

INTEGRATED PEST MANAGEMENT 2016

Annual Report

Prepared by Marin County Parks



Marin County Parks, in collaboration with other County departments, administers IPM (Integrated Pest Management) for the County of Marin. Overseen by the Integrated Pest Management Commission, the program is governed by County Ordinance 3598.

2016 Summary



Keeping Marin County safe and healthy.

Marin County is a leader in ecologically sound IPM (Integrated Pest Management).

Marin County is a regional and national leader in non-chemical IPM alternatives. In 2016, Parks successfully managed 126 sites without pesticide, including zero glyphosate and zero rodenticide across all sites governed by the County's IPM ordinance. To achieve this success, volunteer, staff, and contracted work hours dedicated to non-chemical IPM increased by 16%.

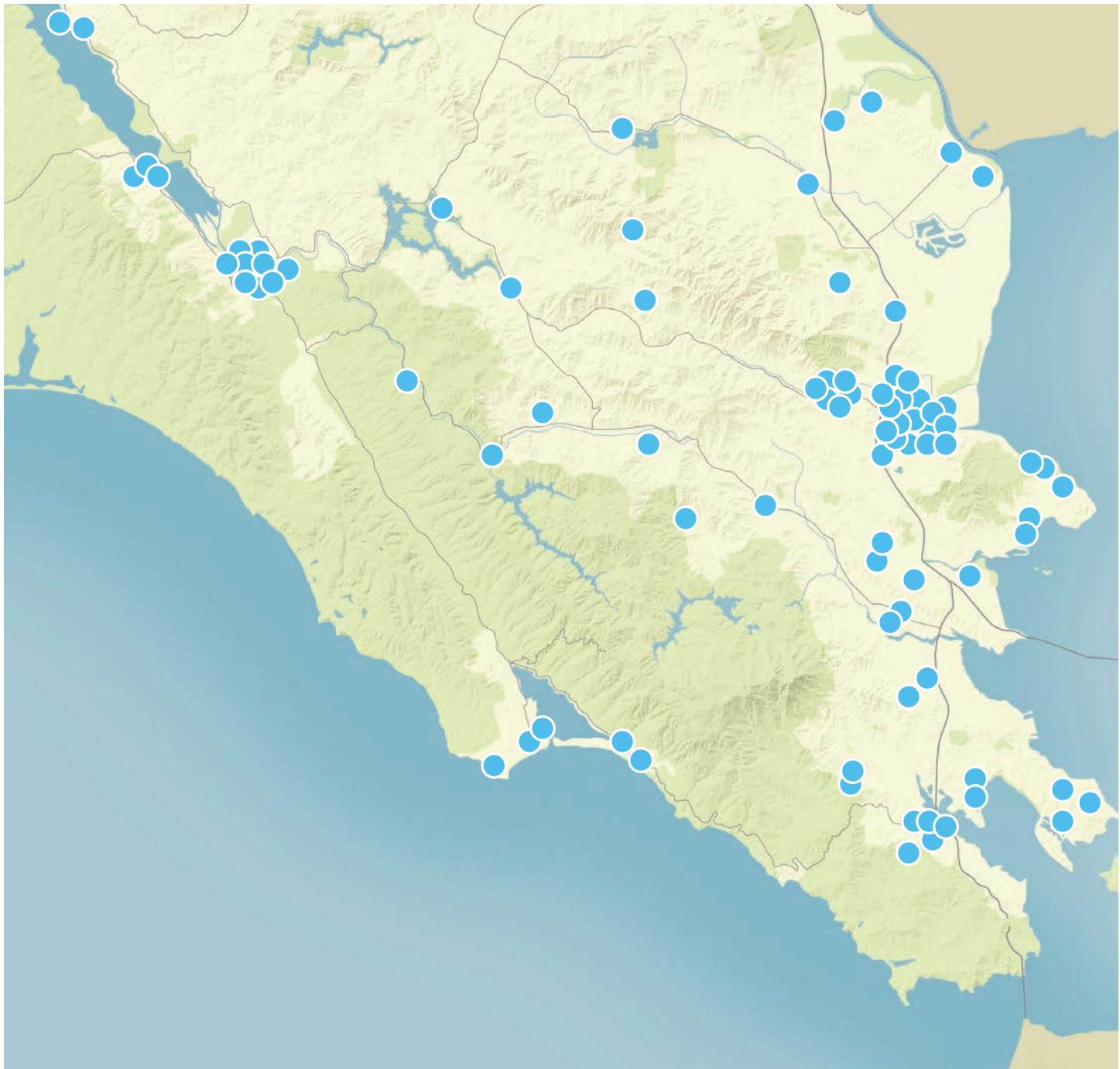
Sound IPM employs a creative, comprehensive strategy. Not all pests are a problem. By continuously monitoring plant and animal populations, Marin County's IPM team focused on pests that affected safety or were likely to damage locations used for public recreation and County services. Each location was individually assessed. Treatment choices were based on level of risk, severity, timing, effectiveness, available resources, and cost. Multiple methods were often employed, including hand-pulling, compost tea, mulching, and mowing. The IPM program also consisted of contract oversight, reporting, communication, and coordination with the County's Agricultural Commissioner and the State Department of Pesticide Regulation.

Marin County's IPM program continues to evolve, based on best practices, shared knowledge, and pilot programs. The Pesticide Research Institute in Berkeley provided Marin County with valuable product evaluations. Networking with other regional IPM agencies, such as the San Francisco Department of the Environment, helped the County navigate through shared challenges. In July, Marin County began a pilot program with no glyphosate on traffic medians and roadside landscapes. Four seasons of data will indicate if these methods can effectively address median weeds without affecting driver visibility and safety.

Ornamental landscape IPM differs from wild land management. Keeping a playground or golf course healthy for recreational use is vastly different from managing large tracts of open space, where invasive plants can fuel wildland fires and put endangered species at risk. Nature is always changing. So our IPM solutions must be flexible, adaptable, and varied, and specific to distinct and diverse locations, to optimize well-being for the people, plants, and animals in Marin County.

IPM Governance

Marin County Ordinance 3598 governs park and ornamental landscape IPM.



County ordinance 3598 governs IPM for parks, libraries, fire stations, office buildings, traffic medians, other buildings, and other ornamental landscapes on County properties across Marin.

Integrated Pest Management Commission

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.

The County's IPM program covers County parks and libraries, the County jail, County government offices, and traffic median sites 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 that may present a public health hazard.



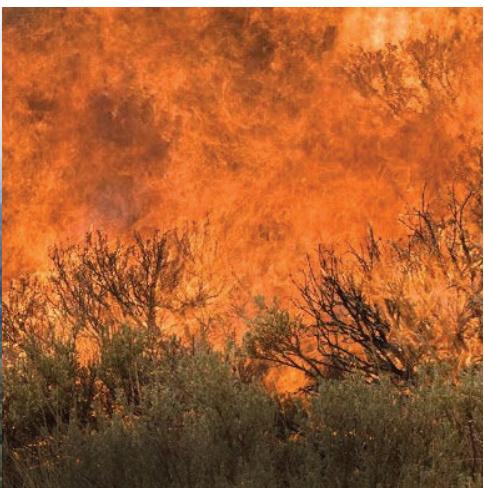
The County's IPM program cares for heavily populated locations where insects, rodents, and weeds may present a public health and safety hazard.

Open Space Vegetation Management

Open Space Vegetation Management is not covered in this report. Open space preserves have significantly different conditions, management objectives, and risk factors:

- 19,000 wildland acres
- 1,671 acres actively managed for hazard reduction
- natural ecosystems threatened by accelerating invasive plant infestations
- wildfire risk to 35,000 residents living within 500 feet of an open space preserve
- rare and endangered species protection
- farms and ranches at risk of spreading invasive vegetation

Marin County's 34 open space preserves are governed by the seven-member Parks and Open Space Commission. For more information about Open Space Vegetation Management visit marincountyparks.org.



Marin County's IPM Ordinance does not cover open space preserves, which are governed by a different authority.

2016 Achievements

In 2016, Marin County maintained 126 sites without pesticides.



No pesticides were used when maintaining the Mill Valley//Sausalito bike path in 2016.

2016 Achievements

In 2016, Marin County IPM program used zero glyphosate-based products.

Marin County has committed to discontinue the use of glyphosate within regional park facilities and reserve its use solely for defined critical uses. **Due to successful pilot programs, no critical uses requiring glyphosate were identified in 2016.** This allowed the County to manage pests and invasive plants with zero glyphosate at County parks and ornamental landscape locations.

Per the IPM program's allowed products list, which is approved by the County Board of Supervisors, products containing glyphosate may be applied for these critical uses:

- mitigating a significant risk to public safety (wild fire, traffic or pedestrian safety, worker safety)
- protecting critical habitats
- fighting invasive or exotic species that pose a threat to local agriculture



Marin County 's IPM program focuses on health in recreational facilities.

2016 Achievements

Marin County continued maintaining the Civic Center without synthetic chemicals.



Civic Center's ornamental landscape is maintained using sticky traps, hand cleaning of foliage, selective leaf removal and plant replacement, and the release of beneficial predatory insects (Encarsia, Cryptolaemus, Orius, minute pirate bugs, predatory mites and Delphastus).

2016 Achievements

Marin County Parks is committed to rodenticide free IPM.

By eliminating rodenticides, Marin County keeps parks healthy for people, as well as wildlife that consume rats and mice.

Rat and mice **trapping** continued to minimize rodent damage. In 2016 there were very few reports of rodent sightings or damage, particularly at the Civic Center campus and McNear's Beach Park.

Owl boxes at various park sites, including Civic Center, continued to be maintained and productive, housing owls that aided rodent control.

Ground squirrel burrows can weaken building foundations, damage utility lines, and cause trip hazards. When a risk was identified, **burrow modification** and trapping helped manage ground squirrels.

Other pests are also addressed with an organic first approach. Predatory yellowjackets have venom that can cause life-threatening anaphylactic shock. **Yellowjacket traps** are systematically and routinely placed in early spring. Other IPM options are used only when yellowjackets continue to threaten visitors or staff.



Public health concerns require controlling rats, mice, and yellowjackets in County parks.

2016 Achievements

In 2016, McInnis golf course was maintained with mostly organic methods.



The greens at McInnis Golf Course were managed with an organic first approach, including compost tea, hand weeding, mowing, and other non-chemical alternatives.

2016 Achievements

Year-over-year, volunteers, staff, and contractors spent 16% more time on non-chemical IPM.

In 2016, volunteers spent 7,983 hours **weeding, picking up litter, spreading mulch, removing invasive species**, and performing other non-chemical methods in support of the County's IPM program.

Staff, contractors, and volunteers spread over **750 yards of mulch** and installed **hundreds of square feet of cardboard sheet mulching**, in an effort to offset synthetic herbicide use.

Turf management practices, including **fertilization, verti-cutting, topdressing, over-seeding and irrigation**, have maintained acceptable levels of weeds and disease in turf areas.

Parks staff has initiated a **tarping** experiment to evaluate an alternative control option for the invasive weed pest *Lepidium* at the White House Pool day use area in west Marin.



Non-chemical IPM requires hands-on field work and special machinery.

2016 Achievements

20 full-time employee equivalents supported non-chemical IPM in 2016.

Labor Hours by Month

Month	Staff IPM	Volunteer IPM	Contractor IPM	Total Hours
January	1782	653	688	3,123
February	1878	509	726	3,113
March	2491	814	860	4,165
April	2538	1299	727	4,564
May	2653	354	702	3,709
June	2858	340	712	3,910
July	2571	288	721	3,580
August	2208	444	761	3,413
September	2362	1130	757	4,249
October	1911	434	730	3,075
November	1730	320	706	2,756
December	1906	501	718	3,125
Total Hours	26,888	7,086	8,808	42,782

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%

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

2016 Achievements

Community partnerships are an essential component of non-chemical IPM.

In 2016 the **Invasive Spartina Project** (ISP) successfully reduced this harmful invasive weed at Hal Brown Park in Creekside. It can now be managed by monitoring and hand pulling. Volunteer Sandy Guldman led the multi-year effort, which balanced persistent hand work with targeted product applications.

Through **One Tam**, the **Linking Individuals to their Natural Community (LINC)** youth stewardship program worked in Stafford Lake Bike Park, removing weeds and compacting trail surfaces. Additional One Tam volunteer groups supported workdays at other locations.

Students and Teachers Restoring a Watershed (STRAW) brought over 60 students, parents, and teachers to help Parks remove weeds and plant native plants along a seasonal creek. STRAW staff also participated in work days at Stafford Lake Park.

Seventy-five **STEM (Science, Technology, Engineering, and Math)** students participated in a large sheet mulching project at Stafford Lake Park, to control invasive weeds.

Many other community groups and schools worked to support the IPM program, including:

Alpha Gamma Sigma Service Club,
College of Marin

Bachich School
Greenplay Camp

Greenwood School
Hall Middle School

Marin Primary and Middle School

Miller Creek Middle School
Redwood High School

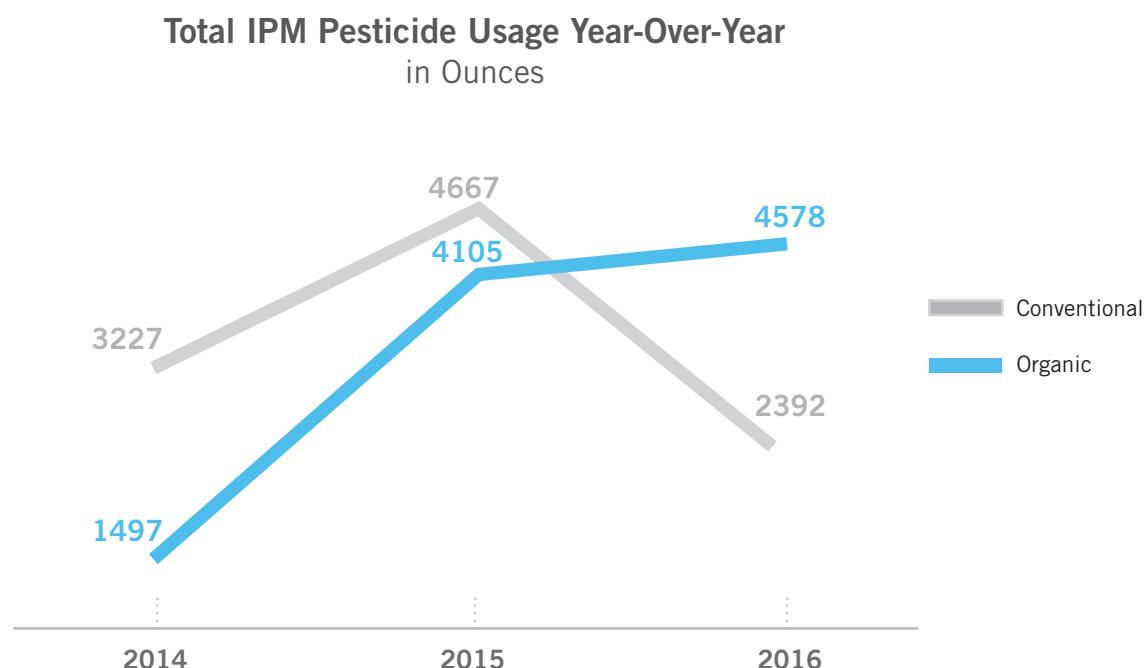
San Marin High School



Volunteer Sandy Guldman led a multi-year effort to remove Spartina from Hal Brown Park at Creekside. Many local community groups provided the volunteers necessary for supporting Marin County's IPM program.

Pesticide Usage Charts

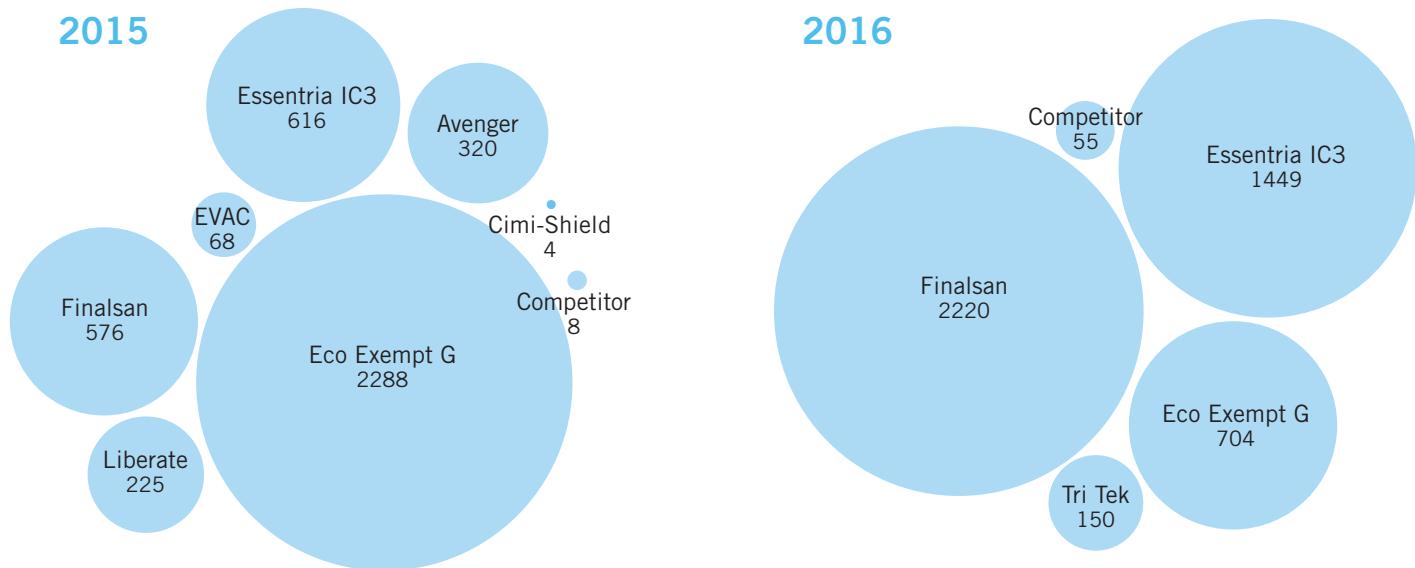
Conventional Pesticide Usage Declined Significantly in 2016



Conventional pesticide use declined by 49% in 2016. Conditions this year allowed Marin County Parks to successfully implement IPM using a minimal amount of synthetic chemicals. The use of organic pesticides increased slightly, indicating that manual methods, such as weed pulling, were a significant component of IPM in 2016. The long term strategy is to favor manual methods, and supplement with organic treatments, minimizing the need for synthetic chemical applications. IPM will vary each year based on the types of pests, risks, and conditions in the field.

Pesticide Usage Charts

Organic Pesticides Proportional Usage Increased 12% Year-Over-Year
in Ounces



Total amount of organic product usage increased by 12% in 2016. Parks reduced the number of organic products used. Avenger, Cimi-Shield, Companion, EVAC, Liberate, and Neem Oil were not used in 2016.

Organic Pesticides Used Year-Over-Year in Ounces

Name	2014	2015	2016
Avenger	0	320	0
Cimi-Shield	0	4	0
Companion	960	0	0
Competitor	3	8	55
Eco Exempt G	60	2288	704
Essentria IC3	2554	616	1449
EVAC	0	68	0
Finalsan	13.5	576	2220
Liberate	170	225	0
Neem Oil	35	0	0
Tri Tek	0	0	150
Total	3795.5	4105	4578

Organic Pesticides Applied in 2016

Organic product alternatives were an integral component of IPM in 2016.

Organic Products Used for Outdoor Landscape Maintenance

Competitor is an herbicide adjuvant. This organic material is usually mixed with systemic herbicides to improve treatment efficacy.

Finalsan is a burn down herbicide used as a glyphosate alternative. It was applied to weeds growing in the hardscape and landscape planters at the Health and Wellness Center, Bon Air Road and Sir Francis Drake Boulevard medians, and Rush Creek Landscape Frontage Road. This product has proven to be more effective than Avenger. However, efficacy is significantly reduced when ambient temperatures are cool and weeds are larger than two to four inches.

Tri-Tek is an OMRI certified mineral oil based insecticide and miticide. It suffocates eggs, larvae, and nymphs as well as soft-bodied adult insects. This product was used on the Bon Air and Sir Francis Drake Boulevard medians to control spider mites, armored scales, soft scale, and mealybugs.

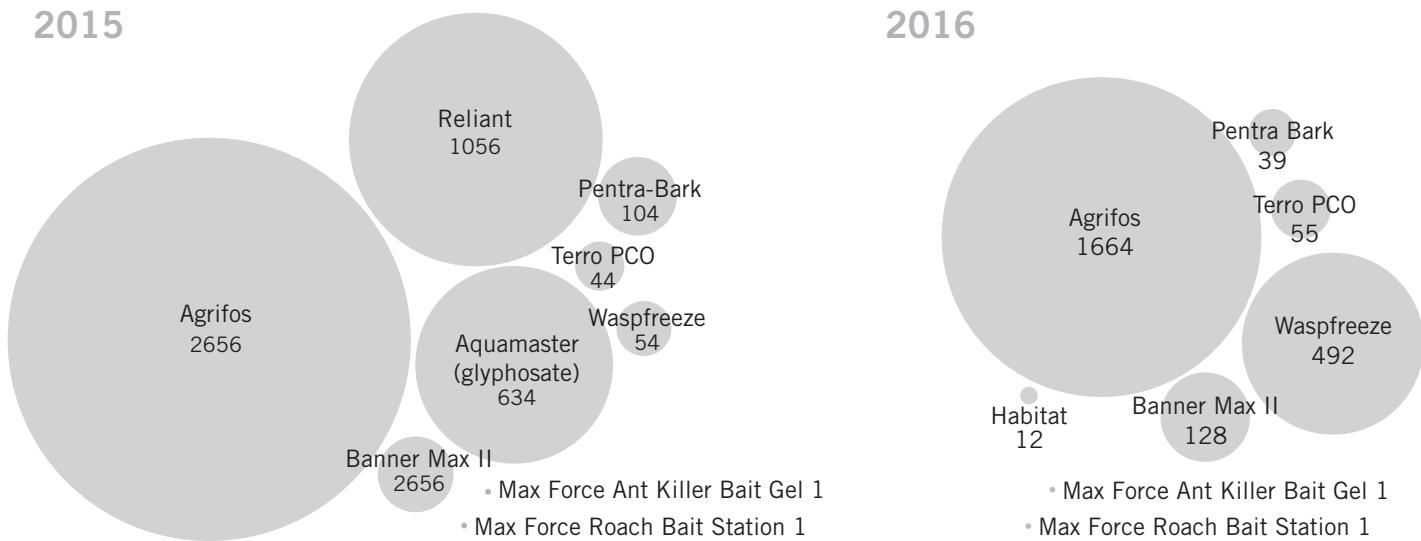
Organic Products Used for Indoor Structural Pest Control

Eco Exempt G is a plant oil based granular Insecticide. Active ingredients include essential plant oils such as clove and thyme. It was used to treat crawling and flying insects at the County jail facility.

Essentria IC3 is an organic, broad-spectrum 25(b) insecticide. Active ingredients include essential plant oils such as rosemary and peppermint. It was used to treat crawling insects at the County garage, 10-20 North San Pedro Road, Juvenile Services Center, Civic Center, and 120 North Redwood.

Pesticide Usage Charts

**Conventional Pesticide Proportional Usage Declined 49% Year-Over-Year
in Ounces**



Overall, 49% less conventional product was applied in 2016 compared to the previous year. Yellowjacket activity spiked this past year. Only yellowjacket nests adjacent to picnic areas trails, or pathways were treated, in an effort to protect members of the public and staff.

Conventional Pesticides Used Year-Over-Year in Ounces

Name	2014	2015	2016
Agrifos	2048	2656	1664
Aquamaster (glyphosate)	741	634	0
Banner Maxx II	128	93	128 (exemption)
Fusilade II	22	0	0
Habitat	0	0	12
Max Force Ant Bait Gel	1	1	1 (special use)
Max Force Roach Bait Gel	0	1	1 (special use)
Pentra-Bark	72	104	39
Reliant	0	1056	0
Terro PCO	58	44	55 (special use)
Waspfreeze	123	54	492
Total	3227	4667	2392

Conventional Pesticides Applied in 2016

In 2016, Marin County Parks decreased application of conventional products.

Conventional Products Used for Outdoor Landscape Maintenance

Agrifos is a fungicide used as a preventative treatment for high value oak trees, to reduce susceptibility to Sudden Oak Death. 2016 treatments focused on the oak trees throughout the Greenbrae (CSA-16) non-pedestrian medians.

Banner Maxx II was used to treat a Pink Snow Mold outbreak at the McInnis Golf Center. Usage totals continued their downward trend as a result of aggressive non-chemical IPM efforts by course staff, including a new compost tea program for the tees and greens.

Habitat was used at Hal Brown Park as part of the Invasive Spartina removal project. It was also used in single treatments at McInnis Park and McNears Beach Park to control invasive Pepperweed.

Pentra-Bark surfactant was used in conjunction with Agrifos as a preventative treatment to the high value oak trees in the Greenbrae (CSA-16) area.

Waspfreeze applications were made to as few nests as possible, and only when a yellowjacket nest posed a health risk to the public or staff.

Conventional Products Used for Indoor Structural Pest Control

Terro PCO was used to aid controlling ants and other crawling insects. This product was used in protected bait stations.

Max Force Ant bait gel and Max Force Roach bait gel were used to control insects at Marin Center Exhibit Hall and at the 1600 Los Gamos complex. These products were applied through controlled bait stations.

Violations and Exemptions

The number of violations and exemptions were significantly lower in 2016.

Violations

1. On January 28, 2016 Gardener's Guild Inc. (GGI) applied TriTek, an organic product, to ornamental trees growing within Sir Francis Drake Boulevard and Bon Air Road medians. GGI used Crosshair, an adjuvant used to control drift as part of this application. Crosshair's active ingredient is Modified Vegetable Oil, Amine Salts of Organic Acids, and Organic Acid. The SDS consists of a **WARNING** rating due to the potential eye danger to the applicator. This product is not on the County's allowed products list, so was in effect a violation of IPM ordinance and policy. A notice of the violation was sent to the contractor, who acknowledged the error and committed to additional approval going forward, to avoid future utilization of products not on the allowed products list.
2. On September 15, 2016, Stafford Lake Park staff found four empty 12 ounce bottles of Ortho Poison Ivy control in the garbage can on the disc golf course, hole #8. Staff did not witness any application being made, nor were they able to locate the treated or affected area in follow up. It is likely that a rogue golfer took it upon themselves to bring in the ready-to-use product and make an application to poison oak growing adjacent to and possibly encroaching onto one of the tee boxes or holes along the course.

Exemptions

1. On January 22, 2016 an exemption to treat the turf (greens and tees) at the McInnis Golf Center with Banner Maxx II was issued to control an outbreak of Pink Snow Mold. Banner Maxx II is an allowed product. However, the County ordinance prohibits the treatment of designated turf areas. This exemption was needed to preserve the course.
2. On March 14, 2016 an exemption to treat the turf (greens and tees) at the McInnis Golf Center with Banner Maxx II was issued to control an outbreak of Pink Snow Mold. McInnis Golf Course staff elected not to move forward with this application as the weather conditions changed and alternative methods were able to control the outbreak.
3. On July 1, 2016 an exemption was requested by the Department of Public Works to try Fresh Cab Balsam Fir Oil rodent repellent as a possible replacement for EVAC, which has been discontinued by the manufacturer. The active ingredient is balsam fir oil. It comes in individual pouches which are installed in engine compartments of County fleet vehicles to deter rodents from entering and causing damage to vehicle wiring systems. This product is an EPA 25B exempt product due to its organic nature.
4. Exemption to advance posting requirement for Waspfreeze, to allow immediate response treatment of yellowjacket nests posing a threat to the public and/or staff.

Proposed Changes to 2017 Products List

Organic product alternatives continue to evolve.

2017 Proposed Product Addition

Marin County Parks proposes the addition of one organic structural product: **Fresh Cab Rodent Repellent**. This will replace EVAC botanical rodent repellent, which is no longer manufactured. Fresh Cab has the same active ingredient, balsam fir oil to repel rodents.

2017 Proposed Product Eliminations

Marin County Parks proposes the elimination of **Barricade**. This is a pre-emergent herbicide slated for elimination. Specticle FLO, a safer, alternative pre-emergent herbicide, will be tested against weeds on Sir Francis Drake Boulevard medians in winter 2017.

Marin County Parks also proposes the elimination of **Gentrol**, an insect growth regulator on the structural pesticide list. This product has not been used for a long period and was used to control food storage pests. There are safer and more effective alternatives on the existing list.



CC Ian Jacobs



Product applications are targeted and minimized.

Education and Training

Parks staff are dedicated to learning IPM best practices.



Irrigation system repair and maintenance was a component of IPM at Lagoon Park.

Education and Training

Education and knowledge sharing strengthen the IPM program.

Annual Training

Parks and landscape staff members involved with IPM participate in an annual training program, **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

Ongoing Training

Throughout the year, staff also attended **trainings on emerging IPM products, laws and regulations, and best management practices**. This year topics included:

- Sudden Oak Death management and preventative treatment
- plant health care
- use and impacts of organic mulch
- use of owls as a component of an IPM program
- rodent control methods
- soil composition and analysis

Knowledge Sharing

Staff routinely participated in **meetings with other Bay Area IPM personnel** to discuss current issues, alternative IPM methods, new products, best management practices, and the science behind IPM. This included:

- City & County of San Francisco Technical IPM Advisory Committee
- California Weed Science Society meetings

IPM Trends

Multi-faceted solutions. To minimize one stop shop conventional applications, IPM is becoming increasingly strategic and creative. Targeted sites often require phased, multiple methods, with higher levels of monitoring and treatment frequency. Conventional product applications continued to decline, being reserved for critical use when other options are not feasible.

Evolution of organic products. As the market for organic products widens, these products continue to evolve and improve, offering alternatives to conventional methods. In particular, pre-emergent, non-carcinogenic organic herbicides may offer increasing efficacy in weed control.

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.

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.



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

Marin County Parks IPM Team



Paradise Park Lupine

Chris Chamberlain

Acting Assistant Director

Chris Chamberlain has over 20 years experience in Integrated Pest Management (IPM). He began his career as a ranger at Marin County Parks, which led to management positions with increasing responsibility at the Greater Vallejo Recreation District and the City of Richmond. He returned to Marin County in 2014 as a Parks Superintendent. Along with other responsibilities, he has managed the Marin County Parks IPM program for the past three years. Consulting with the County's Integrated Pest Management Specialist, Parks staff, other Bay area IPM practitioners, and community stakeholders, he has moved Marin County forward in ecologically sound IPM. He holds a Bachelor's degree in Parks and Natural Resource Management from California State University, Chico.

Albert Hom

Integrated Pest Management Specialist

Albert Hom has spent over 20 years in the field of Integrated Pest Management (IPM). Before joining Marin County as the Integrated Pest Management Specialist in 2014, he held positions as an Entomologist, IPM Coordinator, Senior Public Health Biologist and Program Manager. He has a Bachelor of Science in Biology and a Masters of Public Administration from California State University, Hayward. He is a Pest Control Advisor, Board Certified Entomologist, and a Registered Environmental Health Specialist.

Kirk Schroeder

Volunteer Program Coordinator

Kirk Schroeder has worked at Marin County Parks for 16 years, and has 10 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.