Prepared by
Marin County Parks

INTEGRATED PEST MANAGEMENT

2018 ANNUAL REPORT

Integrated Pest Management Specialist Katherine Knecht removes fragments of Ludwigia peploides p. from the Civic Center lagoon park.

2018 Summary

Keeping Marin County safe and healthy.

Marin County continues to build upon an already-successful Integrated Pest Management (IPM) program.

Marin County continues to lead the way in utilizing non-chemical IPM alternatives. In 2018, Marin County continued to use zero glyphosate and zero rodenticide across all 148 sites governed by the County's IPM ordinance. Parks' landscape teams, including staff, volunteers, and contractors, continued successful management of 131 sites without pesticide. To achieve this, volunteer, staff, and contracted work hours increased slightly to 43,299 labor hours dedicated to non-chemical IPM. In 2018, conventional* product applications increased by 36 ounces while the application of organic* products increased by 2,145 ounces.

The program continually improves. Many county facilities are adjacent to important habitat, so the Marin County IPM approach must continue to focus on pest management solutions that minimize negative impacts to these important resources. Behind the scenes, staff worked hard in 2018 to formalize processes and improve communication between departments. Staff also look for synergies in the IPM program. For example, removing vegetation that attracts pests from around buildings has the added benefit of offering fire protection. Parks continues to train staff and network with other regional IPM agencies on shared challenges.

Structural IPM was a focus in 2018. While Marin County's IPM program includes large swaths of natural areas like regional parks, it also includes the management of ornamental landscapes like traffic medians as well as structures. Structural IPM addresses pest problems in and around structures like public facilities, office complexes, hospitals, cafeterias, the county jail, or other sensitive environments. From vegetation removal to pest control, the Marin County Civic Center campus was a particular focus in 2018.

The Marin County IPM program targets prevention, early detection, and rapid response. Prevention is the most effective way to control pest populations. Each location is individually assessed. Marin County's IPM team is able to focus on early detection and rapid response by continually monitoring plant and animal populations. Strategic plans are in place in the likely event that a new invasive species, like Uruguayan creeping water primrose (*Ludwigia peploides sp.*) or Japanese knotweed (*Fallopia japonica*), is spotted, so that an effective IPM approach can be implemented immediately.

* See glossary on page 30 for definitions.

Marin County Integrated Pest Management

Integrated Pest Management (IPM) is a system of managing pests using careful consideration and integration of all available pest control tools and techniques. The target pest, goals, and site conditions guide a systematic decision-making process on what control methods to use. Mechanical and physical pest controls include weeding, mulching, weed-whipping, and mowing. Cultural control means changing work practices to reduce pests, such as altering irrigation practices to reduce weeds. Biological control uses parasites, pathogens, competitors, and predators to control pests. Pesticides are used only after it is determined that alternative methods will not be effective. A pesticide is a chemical preparation used to destroy plant, fungal, insect, or animal pests. All pesticides used by the county are registered with the U.S. EPA and reported to the California Department of Pesticide Regulation.

Marin County Parks, in collaboration with other County departments, administers IPM for the County of Marin. The program is governed by County Ordinance 3598.

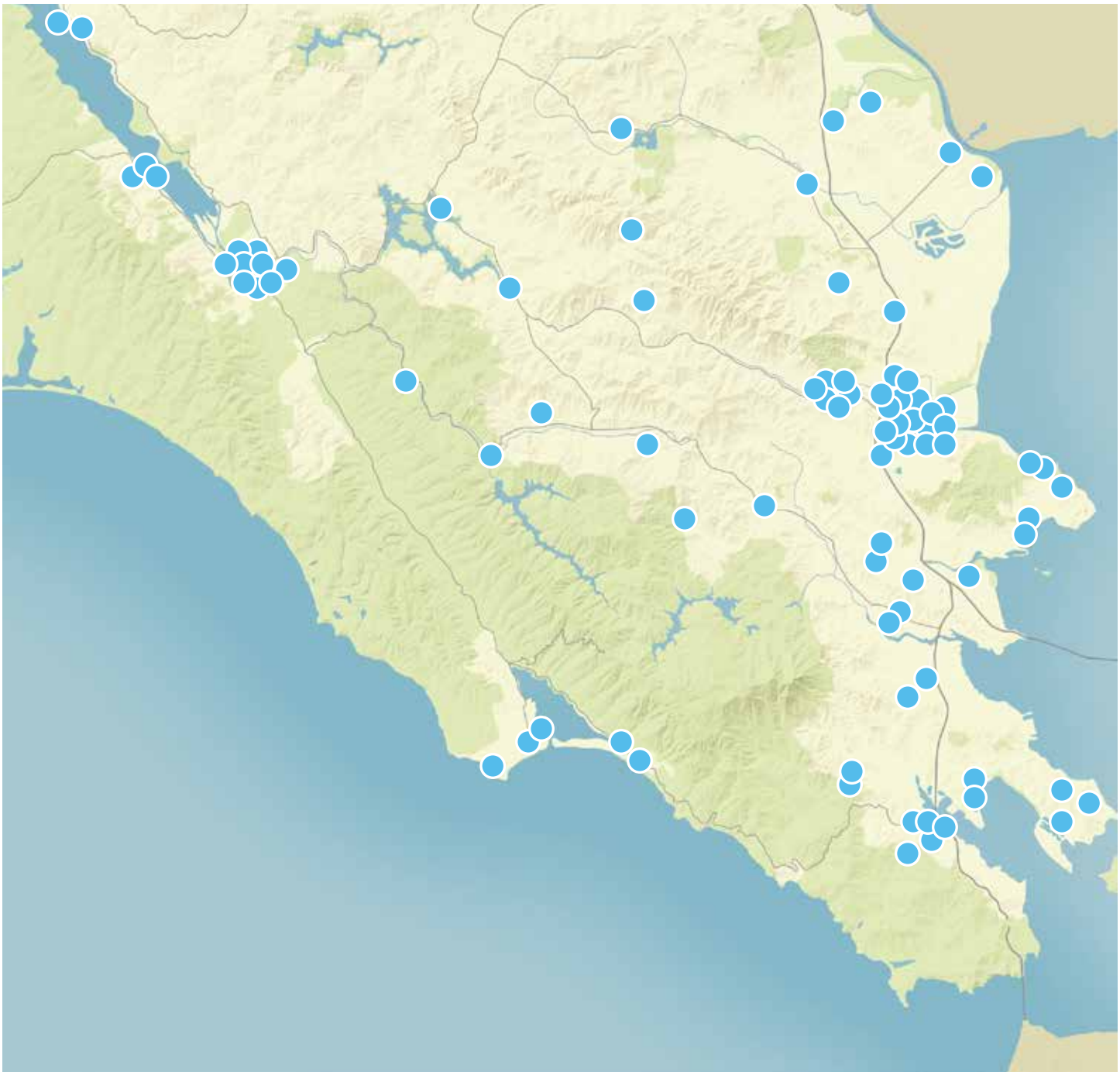
The Integrated Pest Management Commission oversees the implementation of the Marin County Integrated Pest Management ordinance and policy. The nine-member Commission also advises and makes recommendations to Marin County's IPM Coordinator and the County Board of Supervisors as needed. Commission meetings are held quarterly and are open to the public.

The County's IPM policy applies to 148 sites that include county parks and libraries, Marin County government offices, Marin County Health and Human Services sites, and traffic median locations throughout Marin. These locations tend to be heavily populated and used for recreation or business. Common IPM challenges in these locations include wasps, ants, roaches, rodents, and weeds. In addition to managing pests, the county IPM program provides outreach to the public through volunteer opportunities and education.

The County's IPM program cares for heavily populated locations where rodents, insects, and weeds may present a public health and safety hazard.

IPM Governance

Marin County Ordinance 3598 governs park, structural, and ornamental landscape IPM for 148 locations.



County ordinance 3598 governs IPM for parks, libraries, fire stations, office buildings, traffic medians, other buildings, and ornamental landscapes on county properties across Marin. The Marin County Open Space Preserves are governed by the Parks and Open Space Commission and the Open Space District Board of Directors. They are not covered in this report. Visit marincountyparks.org to view the Vegetation and Biodiversity Report and Work Plan for more information on IPM in the preserve system.

2018 Achievements

In 2018, Marin County maintained 148 locations including 131 without pesticides.







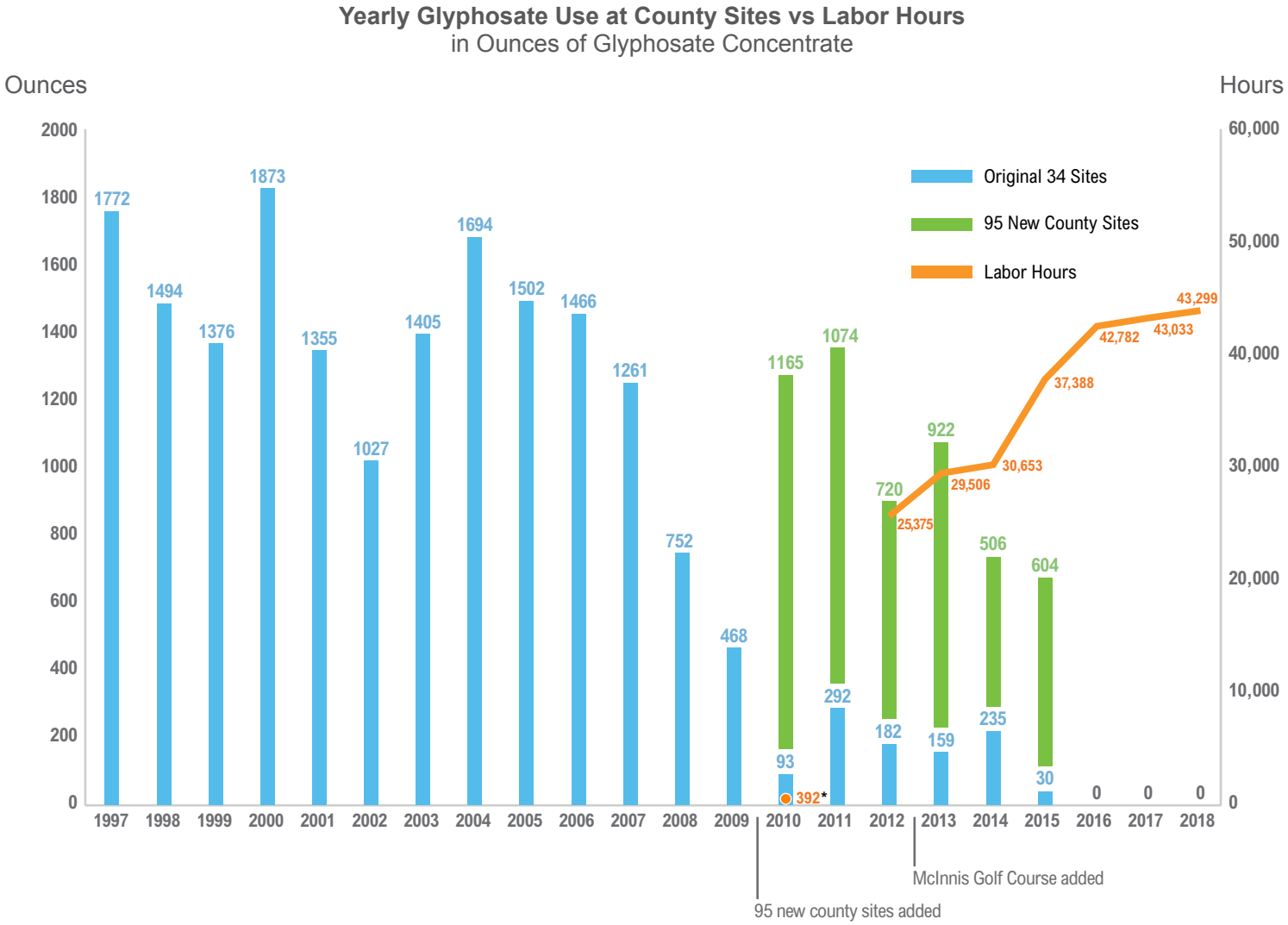

These sites include the Marin County Civic Center campus, 2 boat launches, 4 regional parks, Gnoss Field Airport, the Marin Health and Wellness Campus, the McInnis Golf Course, dozens of neighborhood and community parks, 11 multiuse pathways, 27 traffic medians and roadside landscapes in 8 county service areas, county government offices, 2 libraries, and the county jail.

2018 Achievements

Measure A funds helped to eliminate use of glyphosate-based products for the third year in a row.

Measure A funds many projects and staff members that incorporate non-chemical IPM activities in their workplans.

Glyphosate Use Has Declined to Zero Over Time While Labor Continues to Increase



Over the past 21 years, glyphosate use has declined to zero. Contractors like Gardeners Guild that conduct Marin County IPM on median and roadways have been instrumental partners in achieving this goal. Glyphosate is the active ingredient in products such as Round Up and Aquamaster. The data for the years 1997-2014 is based on combined usage records at the original 34 county sites that were included in the 1998 IPM Ordinance. In 2009, 95 new county sites were added to the IPM Ordinance, and the McInnis Golf Course was added to the program in May 2012. Staff began comprehensively tracking labor hours in 2012. Labor hours include staff, contractors, and volunteers.

** 2010 labor data is only available for the month of December.*
The Marin County Open Space Preserves are governed by the Parks and Open Space Commission and the Open Space District Board of Directors. They are not covered in this report. Visit marincountyparks.org to view the Vegetation and Biodiversity Report and Work Plan for more information on IPM in the preserve system.

Marin County Parks is committed to rodenticide-free IPM.

By eliminating rodenticides from our allowed products, Marin County Parks manages rats and mice while also prioritizing the health of their predators.

Partners like The Hungry Owl Project contribute to our rodenticide-free success. The Hungry Owl Project, recently merged with the nonprofit Wildcare, educates the public and helps controls rodents without rodenticide by installing barn owl boxes across Marin County, including parks. In 2018, owl boxes at various park sites, including the Civic Center, were maintained and productive for rodent control. Owls in two boxes died in 2018, likely due to rodenticide use from neighbors. Because of these incidents, IPM staff is working with local organizations to educate the public about the dangers of using rodenticide.

Neighborhood-level partners are also contributing creative solutions to reduce rodenticide. In 2018, a local community-driven project called Yard Smart Marin launched a public service campaign called "Poison Hurts More Than Rats" aimed at reducing rodenticides at the neighborhood level. Last fall, IPM staff, along with Yardsmart founder Rika Gopinath and Hungry Owl Project volunteer Maggie Rufio, presented to the Maintenance and Superintendents Association to provide education about the impacts of rodenticides, and to offer non-chemical solutions. The IPM program continues to look for new opportunities to partner with local nonprofits in education and pest prevention.

Marin County controls rats and mice without using rodenticides to avoid harming wildlife that consume the rodents.

Prevention and building maintenance are key structural IPM tools.

Marin County's structural IPM focuses on eliminating the root causes of pest infestation, rather than simply applying chemicals for a short-term result. Managing pests through prevention is usually less expensive than trying to control an active pest population. Basic sanitation practices like quickly discarding garbage into a can with lid, storing food in airtight containers, and washing dishes immediately, are key rodent prevention methods. Contractors like ATCO Pest Control and Crane Pest Control help control insects and rodents in a safe and environmentally sensitive manner and offer recommendations for further prevention.

In 2018, parks IPM staff collaborated with the departments of Public Works (DPW) and Environmental Health to implement multiple rodent exclusion projects. In response to the detection of roof rats (*Rattus rattus*) in the Civic Center in 2018, staff worked to identify potential causes and attractants. In addition to purchasing new, rodent-proof trash cans, DPW made major modifications to the structure of the Civic Center café, including exclusion wire, patching holes, and removing vegetation along the walls of the building exterior. Further renovations are currently in progress and will continue into 2019. IPM staff also worked with the county communications team to provide education to county employees concerning rodent prevention. The County IPM program is also providing funds for capital improvements designed to prevent rodents from accessing the building interior of the McInnis Park clubhouse.

Firewise IPM

In 2018, juniper–which is highly fire-prone–was removed from some landscaped areas of County Service Area 13 (CSA 13 - Lucas Valley). Flammable acacias were also removed from the Marin Civic Center building exterior. Because these trees are also invasive, their removal offers synergies between fire fuel reduction, species protection, and pest management. In spring of 2018, IPM staff toured property with Novato Fire Department staff in order to learn about potential opportunities to increase fire safety near buildings.

Basic sanitation and building maintenance are a large part of Marin County's structural IPM program.

In 2018, staff implemented a range of IPM solutions at the Civic Center campus.

The Frank Lloyd Wright-designed Marin County Civic Center is a national- and state-designated historic landmark. The campus includes a variety of community and administrative uses, varied indoor and outdoor landscapes, and a wide range of conditions that must be adaptively managed on a daily basis.

The Marin County IPM Program continually improves.

With a new IPM Program Coordinator and IPM Specialist on board, 2018 offered the opportunity to look at the program through fresh eyes. Behind the scenes, staff worked hard to formalize processes, improve workflows, and evaluate systems to create more efficiency. Communications between departments like Parks and Public Works were formalized to craft a more effective response to detect invasive species and pests early. Staff examined program goals related to communication with the public, and are currently participating in a pilot program to increase transparency and accessibility of IPM data.

Early intervention is the most effective tool. Early detection and rapid response (EDRR) is a management approach that recognizes that is most effective to eradicate invasive plant populations when they are still small. In 2018, the IPM program used EDRR to address invasive Uruguayan creeping water primrose (*Ludwigia peploides sp.*) at the Civic Center Lagoon Park, and also surveyed Larsen creek for Japanese knotweed (*Fallopia japonica*), a worldwide top-20 invasive species that has been recently spotted in Marin County.

The IPM program continues to focus on organic and minimum-risk products to improve handler and public safety. Based on the results of a 2017 pilot project, Marin County continued moving forward without glyphosate on all 27 median and roadside landscapes in 2018.

Common Park Pests

Some common pests are attracted to food. Others are found near paths of travel, like roadside landscapes and medians.

- Roof rat *(Rattus rattus)*
- Canada goose *(Branta canadensis)*
- California ground squirrel *(Otospermophilus beecheyi)*
- Invasive annual grasses — various species
- Common mallow *(Malva neglecta)*, little mallow *(Malva parviflora)*

Prevention, early detection, mowing, hand pulling, and weed whipping are all part of the Marin County IPM program.

In 2018, early detection and rapid response halted the spread of an aggressive weed at the Civic Center.

Staff and contractors from Forest and Kroger bring an early detection, rapid response approach to invasive Uruguayan creeping water primrose (Ludwigia peploides sp.) at the Civic Center Lagoon Park.

Non-chemical IPM is a team effort.

In 2018, Marin County collaborated on best practices and shared resources for non-chemical IPM with regional partners and local organizations. There continues to be interest in non-chemical IPM across the Bay Area, with several organizations reaching out to Marin County or sending staff to our annual safety trainings. In 2018, IPM staff participated in a bay-wide meeting of regional IPM coordinators, UC Davis' Aquatic Weed School 2018, the California Invasive Plant Council Symposium, Marin Master Gardeners presentations about insect pests, and a North Bay Maintenance Superintendents Association meeting to talk about non-chemical IPM strategies. Additionally, staff reached out to other organizations including San Francisco State University's Environmental Science program, UC Davis and the UC Cooperative Extension, Rescape (formerly Bay Friendly Gardeners), and Non-toxics Irvine, to learn how other organizations are approaching non-chemical IPM.

In 2018, Marin County's IPM program also contributed to interagency pest management efforts that cross jurisdictional lines. The Marin Knotweed Action Team was formed in response to sightings of Japanese knotweed (*Fallopia japonica*)—considered one of the most invasive plant species in the world—along San Geronimo Creek, which is home to endangered salmonids and managed by multiple agencies. IPM staff contributed by sharing past experience, drafting outreach and education materials, and surveying the single tributary of San Geronimo Creek that was considered to have the potential for knotweed.

2018 IPM Achievement Awardee: Frank Egger

The IPM Achievement Award recognizes individuals and organizations that further the goal of eliminating pesticide use within the Marin County IPM Program.

While serving on the Marin/Sonoma Mosquito & Vector Control Board, Frank Egger studied various pesticides and successfully found alternatives. He also helped initiate the IPM Ordinance and Commission. Frank has shared many examples of innovative IPM techniques, and has reached segments of the population not usually aware of IPM.

Marin's IPM program requires coordination between staff, contractors, and volunteers as well as regional partners, local organizations, residents, and other Marin County departments to combat invasive species and pests.

2018 Achievements

In 2018, volunteers contributed over 10,000 hours in support of non-chemical IPM.

Volunteers are an essential part of Marin County's IPM program.

21 full-time employee equivalents supported non-chemical IPM.

In 2018, staff, contractors, and volunteers spent 43,299 hours conducting IPM, equal to 21 full-time employees. Contractors like Gardener's Guild and Forest and Kroger have continued to show a willingness to experiment with non-chemical methods such as hand pulling and weed whipping. Staff are also contributing organic solutions like applying Civitas (with the active ingredient of mineral oil) to address turf mold on the San Geronimo golf course.

Volunteers spent 10,766 hours weeding, picking up litter, spreading mulch, removing invasive species, and performing other non-chemical IPM methods. The Marin County non-chemical IPM program would not be possible without community partners and their volunteers including but not limited to

- Hungry Owl Project and Wildcare
- Invasive Spartina Project (ISP)
- Linking Individuals to their Natural Community (LINC) youth stewardship program
- Marin Knotweed Action Team (MKAT)
- One Tam volunteer program
- Students and Teachers Restoring a Watershed (STRAW)
- Marin Master Gardeners
- Marin County's Adult Work Offender program

2018 IPM Achievement Awardee: LINC: Tam

The IPM Achievement Award recognizes individuals and organizations that further the goal of eliminating pesticide use within the Marin County IPM Program.

LINC: TAM brings 20 high school youth onto Mt. Tamalpais for six weeks to recreate, learn, and work to restore the different ecosystems on Mt. Tamalpais. These youth pulled invasive plants such as: ice plant at Bothin Marsh, and Kent and Arambaru island; yellow star thistle on Mt. Tamalpais; and French broom around Marin City's national parks.

Non-chemical IPM requires lots of hand pulling weeds and physical labor.

2018 Achievements

Overall IPM labor hours slightly increased in 2018 and volunteer hours increased by 14%.

Labor Hours by Month

Month	Staff IPM	Volunteer IPM	Contractor IPM	Total Hours
January	1226	556	719	2501
February	1587	912	718	3217
March	1890	862	920	3672
April	1762	1750	974	4486
May	2323	866	966	4155
June	1875	753	748	3376
July	1505	810	848	3163
August	2198	832	846	3876
September	2667	1314	745	4726
October	1954	1068	1010	4032
November	1693	412	1147	3252
December	1291	631	922	2844
Total Hours	**21,970**	**10,766**	**10,563**	**43,299**

Labor Hours Year-Over-Year

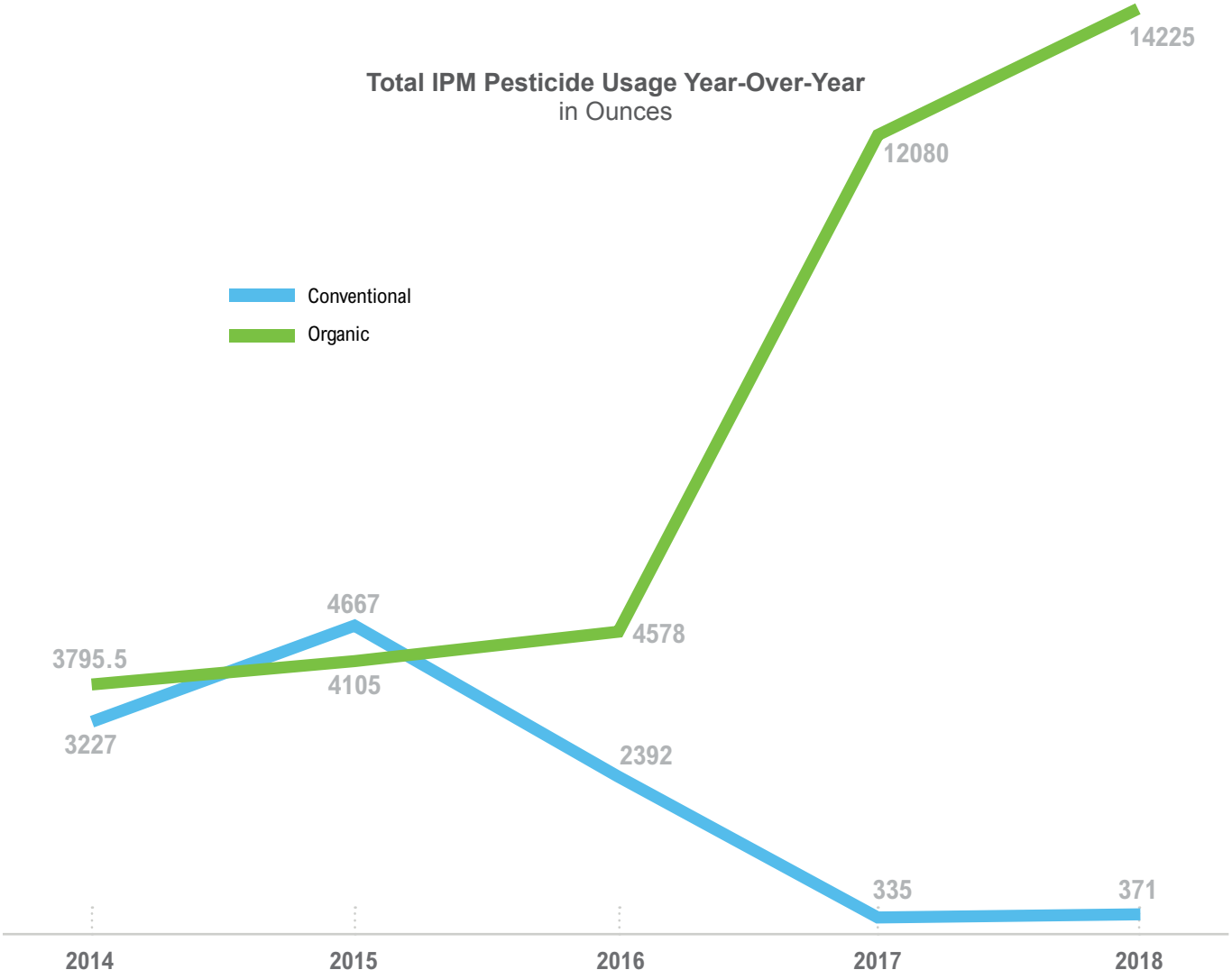
Year	Staff IPM	Volunteer IPM	Contractor IPM	Total Hours	% Change
2013	13,905	7,654	7,949	29,506	**---**
2014	15,774	6,678	8,201	30,653	**3.7%**
2015	20,718	7,983	8,687	37,388	**21.9%**
2016	26,888	7,086	8,808	42,782	**14.4%**
2017	25,052	9,439	8,542	43,033	**.58%**
2018	**21,970**	**10,766**	**10,563**	**43,299***	**.62%**

The County maintains a strong commitment to Integrated Pest Management that emphasizes non-chemical, least toxic methods. Mechanical and manual weed removal, sheet mulching, mowing, trapping, turf aeration, irrigation system improvements, and other site modifications are used in combination to help control various pest populations.

* Equal to 21 full-time staff.

Total Pesticide Use

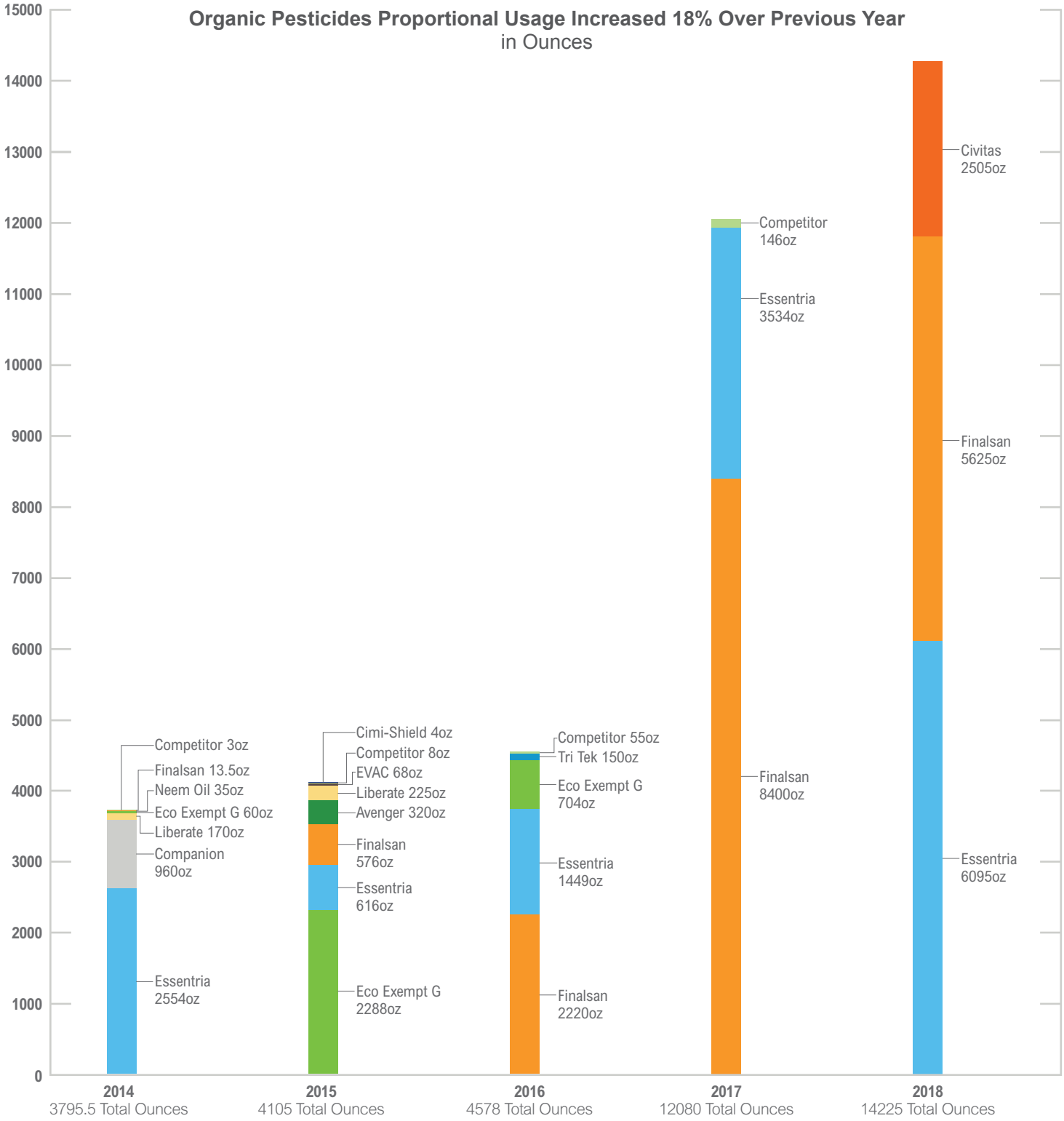
In 2018 conventional pesticide use increased slightly while organic use increased 18%.



Conventional pesticide use increased by 11% in 2018 over the previous year while organic pesticide use increased by 18%. Some of this increase (139 oz conventional, 2505 oz organic) was driven by the addition of the San Geronimo Golf Course property. The long-term strategy is to favor manual methods supplemented with organic treatments while minimizing the need for synthetic chemical applications.

Conditions this year again allowed Marin County Parks to successfully implement IPM using a minimal amount of synthetic chemicals. Organic alternatives require a significantly higher application volume than conventional products, and are primarily used on traffic medians. IPM will vary each year based on the types of pests, risks, and conditions in the field.

Organic Pesticide Use



The diagram above shows organic pesticide applications over the past five years. The total amount of organic product usage increased by 18% in 2018. The application of Civitas was driven by the addition of the San Geronimo Golf Course property. Additionally, organic alternatives require a significantly higher application volume than conventional products. Only 3 products were used in 2018, though this could change in future years depending on the conditions and type of pests.

Organic Pesticides Applied in 2018

Organic product alternatives were an integral component of IPM in 2018.

Organic* Products Used for Outdoor Landscape Maintenance

Civitas is a mineral-oil based product that can be applied to turf areas in order to decrease turf mold growth. It was used at San Geronimo Golf course in order to ensure that the greens stayed playable in cool, wet conditions typical of our coastal fog belt.

Finalsan is a fast-acting herbicide used to control weeds. Its active ingredient is ammoniated soap of fatty acids. It was applied to weeds growing at Sir Francis Drake medians and Rush Creek medians, where hand pulling near vehicle traffic can be dangerous for landscape staff.

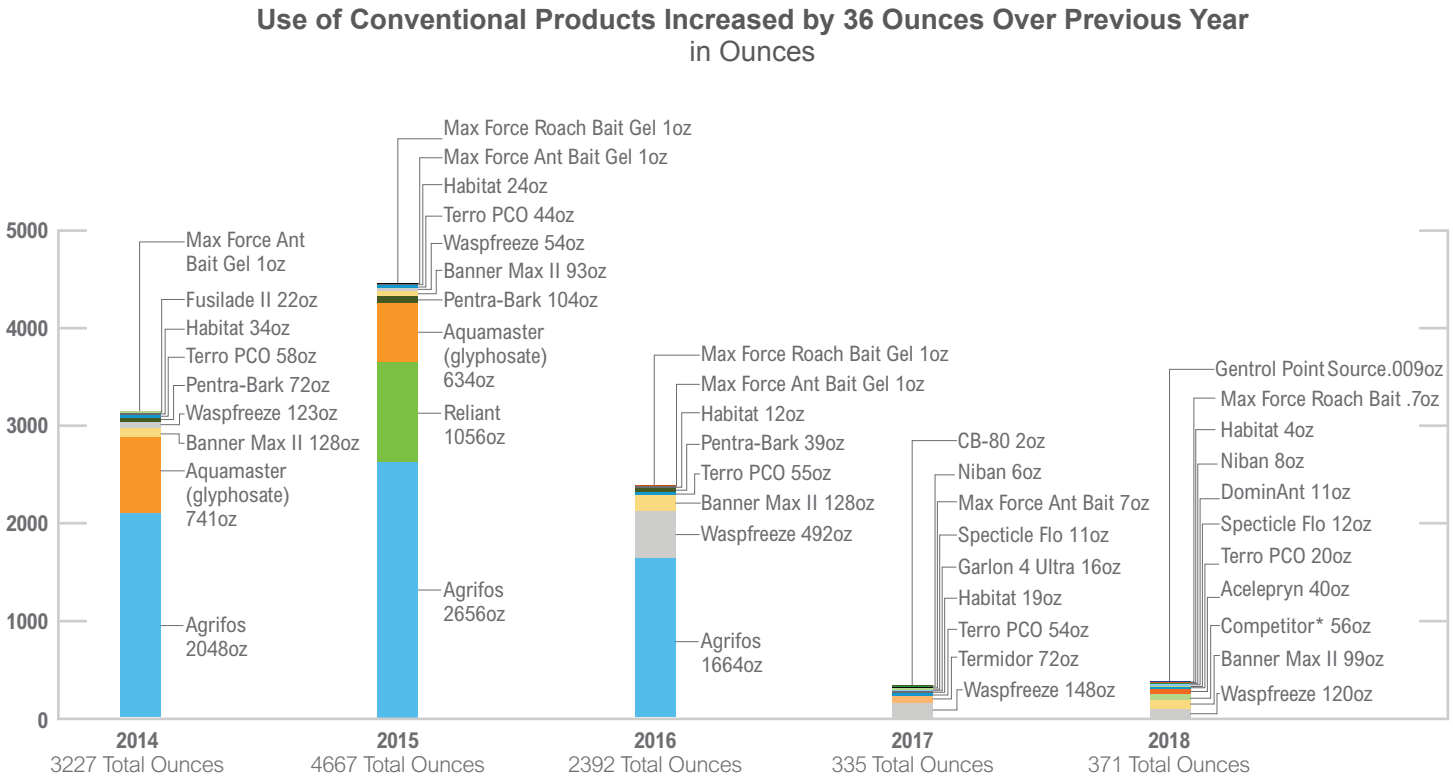
Organic* Products Used for Indoor Structural Pest Control

Essentria† is an insecticide with active ingredients comprised of rosemary oil, geraniol, and peppermint oil. When applied to the perimeter of a building, this product can prevent insect pest problems from affecting structures. This product was used at McInnis Clubhouse, juvenile hall, the roads department building, and others.

* Product verified by the Organic Materials Review Institute (OMRI) to meet federally-regulated organic standards used by certified organic food and fiber producers.

† Essentria IC3 contains active ingredients that fall under FIFRA 25B Minimum Risk category, and the active ingredients consist exclusively of rosemary oil, geraniol, and peppermint oil. However, this product was not certified by OMRI.

Conventional Pesticide Use



The diagram above shows conventional pesticide applications over the past five years. While there was a slight increase in 2018, the use of conventional pesticides has dramatically declined over the past five years. The 2018 application of Acelepryn and Banner Max II occurred at the San Geronimo Golf Course property, which was added as a new site in 2018. If only the properties that were cared for in 2017 are taken into account, the use of conventional pesticide application in 2018 decreases by 103 ounces. Additionally, Competitor was moved from the organics product list, where it appeared in 2017, because it was removed from OMRI's organic product database.

This is in keeping with the long-term strategy to favor manual methods supplemented with organic treatments while minimizing the need for synthetic chemical applications. IPM will vary each year based on the types of pests, risks, and conditions in the field.

Information from previous years and the full list of allowable organic and conventional pesticides is available at www.marincountyparks.org.

*Competitor was removed from OMRI's organic product database and is therefore no longer considered to be organic.

Conventional Pesticides Applied in 2018

Most conventional products used for outdoor landscapes were for golf course turf treatment and road medians.

Conventional* Products Used for Outdoor Landscape Maintenance

Acelepryn is an insecticide that was applied once in spring to control cutworms on the San Geronimo Golf course. This product is used in addition to non-chemical turf management practices such as thatch management, verticutting, and careful control of moisture to eliminate conditions that support fungus.

Banner Max II is a fungicide used to prevent pink snow mold and dollar spot fungus on the San Geronimo golf course. This product is used in addition to non-chemical turf management practices such as thatch management, verticutting, and careful control of moisture to eliminate conditions that support fungus.

Competitor is a surfactant, a substance that is added to a liquid to reduce its surface tension, thereby increasing its spreading and wetting properties. It was mixed with other products like Finalsan to increase efficacy. It was applied to weeds growing at the Bon Air Road and Sir Francis Drake Boulevard traffic medians, Rush Creek Frontage Road, and Alameda Del Prado. This product was removed from OMRI's organic product database and is therefore no longer considered organic.

Habitat, an herbicide with active ingredient imazapyr, is formulated specifically for aquatic and riparian areas. It is used in spot treatment as part of the Bay Area wide invasive Spartina project. Only 4 oz were applied this year to Hal Brown Marsh as part of the final stages of the battle against Spartina densiflora.

Specticle FLO, with active ingredient indazaflam, is a reduced-risk pre-emergent herbicide for the control of annual grasses, sedges, and broadleaf weeds. It was applied to Sir Francis Drake median one time in 2018.

WaspFreeze II, with active ingredient prallethrin, was applied to as few nests as possible, and only when a yellowjacket nest posed a health risk to the public or staff. These products were applied in limited quantities at various park sites during the summer and fall.

* Conventional pesticides are pest control substances or mixtures which contain active ingredients that are generally produced synthetically. If a product has not been verified by the Organic Materials Review Institute (OMRI) to meet federally-regulated organic standards, the Marin County IPM program lists it as "conventional," even if the active ingredient is naturally occurring.

The use of conventional products for indoor structures was to control insects like cockroaches and ants.

Conventional* Products Used for Indoor Structural Pest Control

DominAnt is a liquid ant bait containing borax, which can be transported to any colony queens to eliminate issues related to ants within structures. This product is paired with preventative methods such as sealing cracks and removing food sources from nearby nests. Ants are only managed in areas where they are a nuisance or threat to human health.

Gentrol Point Source is an insect growth regulator containing hydroprene, which translocate into cracks and crevices from a small plastic point source device. This product was used to control cockroaches at the Marin County Civic Center Exhibit Hall.

Maxforce FC Roach bait station is a product used to control German or brown-banded cockroach populations in structures. Cockroaches are only managed in areas where they are a nuisance or threat to human health.

Niban uses boric acid, a low-toxicity mineral, to control insects. It was used to treat fruit flies at McInnis Park clubhouse.

Terro PCO also uses boric acid and was used to aid controlling ants and other crawling insects at multiple structural sites including the civic center interior and Gnoss Field buildings. This product uses borax as its active ingredient and was used in protected bait stations.

* Conventional pesticides are pest control substances or mixtures that are generally produced synthetically. If a product has not been verified by the Organic Materials Review Institute (OMRI) to meet federally-regulated organic standards, the Marin County IPM program lists it as “conventional,” even if the active ingredient is naturally occurring.

2018 IPM Maintenance Log

Parks

TARGET PEST	ORGANIC METHODS	CONVENTIONAL METHODS	OBJECTIVE
Cutworms		Acelpryn (40 oz)	
Denseflower Cordgrass ***(Spartina densiflorens)***	Hand pull Tarping	Habitat (4 oz)	
Rodents	Building modifications Landscaping removal Owl boxes Sanitation modifications Trapping		
Turf Mold	Civitas (2505 oz) Compost tea Equipment sanitation Irrigation management Verti-cutting	Banner Maxx II (42 oz)	
Uruguayan Creeping Water Primrose ***(Ludwigia peploides sp.)***	Hand pull		
Wasps	Early season queen trapping	Waspfreeze II (120 oz)	
General Weeds	Hand pull Irrigation management Mulch Power tools		

OBJECTIVE ICON LEGEND

- Protect Habitat
- Prevent injury or spread of pathogens
- Reduce Fire Fuel
- Roadway Safety
- Engage Volunteers
- Preserve Visual or Recreational Qualities

2018 IPM Maintenance Log

Roads and Medians

TARGET PEST	ORGANIC METHODS	CONVENTIONAL METHODS	OBJECTIVE
General Weeds	Finalsan (5625 oz) Hand pull Mulch Power tools	Competitor (56 oz) Specticle Flo (12 oz)	

Structures

TARGET PEST	ORGANIC METHODS	CONVENTIONAL METHODS	OBJECTIVE
Ants, Spiders, Field Roaches	Essentria IC3† (6094 oz)	DominAnt (11oz) Terro PCO (20 oz)	
Cockroaches		Maxforce FC Roach Bait Station (0.7 oz) Gentrol Point Source (.009 oz)	
Fruit Flies / Flying Insect		Niban Granular/Nibor (8 oz)	
Rodents	Building modifications Landscaping removal Owl Boxes Sanitation modifications Trapping		

OBJECTIVE ICON LEGEND

- Protect Habitat
- Reduce Fire Fuel
- Engage Volunteers
- Prevent injury or spread of pathogens
- Roadway Safety
- Preserve Visual or Recreational Qualities

† Essentria IC3 contains active ingredients that fall under FIFRA 25B Minimum Risk category, and the active ingredients consist exclusively of rosemary oil, geraniol, and peppermint oil. However, this product was not certified by OMRI.

2018 IPM Maintenance Log

Landscaped Areas

TARGET PEST	ORGANIC METHODS	CONVENTIONAL METHODS	OBJECTIVE
Acacia *(Acacia spp.)*	Hand pull Power tools		
Juniper *(Juniperus spp.)*	Hand pull Power tools		
General Weeds	Hand pull Irrigation management Mulch Power tools		

OBJECTIVE ICON LEGEND

- Protect Habitat
- Reduce Fire Fuel
- Engage Volunteers
- Prevent injury or spread of pathogens
- Roadway Safety
- Preserve Visual or Recreational Qualities

Proposed Changes to 2019 Products List

2019 Proposed Product Addition and Eliminations

There is one proposed addition to this year's allowed products list. There were no products proposed for elimination in 2019.

Fresh Cab Botanical Rodent Repellent was granted an exemption to be used in the Civic Center Garage in 2018 and will continue to be used on an as-needed basis in 2019. This product uses wood chips soaked in balsam fir oil to repel rodents with a strong scent.

In 2018, the most significant product exemptions were for turf treatments.

County Ordinance 3598 governs the Marin County IPM program. Any events that differ from the policies laid out in the ordinance are considered violations.

Violations

1. On July 11 and August 29, 2018, Civitas was applied to San Geronimo Golf Course after the 2018 Civitas product exemption had expired on May 31, 2018. Exemptions must be issued to apply any product to turf areas. Civitas is a product containing active ingredient mineral oil, which is used to treat turf mold. Because this product is used exclusively on turf, all applications require an exemption. A new exemption was acquired on October 24th, 2018, after which Civitas could be applied without a violation.

A product that is not on the list of allowable pesticides may be approved for a specific and limited purpose by the IPM coordinator. These are considered limited-use exemptions.

Exemptions

1. On October 4, 2018, and exemption was issued for the product Companion, with active ingredient Bacillus subtilis. This is a bacterial inoculation to prevent turf mold from spreading. This product was not used in 2018.

2. On February 28, 2018, and exemption was issued for PT Waspfreeze II with active ingredient prallethrin. This product is on the county's allowed products list; however, the exemption allows for application in an emergency without the required 4 days' notice typical of this product. This product was used at various sites throughout the wasp season.

3. On May 8, 2018, an exemption was issued for product Acelepryn G, with active ingredient chlorantraniliprole. All applications of any EPA registered pesticide on turf areas requires a product exemption. This product was used once in 2018 in order to treat cutworms at San Geronimo Golf Course.

4. On May 9, 2018, and exemption was issued for Finalsan-O, with active ingredient ammoniated soap of fatty acids. This product is chemically identical to the Finalsan product on our list, but due to inaccuracies within the OMRI database, it was initially believed that Finalsan was not OMRI-certified. Because Finalsan-O is OMRI, certified, the county applied for an exemption to replace Finalsan with Finalsan-O. Once it was discovered that both products were indeed OMRI-certified, and the error was within the OMRI database, use of Finalsan continued. Finalsan-O was not applied in 2018.

5. On June 4, 2018, an exemption was issued for Fresh Cab, a scent-based pouch of wood chips and natural oils, with active ingredient balsam fir oil and other fragrance oils. This product was used in the form of a sachet placed under the hood of county vehicles in order to prevent rodents from being attracted to vehicle fluids and warmth. Fresh cab required an exemption because, when it was temporarily discontinued in 2017, it was not added to the 2018 allowed product list. When the product went back into production, the exemption was issued for use in county vehicles.

6. On February 2, 2018, and again on October 22, 2018, an exemption was issued for the product Civitas. Civitas, with active ingredient mineral oil, is used to reduce fungus on the San Geronimo Golf Course greens and requires an exemption due to application on turf.

7. On February 2, 2018, and again on October 22, 2018, an exemption was issued for the product Banner Maxx II. Banner Maxx II, with active ingredient propiconazole, is a systemic fungicide that was used to kill pink snow mold, which would otherwise make the San Geronimo Golf Course greens unplayable. This product was used twice in 2018.

Education and knowledge sharing strengthen the IPM program.

Annual Training

In 2018, including seasonal workers, 30 full-time Parks and Landscape staff held their Qualified Applicators Certificate (QAC), which provides a technical and safe knowledge-base in the event pesticides applications are needed. Individuals holding this certificate are required to complete 10 hours per year of continuing education on the topics of IPM and other landscape-related issues.

In addition to this cumulative 300 hours per year of staff development, Parks and Landscape staff members involved with IPM also participate in an annual 4-hour training program focused on the **Safe Handling and Use of Pesticides**. The four-hour class includes:

- use of OMRI (Organic Materials Review Institute) and commercial pesticide applications
- proper use of equipment
- personal protective gear
- organic alternatives to commercial chemicals
- best management practices to reduce the need for applications
- mapping sites
- monitoring
- reading pesticide recommendations
- reading a chemical label

Other training topics include:

- IPM methodology and practices
- calibration of equipment
- laws and regulations
- insect and weed identification
- turf management
- plant diseases
- proper sheet mulching
- best management practices

Continuing Education

Throughout the year, staff also attend trainings and seminars to stay up to date on current IPM issues, research, and best management practice.
In 2018, members of the IPM staff attended:

- UC Davis Aquatic Weed School (2 day course)
- Cal Invasive Plant Council (IPC) Symposium (4 days)
- UC Berkeley Sudden Oak Death project supervisor training
- Bartlett Tree Service disease prevention workshop
- Trainings on alternative chemical products
- Sonoma County Landscape Pest Control Seminar
- “Pesticides, People, and Pollinators” training through Marin Master Gardeners

Marin County IPM Trends and Emerging Threats

Early detection. Marin County's IPM staff works closely with other departments and organizations to diagnose emerging threats. Once identified, Marin County responds rapidly to the threat while collaborating with other agencies on shared solutions. Staff will continue to prioritize prevention, early detection, and rapid response for aggressive invasive species like Japanese knotweed.

Proactive planning. Staff are working proactively to develop plans to address the emergence of highly invasive and extremely harmful pests. Processes are being formalized and communication between departments is being improved.

Multi-pronged solutions. Targeted sites often require multiple, phased methods, with high levels of monitoring and treatment frequency. Conventional product applications continued to decline, being reserved for critical use when other options are not feasible.

Data-driven IPM. Pilot programs, shared reporting among IPM practitioners, monitoring, and analysis of organic methods are helping to identify the most effective and ecologically sound solutions.

Collaboration. Because common challenges exist across the Bay Area, staff continue to collaborate with and learn from partners across the region.

Physical labor. Non-chemical IPM depends on persistent hands-on work, such as digging out, hand pulling, and weed wrenching. Successful ecological IPM requires more person hours.

Weed tolerance. Public perceptions of a well-manicured ornamental landscape may need to shift, to accommodate healthy ecosystems maintained without pesticides that include non-harmful weeds.

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.

Fire. With increased temperature comes increased threat of fire. Because our parks, county offices, and roadside landscapes border residential areas, community safety must continue to be a top priority. IPM offers opportunities to simultaneously reduce fire fuel and manage pests.


Marin County Parks continuously tracks new developments in IPM, to evolve and adapt its program.

Marin County Parks IPM Team

Jim Chayka
Parks and Open Space Superintendent, Integrated Pest Management Program Coordinator

Jim Chayka has worked for 20 years in the fields of natural resource management, watershed restoration, and environmental stewardship. Prior to joining Marin County Parks, Jim served as Director of Natural Resources at Conservation Corps North Bay—a regional program dedicated to developing and engaging youth through environmental stewardship. As a consultant with Watershed Sciences and the Urban Creeks Council, Jim spent 10 years as a fluvial geomorphologist supporting research and restoration efforts throughout Bay Area watersheds. Jim has also held leadership positions with FireSafe Marin, East Bay Conservation Corps, the Student Conservation Association, and the Sonoma Ecology Center.

Jim holds the following degrees, licenses, and certifications: a BA in Political Science and a MS in Geosciences; Parks and Recreation Professional (CPRP) certification through the National Recreation and Parks Association; C-27 Landscape Contractors License; Qualified Stormwater Pollution Plan Developer & Practitioner (QSD/QSP); Certified Professional in Erosion and Sediment Control (CPESC).

Katherine Knecht
Integrated Pest Management Specialist

Katherine joined the IPM team in February 2018, bringing experience with education programming, habitat restoration planning, and volunteer coordination. After growing up in Mill Valley, San Rafael, and Novato, she obtained a B.S in Environmental Studies with an emphasis on ecological systems and habitat restoration from UC Santa Barbara. Her graduate thesis focused on salmonid habitat restoration project planning on the Columbia River, which was accompanied by work managing Japanese knotweed in Clark County Washington. In 2015, she worked as a program coordinator and educator at an outdoor and environmental education facility and is thrilled to have the opportunity to bring these skills and experience home to serve Marin County as IPM specialist.

Kirk Schroeder
Volunteer Program Coordinator

Kirk Schroeder has worked at Marin County Parks for 18 years, and has 12 years of experience organizing volunteers. In his current role he coordinates volunteers to support non-chemical IPM in County parks, multiuse pathways, and other landscape service areas. He began his career as a seasonal extra-hire and moved up to Park Ranger and Supervising Ranger positions. Kirk graduated from University of California, Santa Cruz with a bachelor's degree in Fine Art, and is a certified professional lifeguard.

Glossary

Active Ingredient. Active ingredients are the chemicals in a pesticide product that act to control the pests. Active ingredients must be identified by name on the pesticide product's label together with its percentage by weight. An "active ingredient" prevents, destroys, repels, or mitigates a pest, or is a plant regulator, defoliant, desiccant, or nitrogen stabilizer.

Biological Control. A method of controlling pests using predators, parasites, pathogens, and competitors. An example of biological control is releasing green lacewings to control aphids.

Conventional Pesticide. Pest control substances or mixtures of substances that are generally produced synthetically. Synthetic products are man-made by a synthetic or chemical process as opposed to occurring naturally. To avoid confusion with organic standards, the Marin County IPM program lists all non-OMRI verified pesticides as "conventional" even if the active ingredient is naturally occurring.

Cultural Control. A method of controlling pests by changing work practices to reduce pest establishment, reproduction, dispersal, and survival. Changing irrigation practices to reduce the amount of root diseases and weeds is an example of cultural control.

Fungicide. A substance or preparation used to kill fungi, including blights, mildews, molds, and rusts.

Herbicide. A substance or preparation used to kill weeds and other plants that grow where they are not wanted.

Insecticide. A substance or preparation used to kill insects and other arthropods.

Integrated Pest Management (IPM). An ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

Mechanical Control. The management and control of pests using physical means such as weeding, mowing, fences, or barriers.

Organic Materials Review Institute (OMRI). A 501(c)(3) nonprofit organization providing organic certifiers, growers, manufacturers, and suppliers an independent review of products intended for use in certified organic production, handling, and processing.

Organic Pesticide. Pest control substances or mixtures of substances that are compliant with USDA National Organic Program standards. In the United States, the term "organic" is federally regulated and governed by standards in the Code of Federal Regulations when used on food or fiber products. When the Marin County IPM program uses the term "organic," it refers to pesticides verified by OMRI to meet federally-regulated organic standards used by certified organic food and fiber producers.

Pest. Pests are organisms that damage or interfere with desirable plants in fields and orchards, landscapes, or wildlands, or damage homes or other structures. Pests also include organisms that impact human or animal health. Pests may transmit disease or may be just a nuisance. A pest can be a plant (weed), vertebrate (bird, rodent, or other mammal), invertebrate (insect, tick, mite, or snail), nematode, pathogen (bacteria, virus, or fungus) that causes disease, or other unwanted organism that may harm water quality, animal life, or other parts of the ecosystem.

Pesticide. A pesticide is any substance or mixture of substances intended for: preventing, destroying, repelling or mitigating any pest; use as a plant regulator, defoliant, or desiccant; or use as a nitrogen stabilizer. Fungicides, herbicides, insecticides, and rodenticides are all types of pesticides.

Pesticide Precautionary Statements. Each pesticide product label is required to bear hazard and precautionary statements. These provide the pesticide user with information regarding the toxicity, irritation and sensitization on hazards associated with the use of a pesticide as well as treatment instructions and information to reduce exposure potential

Pesticide Product Label. The written, printed, or graphic matter on, or attached to, the pesticide or device or any of its containers or wrappers. It provides critical information about how to safely and legally handle and use pesticide product. Unlike most other types of product labels, pesticide labels are legally enforceable, and all of them carry the statement: "It is a violation of Federal law to use this product in a manner inconsistent with its labeling."

Pesticide Toxicity Category. The EPA established four Toxicity Categories for acute hazards of pesticide products, with "Category I" being the highest toxicity category. Acute toxicity studies examine a product's toxicity as it relates to six different types of exposures (acute oral, acute dermal, acute inhalation, primary eye irritation, primary skin irritation, and dermal sensitization). The product is assigned a toxicity category (I–IV) for each type of exposure based on the results of five of the six studies.

Rodenticide. A substance or preparation used to control mice and other rodents.