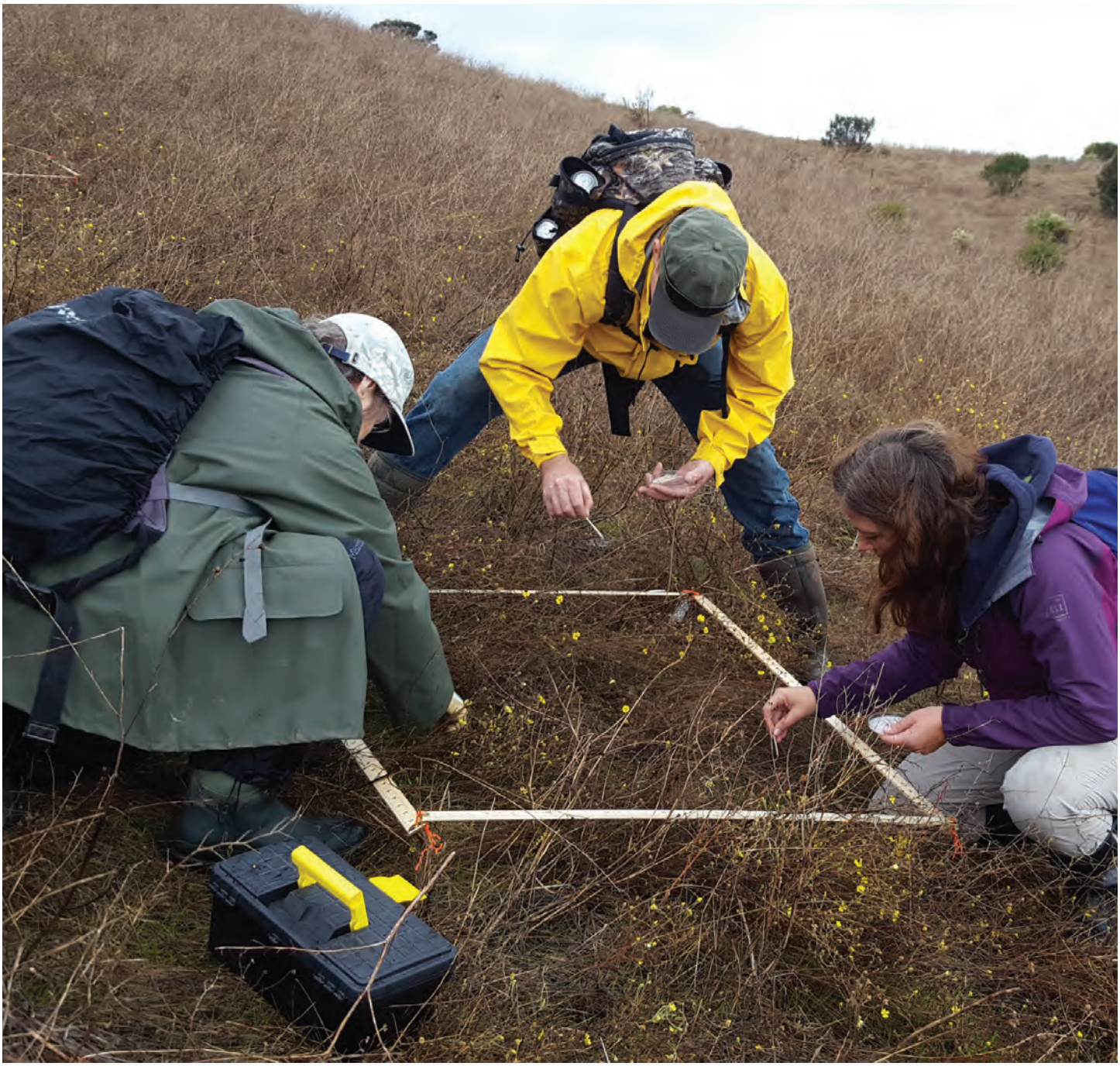
**Not yet detected on Marin County Parks land.*

For more information visit California Invasive Plant Council: cal-ipc.org.

Group 2 plants out of place are not known to be a problem. These include plants that escape from nearby residential or commercial landscaping. Group 2 plants are mapped so that we can monitor their spread.

Group 3 plants already have had negative impacts on local biodiversity and resources. New outlier populations of these species are mapped to be included in future prioritization analysis for control work. Sometimes these species are prioritized at the local or project level but are not managed regionally.

Research increases our understanding of rare species so we can take action to help them survive.



Partnerships with researchers at Ring Mountain seek to establish new populations of rare plants and increase our understanding of what threatens the survival of these species.

Getting to zero means managing invasive weed infestations in our preserves to the stage where there is a feasible, long-term organic maintenance solution.

Removing pennyroyal each year by hand allows rare flowers to thrive in this vernal pool.

Over many years, staff efforts have reduced the invasive pennyroyal problem in Mt. Burdell's Hidden Lake; vernal pool habitat is very rare in Marin, and so are the plants that rely on these seasonally wet areas.

Marin County Parks is a leader in ecologically sound Integrated Pest Management.

Manual and Organic Methods

Hand pull. This method is the most widely used because it is the simplest and, in many cases, most effective. It is commonly used alone or in conjunction with other methods as a follow-up or initial treatment. Even when mature plants are difficult or impossible to pull by hand (as with invasive trees), hand pulling can be used on new seedlings. Weed wrenches help by preventing strain when removing difficult, woody plants.

Mow. Strategically timed mowing can reduce the seeds of many weeds, such as invasive annual grasses. The window for effective seed control is very short. However, mowing can also be used to temporarily reduce fuels and reduce the chance that weed seeds spread along roads and pathways.

Mulch or Tarp. Covering an area with tarps, straw, chips, and/or cardboard to prevent plant growth or seedling establishment is a good tool in some locations. However, it does not allow for preserving desirable plants in the area. Tarps are often difficult to install and maintain, and they must be removed so they don't become trash on the landscape.

Animal grazing. Cattle, sheep, goats, and horses, can help reduce fuels and weeds. They are able to cover large areas that are difficult for people to maneuver. Like all methods, they may have negative impacts that should be weighed against the positive ones so that a net benefit is obtained.

Flaming and prescribed burns. Environmental conditions must be perfect, and this tool is best combined with active follow-up. Safety of staff, visitors, and nearby residential areas must be the top priority. Often fire is used to burn small piles for fuel reduction projects.

Insect predators and pathogens. New helpful organisms are being developed and released by qualified scientists. While they usually target agricultural weeds, some support our fight against wildland weeds.

Organic herbicides. Organic chemicals typically cause the top of a plant to wither. Existing products don't impact large rooted plants, so they aren't effective at managing priority wildland species, although they might provide assistance in special cases. These products should be considered over conventional herbicides when tackling annual weeds within smaller areas in residential landscaping or urban areas.

Conventional products are used in limited, targeted applications for critical use only.

Conventional Products

Tryclopyr (Garlon) is used as a systemic, foliar herbicide or stem treatment for woody plants and brush. It is selective and does not harm grasses growing in the area of application.

Glyphosate (Aquamaster) is a non-selective, broad-spectrum, systemic herbicide. We only use this in a few specific locations where an effective alternative is not yet available.

Imazapyr (Habitat) is a non-selective, broad-spectrum, systemic herbicide that is effective on species with complex root structures like mayten and cordgrass.

Fluazifop (Fusilade) is used for control of annual and perennial grass weeds. Because it is selective to grasses, native broadleaf plants are not harmed.

Critical Use

Critical use is limited to the following three situations:

- mitigating a significant risk to public safety such as wildfire
- protecting critical habitats
- fighting invasive or exotic species that pose a threat to local agriculture

After careful herbicide use, a Ring Mountain broom site has been restored and is maintained by hand.

Rare Oakland star tulips flourish in areas that were threatened by the expansion of dense French broom prior to restoration.

High Priority Invasive Plant Species Summary

Acacia (*Acacia spp.*) is a tree that was introduced as a landscape ornamental and has escaped cultivation in some areas. Acacia trees develop root suckers that grow to become large clonal populations.

Goatgrass (*Aegilops triuncialis*) is an annual invasive grass that threatens California's ranching pastures and native grasslands.

Thoroughwort (*Ageritina adenophora*) is an invasive weed that is not well established in Marin. It is toxic to horses and other grazers.

Beachgrass (*Ammophila arenaria*) forms a dense cover that changes beach topography and excludes native plants.

Iceplant (*Carpobrotus edulis*) is a ground-hugging succulent with a creeping habit. It often forms deep mats covering large areas that degrade soil health.

Distaff thistle (*Carthamus lanatus*) forms dense stands that crowd out other vegetation and is difficult to eliminate because of a persistent seed bank.

Star thistle (*Centaurea spp.*) grows as a deep-taprooted winter annual that produces one to many solitary, spiny, yellow flower-heads during late spring, summer, and fall.

Pampas/Jubata grass (*Cortaderia spp.*) is an ornamental escape plant that grows rapidly, and produces numerous seeds that can travel long distances (up to 20 miles).

Broom (*Cytisus and Genista spp.*) is a woody shrub that forms dense stands, blocks firefighter access along fire roads and increases fire intensity by acting as a ladder fuel.

Left to right: Broom, goatgrass, and yellow star thistle.

High Priority Invasive Plant Species Summary

Blue gum (*Eucalyptus globulus*) Blue gum aggressively invades native plant communities, is extremely flammable, and under severe weather conditions could produce drifting ignition material.

Tall fescue (*Festuca arundinacea*) invades open habitats such as native grasslands. It forms extensive colonies that displace native vegetation.

Fennel (*Foeniculum vulgare*) is an erect perennial herb that can drastically alter the composition and structure of grasslands, coastal scrub, riparian, and wetland communities.

Pepperweed (*Lepidium latifolium*) is a long-lived perennial weed that thrives in wet areas.

Invasive sea lavender (*invasive Limonium spp.*) is an ornamental escape plant native to the Mediterranean. It grows in coastal areas and sand dunes.

Mayten (*Maytenus boaria*) is a tree that is a fast emerging threat in California. Introduced as a landscape ornamental, this tree has recently made the list of Exotic Pest Plants of Greatest Ecological Concern in California.

Harding grass (*Phalaris aquatica*) is a fast-growing, rapidly spreading weed that quickly creates a monoculture, killing other plants, and damaging coastal valley and foothill grasslands.

Himalayan blackberry (*Rubus armeniacus*) is a strong competitor. It easily resprouts from roots and rapidly displaces native plants.

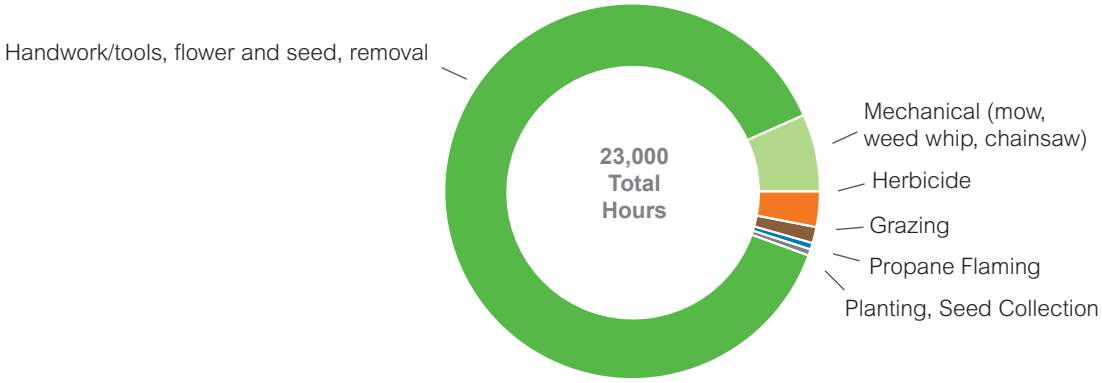
Invasive cordgrass (*Spartina alterniflora X Spartina foliosa*) spreads clonally to become a dense circular patch of up to 20 meters in diameter. Invasive cordgrass does not provide suitable habitat for native salt marsh shorebirds.

Left to right: Fennel, pepperweed, and invasive cordgrass.

2018 Getting to Zero

Work crews spent over 23,000 hours managing vegetation in open space preserves.

We continue to use Integrated Pest Management (IPM) practices to reduce the use of herbicide.



PROJECT	TARGET	PRODUCT	OUNCES
Terra Linda Ridgewood Fire Protection	Blue gum (Eucalyptus globulus)	Garlon 4 Ultra	2
Camino Alto Fire Protection	French broom (Genista monspessulana)	Garlon 4 Ultra	0
Alto Bowl Fire Protection	French broom (Genista monspessulana)	Garlon 4 Ultra	0
Blithedale Summit Hillside Fire Protection	French broom (Genista monspessulana)	Garlon 4 Ultra	0
Pacheco Valle Broom Control	French broom (Genista monspessulana)	Garlon 4 Ultra	0
Ring Mountain Taylor Road Fire Protection	French broom (Genista monspessulana)	Garlon 4 Ultra	0
Terra Linda Goatgrass Control	Goatgrass (Aegilops triuncialis)	Suppress (OMRI organic)	0
Terra Linda Goatgrass Control	Goatgrass (Aegilops triuncialis)	Fusilade II	93
Terra Linda Goatgrass Control	Goatgrass (Aegilops triuncialis)	Aquamaster	110
Bolinas Lagoon Invasive Cordgrass Control	Invasive cordgrass (Spartina foliosa)	Habitat	0
Ring Mountain Mayten Control	Mayten (Maytenus boaria)	Habitat	54
Deer Island Perennial Pepperweed Control	Perennial pepperweed (Lepidium latifolium)	Habitat	15
Terra Linda Purple False Brome Test	Purple false brome (Brachypodium distachy-on)	Avenger citrus oil (OMRI organic)	0
Santa Venetia Perennial Pepperweed Con-trol	Perennial pepperweed (Lepidium latifolium)	Habitat	1
King Mountain Fire Protection	Acacia (Acacia dealbata)	Habitat	256
Old St. Hilary's Acacia Control	Acacia (Acacia longifolia)	Habitat	**34**

Only a small fraction of our work requires herbicide; when we use herbicide, our process is transparent.

We post notices on site and online in advance, in addition to making our annual plans publicly available. We also post monthly treatment reports on our website.

The majority of herbicide is applied under the critical use of maintaining fuelbreaks for safer communities. In other project areas a very small amount of herbicide is used to fight the most tenacious weeds. Our goal is to tackle these problem species before they get big and require greater amounts of treatment. With consistent follow-up, we can ultimately **reduce herbicide use to zero** at each project. In fact, careful herbicide use in past years brought three large fuelbreak projects to the point where herbicide was not needed in 2018.

PRODUCT USED

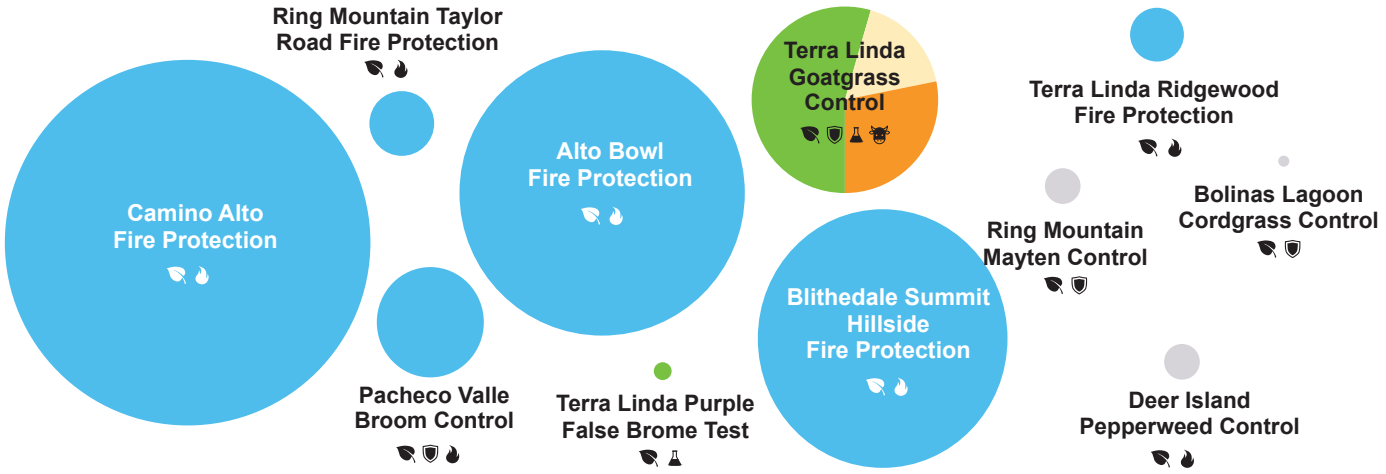
- Garlon 4 Ultra
- OMRI Organic Product
- Fusilade II
- Aquamaster
- Habitat

OBJECTIVES

- Promote Biodiversity
- Prevent Spread & Need for Additional Herbicide
- Reduce Fire Fuel
- Test Alternative Methods
- Agriculture

2018 565 total ounces

2017 5139 total ounces



The size of each circle is proportional to the amount of herbicide used for eacb project.

A variety of methods are used to manage the diverse vegetation that grows across County preserves.









Tools for vegetation management range from education, prevention, and monitoring to propane flaming, weed whipping, and grazing.; the work is accomplished by permanent and seasonal staff, contractors, and volunteers.

Marin County Parks cultivates collaborative working partnerships with government and community organizations. We work together to protect Marin's open space lands.

Partnership between Novato Fire Department, Marin County Parks, and local Firewise groups.

Sarah Minnick, Marin County Parks Vegetation & Fire Ecologist with Kay White, Pacheco Valle Firewise and Lynn Osgood, Novato Fire Protection

2018 Collaborative Partnerships

In partnership with fire service agencies, 1,671 acres are managed to reduce wildfire risk.

53 acres

mowed each year to maintain defensible space. The area adjacent to homes is critical when defending structures during a wildfire. Marin County Parks supports the efforts of our neighbors to clear fuels from the defensible space zone.

249 acres

mowed and pruned to keep fire roads open and safe. In addition to maintaining road surfaces for safe driving conditions, we carefully prune branches so that fire trucks can pass, and we mow grass so that maintenance and fire vehicles can safely use the roads during fire season.

1,362 acres

grazed annually for fuel reduction. Cows, goats, horses, and sheep help keep grass and brush from becoming too thick at Mount Burdell, Terra Linda/Sleepy Hollow Divide, King Mountain, and Horse Hill.

167 acres

fuelbreaks maintained and areas thinned for fuel reduction. Shaded fuelbreaks extend the defensible space of preserve neighbors. By removing dense invasive broom, fire is less likely to spread into the oak canopy above. Some wildfires will slow down or even stop where the density of vegetation is low. Fuelbreaks can provide wildfire responders with a better opportunity for control and a safer space for fighting the fire.

Conservation Corps North Bay is a critical partner on fuel reduction and invasive species management.

Eucalyptus thinning in Terra Linda

Regional partnership tackles new high-risk weed in Marin.

Japanese knotweed (Fallopia japonica) is a native perennial in Japan, China, and Korea. It primarily propagates or reproduces vegetative, meaning new plants spread and grow from small pieces of existing plants. Knotweed sprouts from underground rhizomes (stems) in the spring, grows to over six feet tall during the summer, and loses its leaves and canes in the fall. Recognized as an "ecosystem engineer," it pioneers volcanic geology and soil dominated landscapes. It is considered one of the top 10 most aggressive, destructive and invasive plants in the world. Because of these traits and capabilities, it poses many risks.

The Marin Knotweed Action Team (MKAT) is a coalition of various land managers (comprised of local, state and federal agencies and non-profit organizations) who are dedicated to the control and long-term eradication of Japanese knotweed (Fallopia japonica) from the Lagunitas Creek watershed. Successful eradication requires a coordinated effort among the watershed's public and private landowners and resource managers. MKAT partners are working together to encourage and support the necessary public participation to eradicate Japanese knotweed. As a coalition, MKAT leverages resources to improve ecoiogical integrity.

While Japanese knotweed has not been found on Marin County Parks land, we contributed to education and outreach materials as well as surveying Larsen Creek, which flows into the San Geronimo valley. The survey was negative; however, future surveys will continue to ensure that new knotweed plants are identified and removed.

MKAT
Marin Knotweed Action Team

Community partnerships and volunteers are key to our success.

Volunteers of all ages and abilities contribute through community volunteer events, special events and programs. These efforts are critical in helping us restore natural habitats and educating and engaging the community in a shared commitment to protecting Open Space lands.

In 2018, 2,227 volunteers contributed 8,585 hours towards invasive weed control. 90% of volunteer events focused on invasive weed removal, with over half of those targeting invasive broom species.

We collaborated on weed management projects with government, corporate, and non-profit organizations including but not limited to:

Access4Bikes
Audubon Canyon Ranch
Bay Area Climbers Coalition
Bold Earth
Clif Bar
Girl & Boy Scouts of America
Golden Gate National Parks Conservancy
Greater Farallones NMS
GreenPlay
Marin County Bicycle Coalition
Marin Horse Council
Marin Master Gardeners
One Tam Partners
REI
Richardson Bay Audubon
Rotary clubs in Marin
University of San Francisco
VoCal
Wells Fargo
Whole Foods
Public and private schools throughout Marin County

Volunteers and community partnerships are an essential component of the Marin County Open Space District vegetation management program.

We share knowledge and best practices with land management agencies region-wide, and collaborate on employing technology that can offer unprecedented perspectives and insights.

Using new technologies to gain greater regional perspectives.

Cal Flora is a cloud based platform for collecting observations about plants, including weeds and rare species. It helps us track weed management activities and success through time. Data collection is streamlined by cutting-edge mobile apps and online interfaces that enhance sharing and collaboration.

iNaturalist helps us to collect species observations during bioblitz events. Observation can contribute to biodiversity science, from the rarest butterfly to the most common backyard weed. Findings are shared with scientific data repositories like the Global Biodiversity Information Facility to help scientists find and use data collected by the community.

The Marin Wildlife Picture Index Project has answered important questions about 17 species of mammals, ranging from the common squirrel to the more mysterious spotted skunk. With over 100 cameras, a dedicated crew of volunteers, we have cataloged over 4 million images to date. This project helps us understand habitat use and needs for wildlife across Marin.

One Tam leads inter-agency effort to map Marin County's vegetation using new technologies.

In 2018, One Tam began mapping vegetation across the county. Having one consistent map across all lands allows for better inter-agency coordination during an emergency response situation, such as a wildfire. The vegetation map will provide the data needed to:

- Conduct county-wide flood and wildfire risk assessments
- Plan for climate change, including sea level rise planning and project development
- See landscape-level plant community changes over time, including the impacts of Sudden Oak Death and other plant diseases
- Plan and monitor wildlife corridors and special-status species habitats

New technology will create a fine-scale map with the help of experts collecting data on the ground. The project will create digital aerial photos and three-dimensional landscape imagery through LiDAR surveys. (LiDAR stands for Light Detection and Ranging.) Images will be combined with field surveys to create detailed vegetation maps for the entire county.

A broad coalition of Marin County land management agencies and other partners have joined forces to meet their common need for a fine-scale vegetation map and landscape database. The regional mapping effort is coordinated by the One Tam collaborative:

- California State Parks
- Marin County Parks
- Marin Municipal Water District
- National Park Service
- Golden Gate National Parks Conservancy

Additional support is provided by:

- Marin County Department of Public Works
- United States Geologic Survey
- MarinMap
- Marin Community Foundation
- a philanthropic gift from a Marin resident and other private donors

Vegetation Management Trends

The environment continues to change, so we observe, learn and adapt. We are committed to exploring new materials, concepts, and techniques that will help reduce the need for herbicides. We work together with other public land management agencies, scientists, researchers, and the local community to stay informed about trends and discoveries, increase our awareness of ongoing research about invasive plants, and to adapt to the changing landscape.

Climate change. Drought, temperature shifts, extreme weather, and rising sea levels are bringing new challenges, as some ecosystems struggle to adapt and become more susceptible to pests and disease.

Multi-faceted solutions. Treatment sites often require multiple methods used in conjunction or conducted in phases over time. Treatment plans should provide long term solutions using the safest and most effective methods. Conventional product applications are reserved for critical use in limited situations, and always with the goal of transitioning away from chemical use.

An ounce of prevention is worth a pound of cure. Early Detection and Rapid Response (EDRR) identifies potential threats in time to allow efficient and environmentally sound decisions to be made. EDRR can stop the spread of new and emerging invasive species before they become established. It is one of the most cost-effective and ecologically viable methods for controlling invasive species and is well worth the effort to protect natural resources.

Data-driven treatment plans. Pilot programs, monitoring, and analysis of methods help identify the most effective and ecologically sound solutions.

Physical labor. Getting to zero herbicide use depends on persistent hands-on work, such as digging, hand pulling, weed wrenching, using power tools, and operating chainsaws. It often requires working in difficult conditions, pushing through dense shrubs and poison oak, and traversing steep slopes in remote locations. Successful ecological vegetation management requires dedication and many person hours.

Weed tolerance. Healthy ecosystems maintained without herbicides will include some non-harmful weeds. Intact communities are more resistant to invasive species and therefore require less management while providing high ecosystem value.

2019–20 Project List

FY 2019–20 Project List

Proposed Vegetation Management Projects

PROJECT NAME	INVASIVE SPECIES TARGETS	OBJECTIVES	PROPOSED METHODS WINTER (Jan–Mar '20)	SPRING (Apr–Jun '20)	SUMMER (Jul–Sept '19)	FALL (Oct–Dec '19)
Old Saint Hilary's Acacia Control	Acacia	Protect rare serpentine habitat and stream waterflow	Hand pull (small seedlings)	Hand pull (small seedlings)		Tryclopyr (Garlon) selectively applied once annually over a 2-day period in Fall
Ridgewood Fire Protection	Blue gum eucalyptus	Control ladder fuels within fuelbreak	Tarp additional stumps if 2018 tarping is successful and practical; hand pull small plants if feasible to remove root			Tryclopyr (Garlon) selectively applied to newly cut stumps over a 2-day period in fuelbreak area
Alto Bowl Fire Protection	Broom *(Cytisus and Genista spp.)*	Keep understory fuels low by managing broom north of Bob Middagh Trail and east of fire road in wide area fuelbreaks; work with neighboring lands toward additional fuel reduction and broom control	Hand pull broom plants >6" in fuelbreak areas		Mechanical fuel reduction adjacent to Meadowcrest Dr. (or next summer after broom has been removed)	Hand pull broom adjacent to Meadowcrest Drive
Baltimore Canyon Crown to Coronet Fire Protection	Broom *(Cytisus and Genista spp.)*	Keep understory fuels low by managing broom in fulebreak areas	Hand pull broom plants >6" in fuelbreak areas			
Big Rock Ridge Broom Control	French broom	Prevent pioneer broom from spreading into disturbed fuelbreak areas	Hand pull	Hand pull	Tryclopyr (Garlon) selectively applied over 1-day in fuelbreak areas Note: Only if broom is too dense to hand pull earlier in the year.	
Blithedale Summit Blithedale Ridge Access and Fuelbreak	*Broom (Cytisus and Genista spp.)*	Keep emergency access clear; transition to annual mowing after broom is absent	Hand pull broom plants >6" in within 75 ft of the road			
Blithedale Summit Corte Madera Ridge Access and Fuelbreak	*Broom (Cytisus and Genista spp.)*	Keep emergency access clear; reduce understory fuels	Weed whip broom for at least 50 ft on each side of the road (complete before Feb. 1)			
Blithedale Summit Hillside Fire Protection	*Broom (Cytisus and Genista spp.)*	Keep understory fuels low by managing broom in wide area fuelbreak	Hand pull broom plants >6" in fuelbreak areas Note: Assessed grazing as alternate treatment in 2017, but herd logistics were too difficult for the grazing contractor to implement in this location.			

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Bolinas Lagoon Broom Control	Broom *(Cytisus and Genista spp.)*	Extirpate from Kent Island	Hand pull	Hand pull		
Camino Alto Fire Protection	Broom *(Cytisus and Genista spp.)*	Keep understory fuels low by managing broom in wide area fuelbreaks	Hand pull broom plants >6" in fuelbreak areas			
Cascade Canyon Broom Control	French broom	Contain broom to eastern portion of preserve by removing all broom within San Anselmo Creek subwatershed	Hand pull			
Cascade Canyon Toyon Fuelbreak	Broom *(Cytisus and Genista spp.)*	Keep understory fuels low by managing broom within 50' of the fire road, or more where previously managed	Hand pull broom plants >6" in fuelbreak areas			
French Ranch Broom Control	Broom *(Cytisus and Genista spp.)*	Control broom in eastern portion of preserve to complement neighbor's control efforts	Hand pull			
Gary Giacomini Broom Control	Broom *(Cytisus and Genista spp.)*	Extirpate isolated early detection populations	Hand pull	Hand pull		
Horse Hill Fire Protection	Broom *(Cytisus and Genista spp.)*	Keep fuels low by managing broom; partnership with Alto Bowl Horseowners Association to manage invasives	Propane flame or hand pull especially in areas of mechanical removal and pile burning in 2018 (volunteers needed!)	Hand pull especially in areas of mechanical removal and pile burning in 2018 (volunteers needed!)		
Loma Alta Broom Control	French broom	Contain broom to lower preserve; extirpate isolated early detection populations in upper preserve	Hand pull	Hand pull		
Old Saint Hilary's Broom Control	Broom *(Cytisus and Genista spp.)*	Protect rare serpentine habitat	Hand pull			
Ring Mountain Broom Control	Broom *(Cytisus and Genista spp.)*	Protect rare serpentine habitat	Hand pull Seeding/planting			

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Ring Mountain Taylor Road Fire Protection	Broom *(Cytisus and Genista spp.)*	Keep fuels low by managing broom	Hand pull			
Roy's Redwoods Broom Control	Broom *(Cytisus and Genista spp.)*	Extirpate isolated early detection populations	Hand pull	Hand pull		
Rush Creek Broom Control	French broom	Extirpate early detection populations	Hand pull			
Santa Venetia Marsh Restoration Maintenance	Broom, Fennel, & Harding grass	Maintain native marsh restoration site	Hand pull	Hand pull	Hand pull	
Terra Linda/ Sleepy Hollow Broom Control	Broom *(Cytisus and Genista spp.)*	Extirpate isolated populations with large volunteer engagement	Hand pull	Hand pull		
Mount Burdell Goatgrass Control	Goatgrass	Reduce seed bank for eventual extirpation	Propane flame seeds on ground surface before germination	Hand pull all sites		
Terra Linda / Sleepy Hollow Goatgrass Control	Goatgrass	Containment, prevent from impacting grazing lands elsewhere in Marin County, while preserving native seed bank in portions of serpentine habitat infested	Apply grass-specific herbicide (Fusilade) in grass-dominated areas near rare plants Trial: Test OMRI organic product on yellowstar seedlings (within goatgrass control areas) to reduce or eliminate need for Milestone in spring. Note: Previous trial of OMRI product (Suppress) on goatgrass yielded poor results.	Mow or graze all dense grass sites Hand pull all sparse grass sites Selectively apply herbicide (Aquamaster) once over a 2-day period as a follow-up treatment to mowing, grazing, or Fusilade. Apply thistle-targeted herbicide (Milestone) in goatgrass areas dominated by yellowstar thistle. Hand pull	Hand pull	
Mount Burdell Fuel Reduction and Medusahead Control	Invasive annual grasses (e.g. medusahead, wild oat, Italian wild rye, false brome)	Promote native biodiversity	Cattle grazing	Cattle grazing	Monitor residual dry matter to determine whether grazing is sufficient to help control medusahead	

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Ring Mountain Monterey Pine Control	Monterey pine		Hand pull Power tools	Hand pull Power tools	Hand pull Power tools	Hand pull Power tools
Santa Venetia Marsh Pepperweed Control	Pepperweed	Protect marsh habitat	Check and maintain tarps	Imazapyr (Habitat) selectively applied over 1-day		
Districtwide Thoroughwort Control (Blithedale Summit, Old St. Hilary's)	Thoroughwort	Extirpation on MCP lands, protect waterways	Hand pull all sites	Hand pull all sites (follow up to first round of treatment)		
Mount Burdell Yellow Star Thistle Control	Yellow star thistle	Eliminate from northern and western regions of preserve	Seed or plant disturbed areas to increase competition		Hand pull in early July and again in early August to get all plants	Seed or plant disturbed areas to increase competition
Districtwide Defensible Space Clearance	Invasive annual grasses (e.g. medusahead, wild oat, Italian wild rye, false brome)	Remove flashy fuels near homes		Mow Graze		
Bolinas Lagoon Acacia Control	Acacia	Exterpate from Kent Island		Hand pull		
Bothin Marsh Alkalai Russian Thistle Control	Alkalai russian thistle	Protect marsh habitat		Hand pull		
Bolinas Lagoon Beachgrass Control	Beachgrass	Extirpate from Kent Island		Hand pull		
Bolinas Lagoon Bird's Foot Trefoil Control	Bird's foot trefoil	Control on Kent Island by reducing cover to lower densities that allow for native diversity		Hand pull		
Ring Mountain Bull Thistle Control	Bull thistle	Reduce density to maintenance level to protect seeps, springs, and marsh areas		Hand pull		

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Bolinas Lagoon European Sea Rocket Control	European sea rocket	Reduce and control on Kent Island to prevent stabilization of mobile sand processes and protect habitat for pink sand verbena; sustain control efforts		Hand pull		
Bolinas Lagoon Fennel Control	Fennel	Reduce to maintenance levels; sustain control efforts		Hand pull		
Deer Island Goatgrass Control	Goatgrass	Extirpate early detection populations		Weed-whip in early May; hand pull in early-mid June as a follow-up to mowing		
Terra Linda/ Sleepy Hollow Fire Protection	Goatgrass, Invasive annual grasses	Fire fuel reduction that also keeps goatgrass from spreading along road/trail corridors		Grazing		
Ring Mountain Harding Grass Control	Harding grass	Prevent spread into serpentine		Hand pull Fluazifop (Fusilade) or Imazapyr (Habitat) selectively applied up to twice annually over a 2-day period in spring/summer (only if hand pulling in spring is not effective)		
Roy's Redwoods Harding Grass Control	Harding grass	Extirpate isolated early detection populations		Hand pull		
Bolinas Lagoon Iceplant Control	Iceplant	Extirpate from Kent Island		Hand pull Cover with fabric or plastic		
Ring Mountain Invasive Annual Grass Control	Invasive annual grasses (e.g. wild oat, Italian wild rye)	Reduce density in higest priority rare plant habitats and/or within test plots		Hand pull or weed whip		
Bolinas Lagoon Invasive Cordgrass Control	Invasive cordgrass	Extirpate this species in partnership with regional goals and efforts		Imazapyr (Habitat) selectively applied once annually over a 1-day period in summer/fall.		

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Bolinas Lagoon Invasive Sea Lavender Control	Invasive sea lavender	Extirpate this early detection species that threatens intact marsh habitat		Hand pull		
Bothin Marsh Invasive Sea Lavender Control	Invasive sea lavender	Extirpate this early detection species that threatens intact marsh habitat		Hand pull	Hand pull	
Old Saint Hilary's Endangered Jewelflower Protection	Italian rye grass, wild oat	Protect federally endangered jewelflower population		Hand pull		
Bolinas Lagoon Monterey Pine Control	Monterey pine	Prevent spread on Kent Island while retaining mature trees as wildlife habitat		Hand pull		
Deer Island Pepperweed Control	Pepperweed	Extirpate from preserve		Imazapyr (Habitat) selectively applied once over a 2-day period		
Districtwide Purple Star Thistle Control (Little Mountain, Loma Alta, Lucas Valley, Mount Burdell, Ring Mountain, 680 Trail)	Purple star thistle	Extirpate all populations on MCP lands (early detection)		Hand pull May - July with a second round before August to get all plants	Hand pull May - July with a second round before August to get all plants	
Bolinas Lagoon Rosy Iceplant Control	Rosy iceplant	Extirpate from Kent Island		Hand pull		
Ring Mountain Rosy Sandcrocus Control	Rosy sandcrocus	Prevent spread into serpentine		Hand pull		
Ring Mountain Tocalote Thistle Control	Tocalote	Extirpate from preserve		Hand pull		

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Bolinas Lagoon Tall Fescue Control	Tall fescue	Exterpate from Kent Island		Hand pull		
Ring Mountain Tall Fescue Control	Tall fescue	Control to prevent spread in wetlands		Cover (fabric or plastic) Hand pull Imazapyr (Habitat) selectively applied once annually over a 1-day period in spring/summer.		
Ring Mountain Wild Mustard Control	Wild mustard	Prevent spread into serpentine areas		Hand pull		
Ring Mountain Endeavor Fire Road Repair and Restoration	Wild oat, fennel	prevent weeds from dominating recently disturbed road edges		Hand pull Power tools		
Baltimore Canyon Pinchpoint Emergency Access	Broom *(Cytisus and Genista spp.)*	Keep emergency access clear			Tryclopyr (Garlon) selectively applied over a 2-day period Note: Hand pulling in January 2018 was not effective; roots could not be extracted due to previous cutting which led to large roots in hard rocky soil.	
Blithedale Summit Middle Summit Access and Fuelbreak	Broom *(Cytisus and Genista spp.)*	Keep emergency access clear; reduce broom cover and fine fuels annually in the fuelbreak understory; maintain horizontal and vertical spacing; partnership with Mill Valley Fire to maintain access/fuelbreak			Weed whip broom and fine fuels for at least 60' on each side of the road (except south/east end where ownership is private on downhill side); prune/thin for horizontal and vertical spacing (focus thinning on common/abundant shrub species)	
Blithedale Summit Ryder Ridge Access and Fuelbreak	Broom *(Cytisus and Genista spp.)*	Keep emergency access clear; reduce fine fuels in the fuelbreak understory; partnership with Mill Valley Fire to maintain access/fuelbreak			Weed whip fine fuels for at least 50' on each side of the road	

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Blithedale Summit Two Tanks Emergency Access	Broom *(Cytisus and Genista spp.)* Acacia	Keep emergency access clear; reduce understory fuels			Power tools to cut large broom and acacia; chip cut material back onto site or haul off site. Tryclopyr (Garlon) selectively applied to cut acacia stumps over a 2-day period	Trial: Pull large plants using stems left behind after cutting
King Mountain Fire Protection	Broom *(Cytisus and Genista spp.)*, Acacia	Keep woody fuels low by managing broom and acacia in wide area fuelbreaks			Grazing and associated mechanical or hand cutting/thinning within fuelbreak downslope of Citron Fire Road. Tryclopyr (Garlon) selectively applied to cut stumps of Acacia within fuelbreak upslope if Citron Fire Road.	
Baltimore Canyon Kent Woodlands Fire Protection	Broom *(Cytisus and Genista spp.)*, acacia, mayten, pines	Create shaded fuelbreak within 100-200 feet of homes; expand understory fuel reduction by managing broom beyond 200 feet to create a wide area fuelbreak			Tryclopyr (Garlon) selectively applied over a 2-day period	Mechanically limb-up trees, thin trees/shrubs, remove dead/down woody vegetation, chip cut material back onto site or haul off site; cut and pile broom. Tryclopyr (Garlon) selectively applied to cut stumps of Acacia and Mayten
Distaff Thistle Control (Indian Tree, Lucas Valley)	Distaff thistle	Extirpate all populations on MCP lands (early detection)			Hand pull	
Ring Mountain Fennel Control	Fennel	Protect native grasslands			Hand pulll	
Bothin Marsh Invasive Sea Lavender Control	Invasive sea lavender	Extirpate this early detection species that threatens intact marsh habitat			Hand pull	

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Old Saint Hilary's Pampas Grass Control	Pampas/jubata grass	Protect rare serpentine habitat and stream waterflow			Hand pull	
Terra Linda/ Sleepy Hollow Pampas Grass Control	Pampas/jubata grass	Extirpate isolated populations			Hand pull	
Lucas Valley Rare Buttercup Protection	Pennyroyal	Preserve rare plant habitat and frog breeding grounds in natural vernal pool			Hand pull	
Mount Burdell Hidden Lake Rare Navarretia Protection	Pennyroyal	Preserve rare plant habitat and frog breeding grounds in natural vernal pool			Hand pull	
680 Trail Mitigation	Purple star thistle, yellow star thistle	Prevent purple and yellow star thistles from spreading along trail corridor			Hand pull	
Stinkwort Control	Stinkwort	Extirpate this early detection species in all priority habitats			Hand pull	
Emergency Access	Woody species encroaching on access routes	Keep road clear for emergency vehicles			Mow Prune	
Ring Mountain Mayten Control	Mayten	Protect native grasslands				Imazapyr (Habitat) or Tri-clopyr (Garlon) selectively applied to cut in bark once annually over a 2-day period in summer/fall

Vegetation and Biodiversity Team

From left to right: Greg Reza, Sarah Minnick, Pete Frye, and Mischon Martin.

Mischon Martin
Chief of Natural Resources and Science

Mischon has worked professionally in Natural Resources and Science for over 20 years. In addition to her current role, she has served in a number of positions with Marin County Parks, including Resource Ecologist and Natural Resources Program Manager. Mischon oversees the planning and implementation of a variety of landscape-level restoration and vegetation management projects throughout Marin County parks and open space preserves. Her work focuses on improving habitat for endangered species, as well as reducing fire fuels and managing the spread of invasive species. Mischon holds a Bachelor of Science in Biology.

Pete Frye
Resource Specialist

Pete's primary responsibilities include vegetation restoration, supervising field crew work, and mapping. He started his career with Marin County Parks 14 years ago, as a seasonal parks employee. Pete has a Bachelor's degree in Environmental Studies and a Master's degree in Environmental Remote Sensing and Geographic Information Systems.

Sarah Minnick
Vegetation and Fire Ecologist

Sarah has over ten years of experience in land conservation and vegetation management, including six years working for the National Park Service. In her current position at Marin County Parks, she focuses on vegetation and biodiversity management, including habitat restoration and monitoring, fire protection, invasive weed control, rare species mapping, monitoring and preservation, and community engagement. She holds an undergraduate degree in Mathematics/Biology and a graduate degree in Conservation Ecology.

Greg Reza
Volunteer Program Coordinator

Greg has organized volunteer projects at Marin County parks and open spaces for over 20 years. He builds community with local schools, groups, businesses, and non-profit organizations, coordinating the many thousands of volunteers each year needed to support ecologically sound vegetation management and habitat restoration. Greg holds a Bachelor's degree in Environmental Studies and Planning with a concentration in Conservation and Restoration.

Vegetation and Biodiversity Team

Seasonal biological technicians at work.

Seasonal Field Technicians and Assistants

Early Detection/Rapid Response Technician – Practices and promotes weed prevention and biosecurity within our organization; engages our neighbors about invasive plants.

Biological Monitor Technician – Oversees bird habitat and compliance surveys (e.g. preconstruction surveys and worker awareness trainings).

Wildlife Technician – Oversees the Marin Wildlife Picture Index Project and assists with the Bat Monitoring Project.

Nursery Technician – Oversees daily operations in our new native plant nursery, working with volunteers to provide material support for ongoing restoration projects.

Vegetation Mapping Technician – Survey for and map rare plant populations and fuel break vegetation.

Trail Technician – Oversees trail maintenance crews, regulatory permitting compliance, trail revegetation projects, analyzes visitor use data, assists the Open Space Planner in the project management of the road and trail system.

Field Assistants – Work alongside technicians and full-time staff providing capacity to achieve vegetation and biodiversity goals including weed management, project implementation, and data collection.