Contra Costa County Integrated Pest Management Advisory Committee

2014 Annual IPM Program Status Report

to the

Transportation, Water, and Infrastructure Committee of the Contra Costa Board of Supervisors

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Executive Summary

This year, the IPM Advisory Committee continued to explore

- how pest management decisions are being made in the County,
- transparency in the IPM Program, and
- the cost of alternatives to the use of herbicides in County landscaping.

In 2012, the Committee developed a form for documenting pest management decisions. Since then, the Departments have been using this form to document decisions for various pests. This year, the Agriculture Department developed three decision making documents for noxious weeds, and the Public Works Roadside and Flood Control Maintenance Division developed a document for the County's two airports. The Committee reviewed these documents thoroughly and found them to be useful for enhancing program transparency and for educating interested persons in the details and complexities of pest management in the County. The Committee recommends that the Departments continue to use the form to document pest management decisions.

Pesticide use by County operations decreased by 24% from FY 12-13. Pesticide use in this fiscal year (13-14) is 70% below the amount used in FY 00-01.

The Contra Costa County Department of Agriculture continued work on its noxious weed management program. The Department surveyed over 176,000 acres of public and private land, and treated 422 net acres of weeds. Last year the Department revised its treatment procedure for ground squirrels which resulted in a 51% reduction in the amount of treated grain bait that was used in FY 13-14 along County roads, levees, earthen dams, and railroad embankments.

In the Public Works Department, the Facilities Division continues to repair structural deficiencies in buildings to prevent the entry of pests. These deficiencies are prioritized and the backlog is addressed as time and resources allow. This summer, the Division went out to bid for its structural IPM contract, and Pestec was awarded the contract for another three years. This year the Grounds Division has again been able to increase its staffing, and with the added staff continues to work on improving the visual appearance of County grounds. As a result of the multi-year drought, the Division is seeing stressed and dying trees throughout the County. Staff are preparing plans to remove dead trees and where appropriate, plant new, drought tolerant species. The Roadside and Flood Control Maintenance Division used goats and/or sheep to abate weeds at 22 sites, a total of 275 acres, and is increasing its knowledge and experience with this management method.

Bed bugs remain a serious problem in the County, especially for those citizens who are least able to cope with the problem, such as the elderly, the disabled, and those with little means. The IPM Coordinator continues to provide information to these citizens about what they can do to prevent bites and reduce bed bug numbers. This year, the IPM Coordinator began work as a partner with the University of California on a grant to compare "conventional" bed bug treatments with an IPM approach. At least one field study site will be in Contra Costa County. The IPM Coordinator also worked with the Environmental Health Division and the City of Concord to clarify responsibilities and policies around dealing with bed bugs in Concord.

History of the IPM Advisory Committee

From 2002 to 2009, an informal IPM Task Force met to coordinate implementation of the IPM Policy that was adopted by the Board of Supervisors in November 2002. The Integrated Pest Management (IPM) Advisory Committee, a formal body, was created by the Board of Supervisors in November 2009. This report is the sixth annual status report from the IPM Coordinator and the IPM Advisory Committee.

Background on the IPM Advisory Committee

Purpose of the IPM Advisory Committee

The purpose of the Committee is to:

1. Protect and enhance public health, County resources, and the environment;
2. Minimize risks and maximize benefits to the general public, staff, and the environment as a result of pest control activities conducted by County staff and contractors;
3. Promote a coordinated County-wide effort to implement IPM in the County in a manner that is consistent with the Board-adopted IPM Policy;
4. Serve as a resource to help the Agriculture and Public Works Departments and the Board of Supervisors review and improve existing pest management programs and the processes for making pest management decisions;
5. Make policy recommendations upon assessment of current pest issues and evaluation of possible IPM solutions; and
6. Provide a forum for communication and information exchange among members in an effort to identify, encourage, and stimulate the use of best or promising pest management practices.

Members of the IPM Advisory Committee

Currently the Committee has a total of 13 seats consisting of voting and non-voting members.

The 8 voting members include

- One representative from Contra Costa Health Services
- One representative from the County Storm Water Program
- One representative from the County Public and Environmental Health Advisory Board
- One representative from the County Fish and Wildlife Committee
- One representative from an environmental organization
- Three at-large members of the public.

The 4 non-voting members include

- A representative from the Agriculture Department
- Two representative from the Public Works Department (Facilities Division and Maintenance Division)
- One representative from the County's pest management contractor

The Committee also has one public member alternate who only votes if one or more of the three at-large public members is absent from a meeting.

IPM Advisory Committee Priorities for 2014

In January of this year, the IPM Advisory Committee made the decision to focus its work for the year on the following three IPM program features:

A. IPM decision-making—documenting pest management decisions in the various IPM programs

B. IPM Cost Accounting—conducting a detailed cost analysis of one or two pest management issues including alternatives to pesticides

C. IPM Program Transparency—reviewing program transparency

The Committee formed three subcommittees to work on these priorities.

2014 Accomplishments of the IPM Advisory Committee and the IPM Coordinator

Accomplishments of the IPM Committee

The IPM Advisory Committee (the Committee) held 6 regular meetings and one extra meeting during 2014. The subcommittees held a total of 14 meetings to address the above priorities. The IPM Coordinator serves as staff to the Committee and the three subcommittees. The accomplishments of the IPM Committee and its subcommittees are as follows:

Priority A: IPM Decision-Making

Through the work of the subcommittee, the IPM Advisory Committee

1. Gained a detailed understanding of the complexities involved in making pest management decisions and the degree to which these decisions are site specific and require highly specialized experience and knowledge, and

2. Reviewed the following decision-making documents:
   - Agriculture Department:
     a. Artichoke thistle
     b. Purple starthistle
     c. Japanese knotweed
   - Public Works Roadside and Flood Control Channel Maintenance Division:
     a. Weed management at Buchanan and Byron Airports

   These are detailed text documents developed by the Departments and follow a form devised by the IPM Coordinator and the subcommittee. These documents are considered current as of the date on the document and may be updated in the future.

   See Attachment A for the decision making documents completed this year. See Attachment B for the subcommittee final report.

Priority B: IPM Cost Accounting

Through the work of the subcommittee, the IPM Advisory Committee

1. Reviewed the workings of the Grounds Division, including sites under management, weed management tactics (mechanical and chemical), other pest management practices, and budget issues that have limited the number of staff and the number of hours they can spend at County buildings for the past six years;

2. Gained an understanding of the complexities of managing County landscapes and the challenges faced by the Grounds Division;

3. Gained an understanding of the costs of maintaining different kinds of landscapes and the factors that contribute to those costs;
4. Researched costs of installing and maintaining artificial turf and concluded it was not the solution for reducing pesticide and water use, except perhaps at the animal shelter and in Head Start play yards;
5. Researched costs of installing and maintaining "sustainable" landscaping; and
6. Developed the following suggestions for the County:
    - The County could look for opportunities to change people's expectations regarding landscaping:
        a. People cannot expect perfect turf, or any other turf.
        b. People cannot expect County landscapes to be weed-free.
        c. During the dry season, and especially during times of drought, people cannot expect lush, green landscapes.
    - The Grounds Division could find opportunities to educate building occupants and citizens about tolerance for weeds and brown landscapes, especially during drought.
    - The County could consider developing a strategic plan for sustainable landscapes around County buildings.
    - The County could adopt a policy specifying that any new landscapes that are created, or any landscapes that are renewed should be planted with drought tolerant plants that are appropriate to the site and that are planted to minimize water use and maintenance costs.
    - Since we are in the midst of a several year drought, this is not the time to begin extensive landscape renovation projects.

See Attachment B for the subcommittee final report.

Priority C: IPM Program Transparency

Through the work of the subcommittee, the IPM Advisory Committee

1. Reviewed the new pesticide use posting website;
2. Reviewed the laws regarding public records requests and the County's process for addressing those requests; and
3. Reviewed the request from Parents for a Safer Environment for the Public Works Roadside and Flood Control Maintenance Division to report their pesticide use for creeks, roads, and real property separately.

    There is no easy way for Public Works to separate their pesticide use reporting to the County Agriculture Department. The Maintenance Division has no practical need to do so, and filing separate reports would entail extra work for their very limited staff. However, the Maintenance Division always collects separate data that is entered into their computerized maintenance management system, called Maintstar. The Department provided Parents for a Safer Environment with a Maintstar report to help them to separate pesticide use for themselves.

See Attachment B for the subcommittee final report.

Accomplishments of the IPM Coordinator

In addition to staffing the IPM Advisory Committee and working on the three subcommittees, the IPM Coordinator accomplished the following:

Bed Bugs

The common bed bug continues to be one of the most serious pests in the County, a pest that has provoked citizens to misuse pesticides to an alarming extent. Pesticides do not solve the problem, and in many cases make the problem worse. We increasingly see bed bugs affecting the citizens of Contra Costa who have the fewest resources to combat them.

The bed bug problem is increasing in the County

There is a sense that the bed bug problem is increasing in the County, but this is anecdotal since there is no coordinated effort in the County to collect data. The IPM Coordinator records each call for advice, but it is unclear how many calls other staff in the County are receiving that are not forwarded to the IPM Coordinator. We also have no way of knowing how many calls city staff receive. For the first time since 2009, a substantial number of complaints have come from West County. There are increasing numbers of complaints from Pittsburg and Antioch, as well as Walnut Creek, and it is generally acknowledged that there are numerous apartment complexes in Concord with severe infestations throughout the complex.

The County joins with U.C. Cooperative Extension on research to help low income residents of apartment complexes

Funding was received for a research proposal designed to compare the efficacy of IPM methods and conventional methods of bed bug management in multi-family dwellings. Among the collaborators in this research are the University of California Cooperative Extension, U.C. Riverside Department of Entomology, the Los Angeles and the San Francisco Housing Authorities, the Monument Impact in Concord, three pest management companies, and the IPM Coordinator. At least one field study site will be located in Contra Costa County. Work began this year with designing surveys for tenants, property owners, and pest control companies in order to assess baseline knowledge of bed bugs and their control.

To educate County staff and the public about bed bugs, the IPM Coordinator

- Continued to organize and staff the County's Bed Bug Task Force; the Task Force meets at least every quarter and advocates for increasing public awareness of bed bug problems and for developing sound bed bug management policy throughout the County;
- Investigated by telephone (with the help of the Bed Bug Task Force) the 42 bed bug complaints that came to the attention of the IPM Coordinator;
- Worked with the City of Concord and the County Environmental Health Division to develop city protocols for responding to bed bug complaints and working with recalcitrant landlords; Concord conducted a 6 month pilot using these protocols and will now use them permanently;
- Accompanied Environmental Health Inspectors and California Department of Public Health staff on three bed bug investigations in Concord during the City's pilot program;
- Worked with Environmental Health to develop a bed bug training program for County Health inspectors; on April 17, the inspectors were trained in how to inspect for the presence of bed bugs and were provided with information about bed bug management and resources available in the County;
- Produced additional bed bug fact sheets in English and in Spanish for the County's bed bug website;
- Presented a bed bug awareness training to around 20 residents of Meadow Wood Alamo Creek, a senior living facility in Danville and provided follow-up help to individual residents and staff; and
- Provided advice to the Greater Richmond Interfaith Program (GRIP) Family Housing Program about bed bug prevention; connected them with Target Specialty products, which conducted a fumigation training program in November for pest control personnel and needed a demonstration site for the practical portion of the training. Fumigation is an expensive control option for bed bugs and is generally only used when an infestation is extremely severe and widespread. The GRIP facility had only a moderate infestation, but the treatment was free, and fumigating the Family Housing Program quarters allowed GRIP to start anew and institute a strict prevention protocol to keep bed bugs out.

To provide advice on IPM and to provide general outreach, the IPM Coordinator

- Wrote an article on the new state and federal rodenticide regulations for Supervisor Andersen's July eNewsletter;
- Provided on-going advice along with review of educational materials for IPM training in child care settings as part of a project of the Center for Environmental Research and Children's Health at U.C. Berkeley;

- Worked with the Cities of San Pablo and El Cerrito to develop a model IPM Policy for Contra Costa cities and a set of standard operating procedures for major pests encountered in city parks and buildings;
- Provided a presentation on urban IPM for a meeting of the California Pest Control Advisors in San Mateo on April 10;
- Organized a workshop given by Dr. Igor Laćan, U.C. Cooperative Extension Urban Horticulture Advisor, on landscape maintenance during drought for Public Works' personnel and administrative staff;
- Attended regular meetings of the Head Start Health and Nutrition Services Advisory Committee to report on IPM issues;
- Responded to a number of requests for pest management information from County staff and citizens; and
- Participated in a committee developing IPM standards of practice for the Healthy Homes Alliance in Alameda County. These standards, which include many more areas than just pest management, will be directly applicable to Contra Costa County and will become part of a manual for in-home visitors in a wide range of professionals.

Conferences and Trainings Attended

- Weed Science Society Annual Conference
- Bed Bug Global Conference
- County Advisory Body Training

2014 Department IPM Program Highlights and Challenges

Agriculture Department

IPM Program Highlights

- The Department actively worked on all three subcommittees of the IPM Advisory Committee.
  The Department created three decision making documents: Japanese knotweed, artichoke thistle, and purple starthistle. (See Attachment A.) These documents were reviewed by the Decision-Making subcommittee and revised by the Department using their comments.

- All historically treated noxious weed sites were surveyed and treated again this year
  Significant progress was made in the Department's control effort this year. The department program involves 16 target terrestrial noxious weed species. This year the Department surveyed over 176,000 acres and treated a total of 422 net acres.

  Treatment involved hand removal, mechanical removal and targeted treatment with low toxicity herbicides. With rare exception, pesticide treatment involved highly focused spot spraying using backpack sprayers. In some newly treated areas, treatment involved focused area spray using a vehicle-mounted sprayer. Approximately 40-50% of staff time was spent in surveying and monitoring, with the remainder being spent on treatment actions.

- Artichoke Thistle (*Cynara cardunculus*)
  Artichoke thistle is a highly invasive, non-native perennial weed species that displaces herbaceous plants and annual grasses, decreasing the value of agricultural land, open space, and wildlands. Horses and cattle will not consume this thistle, and at high densities, the formidable spines on the leaves and stems and on the bracts around the flowers make it impossible for animals or people to walk through stands of the weed.

Rangeland infested with artichoke thistle

In 1979 Contra Costa County was identified as one of the most heavily infested counties in the state. At that time, at least 100,000 acres of land were infested with artichoke thistle to one degree or another. In that year, the Department began their management program in cooperation with property owners by using ground rigs and helicopters to spray large swaths of land. The artichoke thistle population has been reduced to such an extent that staff primarily spot treat individual plants using a backpack sprayer. Because seedlings form deep, fleshy taproots within the first year, mechanical or hand removal (digging out the plants) is cost-effective only in a very limited area with a small number of very young plants. Mowing and burning are neither practical nor effective.

Currently the Department monitors about 181,000 gross acres of land each year for artichoke thistle, which includes over 590 properties (mostly private) that have been treated in past years. In 2013, staff spot-treated a total of 206 net acres of artichoke thistle.

- Japanese dodder (*Cuscuta japonica*)
  Japanese dodder is a very aggressive parasitic plant that has the potential to severely alter the composition and function of riparian areas. It also affects ornamental plantings and agricultural crops. It is native to Southeast Asia and was first discovered in the county in 2005.

  Forty-six of the 49 historically infested properties in the county have been free of Japanese dodder for three or more years, which meets the criteria for eradication on these properties.

First Japanese dodder find in CCC, 2005

- Red sesbania (*Sesbania punicea*)
  This was the ninth year of red sesbania removal at the primary infestation site of Kirker Creek, Dow Wetlands. Red sesbania is a small tree that has a high potential for environmental damage by displacing native plants and wildlife in riparian areas. Red sesbania is an exotic invasive weed that is native to South America and is poisonous to humans, livestock, and many native vertebrates. It is invading riparian areas locally, and in the American River Parkway in Sacramento County, about $300,000 has been dedicated to its control. Red sesbania was first detected in California about ten years ago.

  In Contra Costa County, red sesbania infestations are located on three wildland and 12 residential properties. All plants removed were seedlings that germinated from the existing seed bank. Removal of red sesbania is performed mechanically with a weed wrench or by hand pulling.

Red Sesbania

All historic sites were surveyed this year, and a total of 1,592 plants were removed from all sites, compared to 2,194 last year and 4,293 in 2012. No seed pods have been allowed to mature at this site since 2006. The yearly statistics show that red sesbania seeds are long-lived, and that the seed bank is healthy and persistent. However, the reduction in the number found this year and last year may be indicative of a slow downward trend into the future. This would be consistent with the Department's experience with other noxious weeds that have long-lived seeds.

- Kangaroo thorn (*Acacia paradoxa*)
  The County has one site infested with kangaroo thorn. The removal of the existing infestation in 2005 involved 52 hours of staff time. At that time the infestation covered a little less than one net acre. This year, it took only 2 hours of staff time to accomplish the surveying and seedling removal. Only small seedlings of less than one foot in height were found, and the infested area totaled less than one hundredth of an acre.

  Each year the Department removes by hand pulling all new seedlings sprouting from the old seed bank.


Kangaroo Thorn

- Smooth Distaff Thistle (*Carthamus baeticus*)
  There is only one known smooth distaff thistle infestation site in the county. It originated from the movement of a tractor from Fallon, Nevada to a site off Christie Road in Martinez. The small infestation was first discovered in 2005 by one of the Department's biologists. For six years, the Department spot-sprayed this area.

- Two new noxious weed species: Japanese knotweed and woolly distaff thistle
  Two very small infestations of Japanese knotweed (*Fallopia japonica)* were found in the county in 2012 by staff biologists. One is in Lafayette and one in El Sobrante. These were the first recorded occurrences of this species in Contra Costa County. Japanese knotweed spreads by tenacious rhizomes from which small pieces can break and form a new plant. The weed is a particular threat in riparian areas where it can survive floods and quickly colonize scoured streambanks. The plant can form very dense patches that shade out all other vegetation. The rhizomes produce bamboo-like shoots that can penetrate through two inches of asphalt.

  The treatments continue to be very successful with only a few small Japanese knotweed plants found and treated this year.

  Two woolly distaff thistle (*Carthamus lanatus*) plants were found in 2012 by a staff biologist on CalTrans right-of-way on Highway 4 at the Highway 680 overcrossing. This was also the first recorded occurrence of this weed in the county. It occurs in Nevada, and it is very likely that the source of the infestation was thistle seed falling off a vehicle carrying infested hay or equipment. Woolly distaff thistle can form dense monocultures that displace native plants and reduce the availability and value of forage. The plant does not produce rhizomes.

  No new plants were found at the site for the second year. We are hoping this infestation has been eradicated.

- Critical infrastructure protection continues
  The Department continues to protect critical infrastructure including levees, earthen dams, railroad beds, and roadways from damage by ground squirrels. The goal is to maintain a 100 linear foot buffer around the infrastructure. Ground squirrel burrowing is the single biggest threat to California levees. Burrowing can compromise the earthen embankments and create pathways for water leakage that can undermine the structural integrity of levees, as well as earthen dams and railroad embankments. Burrowing and the resulting pathways for water erosion can also cause damage to, or sudden failure of, roadsides and other structures.

  Last year the Department modified its ground squirrel treatment procedure for safety and efficiency. Staff are applying bait more precisely and have reduced the number of bait applications in an area from three to two. Treatments are carried out by a team of two staff members so that one person can concentrate on driving while the other operates the bait spreader to apply bait only where ground squirrel activity is observed. This procedure has resulted in a 51% reduction in rodenticide use. (See also the graph of the County's rodenticide use for the last several years on page 23.)

- Exotic pest prevention continues
  The Agriculture Department is the County's first line of defense against invading pests including insects, plants, and diseases. Every day staff perform inspections on incoming shipments at destination points, including nurseries, the post office, and express carriers (UPS, FedEx and others) to look for quarantined plants as well as pests that can hitchhike unnoticed on plant material and other items such as household goods.

  In 2006, the Department was the first in the state to incorporate dog teams into parcel inspection. Since then a number of other counties have followed Contra Costa's lead. The dogs greatly speed inspections and have significantly increased detections of quarantined plants and exotic pests. The dog teams are a shared resource with other Bay Area counties that do not have the expertise or resources to maintain an active surveillance program; therefore, as a result of Contra Costa's initiative, pest detections in those counties have increased.

  This year the Department inspected 34,696 shipments and rejected 156 after finding various pests.

  The Department also deploys and services numerous traps for the purpose of early detection of more than 17 different serious insect pests. This year the Department deployed 5,395 traps, and staff serviced those traps 73,928 times.

Agriculture Department Challenges

- Ground squirrel control alternatives
  The department continues to search for alternatives to treated grain bait. Unfortunately, raptor perches and live trapping of ground squirrels have proved to be ineffective and/or too costly.
- Finding alternatives to herbicides
  Although in field operations the Department uses only least toxic "Caution" labeled herbicides, staff are continually trying to find safer and more effective materials and methods for noxious weed control. This includes evaluating the feasibility of mechanical or hand removal as well as new herbicides that may be more efficacious and of reduced toxicity. Last year the Department switched from the less environmentally friendly imazapyr herbicide to glyphosate (Roundup®) for treating pampas grass after consulting with a U.C. Invasive Weed Research scientist whose research has shown that glyphosate can be very effective when used correctly on this species.

Public Works Facilities Division

IPM Program Highlights

- The Division assisted as needed in the work of the three subcommittees of the IPM Advisory Committee, and a representative from Pestec sat on the Decision-Making subcommittee and the County's Bed Bug Task Force.
- Pestec was rehired as the structural IPM contractor
  This summer the County sent out a request for proposal for the structural IPM contract. Ten companies attended the pre-bid conference, eight companies attended a building walk-through, and six companies submitted proposals. A team that included the IPM Coordinator and representatives from the Facilities Division and the Department of Agriculture reviewed and rated the proposals and then chose three to interview. Pestec was awarded the contract.
- Training for Head Start Home Base Educators
  Pestec provided a workshop focused on pest prevention in the home and simple strategies for low income families to combat pest invasions. Attendees said the workshop was excellent and asked to have it repeated for the Home Base parents.

- Correcting structural deficiencies in buildings continues
  The Facilities Division is still understaffed and has an extensive backlog of work orders for the 361 buildings comprising more than 4.7 million square feet that the County maintains. The Division has increased their staff to 13 carpenters, with 3 of those added in the summer of 2014. This is still below the 18 carpenters in the Division prior to 2008.

  Pestec regularly reports on conditions conducive to pests ("deficiencies") in County buildings. Correcting these deficiencies is the key to pest prevention in County buildings. Deficiencies include things such as doors without doorsweeps that allow rodents to enter the building, cracks and gaps in walls where insects can hide and rodents can enter, and dirty drains in kitchens that provide breeding habitat for flies. It has been difficult for the Division to keep up with pest exclusion repairs because of lack of budget and staff, and their priorities must of necessity be emergencies and fire/life safety issues. Pestec has been authorized to perform caulking and can request permission to perform larger pest exclusion projects to remedy deficiencies.

- Structural IPM program pesticide use remains low
  In FY 13-14, 5.6 lbs. of pesticide active ingredients were used in approximately 2.75 million square feet of County buildings. These pesticides are almost entirely deployed as baits in bait stations or in cracks and crevices. Pestec continues to successfully manage rats and mice exclusively with traps, sanitation, and pest proofing.

- Increase in service calls involving ants, cockroaches, bees and yellowjackets, and mice
  In FY 13-14, the Facilities Division received 160 additional calls for service for various pest problems compared to 154 calls last year. These are calls for service that are outside the regularly scheduled monitoring service of the pest control contractor. Of the 154 calls this year, 26% were for ants, 25% were for cockroaches, 8% for bees and yellowjackets, and 8% for mice. Six out of the 17 buildings that called 4 or more times were Head Start buildings, which by their nature often have more food and habitat available.

  Last year 28% of the calls were for ants, 18% for bees/yellowjackets, 15% for cockroaches, and 8% for spiders.

- Bed bugs in County buildings
  In 2010, the Concord homeless shelter began experiencing a serious bed bug infestation. Pestec treated the infestation several times, but in a homeless shelter, reinfestation is a continuing problem. In 2011, the IPM Coordinator and shelter staff developed bed bug prevention protocols, which were instituted in 2012 by both the Concord shelter and the Brookside shelter in West County. In the fall of 2012, the Concord shelter purchased metal bed and new encased mattresses. Both are easier to inspect and clean, and they provide far fewer hiding places for bed bugs than did the old mattresses and wooden beds. These changes, coupled with staff vigilance and the involvement of clients in inspections and cleaning, have resulted in the Concord shelter remaining bed bug free from September 2012 to October 2014. In October this year a client with bed bugs was admitted, and despite all precautions, some bugs made it into the sleeping area. Staff found them immediately and instituted a cleanup to solve the problem. To date, the Brookside Shelter has not had a bed bug infestation.

  The chances for new introductions of bed bugs to a shelter are very high with the daily influx of clients, but with alert staff any new introductions will be quickly found. Strict adherence to the prevention procedures will make it unlikely that either shelter will experience a large or prolonged infestation.

  Other County buildings such as the hospital and offices with waiting rooms are at risk for bed bug infestations, and County staff must continue to be vigilant. Over the past several years staff at a few County buildings have reported seeing bed bugs. Pestec was called and the areas carefully inspected but none were found. To date we have not found evidence of bed bugs at any building except the Concord Homeless Shelter.

Facilities Division Challenges

- Pest exclusion in County buildings
  This continues to be a challenge, but the Facilities Division is doing what they can with their staffing and schedule.
- Pest exclusion in leased buildings
  Reducing pest intrusions into leased buildings continues to be more of a challenge since the responsibility often falls to the landlord.
- Bed bugs in County buildings
  Bed bugs are particularly difficult and costly to control. As bed bugs become more prevalent, it is very likely that more County buildings will be affected. At this point, awareness and prevention are critical.

Public Works Grounds Division

IPM Program Highlights

- The Division participated in the work undertaken by the Cost Accounting subcommittee of the IPM Advisory Committee.
  The Grounds Division provided research, information, and analysis to the committee on using artificial turf on County properties, on the cost of maintaining County properties, and on where and how to use sustainable landscaping principles.
- Division staffing has increased
  Currently the Division has 14 full time permanent employees and 3 temporary employees. This is 5 more crew members than 3 years ago, but is still substantially fewer workers than the 45 gardeners, 2 irrigation technicians, and additional summer hires of 10 years ago. The number of properties that the Division maintains has changed little in this time, but the level of maintenance for County properties is considerably lower now because of the financial crisis. The majority of County properties are still underfunded for full landscape maintenance, but as funding increases at some buildings, the Division is caught without sufficient staff to provide the increased maintenance that is budgeted.
- The Division has improved the visual appearance of many County landscapes
  As staffing and funding have been slowly increasing, the Division has been working hard to improve the appearance of County properties. The Animal Services Department was originally landscaped with an overabundance of diverse plants. This made landscape maintenance at the site difficult and time consuming, and the site did not have sufficient funds available to do the work. During this time the landscaping was overrun by weedy grasses. For 3 years the crew has been working on the site to make it manageable. It took one year to get the grass weeds under control. Once the gardeners could see the landscape plants again, they were able to spot spray weeds around the plants. The crew then mowed down all the plants knowing that some of the landscape plants would resprout. The second year they concentrated on making the site look better and maintaining a good level of

Mulched landscape bed around Animal Services on Imhoff Place in Martinez

weed control by hand pulling. In the third year the crew was able to mulch all the beds. With mulch and only a minimum of plants, the Division can now keep up with maintenance at this site.

- Turkeys at Hidden Pond Special District
  In 2012 a new irrigation system and many new plants were installed in the frontage landscape at Hidden Pond Rd. and Reliez Valley Rd. After a flock of turkeys began digging up plants and irrigation lines and scattering mulch, the Division experimented with two different scare tactics used in vineyards to chase away turkeys. One was a kite that is shaped and colored to look like an osprey and is tethered to a flexible pole. It can be lifted by even a gentle breeze. The other device was a bird scare windmill that combines sound and reflected light to repel birds.

  Two years later, it appears that the scare kites have been effective in deterring the turkeys, but not the windmill. Staff saw damage abate and remain low after the kites and windmill were installed. Last year after the kites were removed because they had been shredded by a year of wind, staff found new turkey damage. The Division has now installed three new kites at the site.

- Workshop on landscape maintenance during drought
  The Grounds Division sponsored a workshop for County and municipal staff on maintaining landscapes during drought. Dr. Igor Laćan, U.C. Cooperative Extension Urban Horticulture advisor, led the workshop. Sixteen Public Works staff from Grounds, Special Districts, the Watershed Program, and Administration attended.

- Drought and water use
  The Division continues to pare down water use by cutting back on irrigation all across the County, fixing irrigation problems, changing sprinkler heads, removing excessive vegetation, and mulching as much as possible. The Division is finding many stressed plants because of water restrictions, and the drought is having severe consequences for trees. The Division is seeing many dying trees and is preparing for eventually removing them and replacing them with more drought-tolerant species. Redwood trees all around the County are particularly vulnerable and will slowly die. They should not be replanted.

- New contracts with two tree care companies
  The Public Works Department recently awarded contracts to Davey Tree and to Professional Tree Care of California. Both companies have certified arborists on staff and each company's strengths complement the other's. Both these companies are skilled in tree care and selection and can advise the county on the kind of tree to replant when a tree comes down. The Grounds Division is working on removing the County's problem trees as well as those dying from drought. These companies have the knowledge, experience, and equipment to take down a tree, grind out the stump, prepare the ground, and plant the new tree.

  Both companies recycle trees into mulch and biofuel, and in addition, Professional Tree Care runs its own millworks where they recycle logs and trimmings into lumber.

- Gopher management
  Several years ago the Division used the Rodenator to remove gophers that were beginning to undermine the foundation at the Public Works Administration building on Glacier Drive in Martinez. This device creates an explosion underground and the concussion kills any nearby gophers. This treatment worked very well and no new gophers have been seen at the Administration building. However, this device sounds like a gunshot and can be quite disturbing to nearby building occupants and County residents.


The Eliminator for managing gophers

  This year the Division hired a contractor with a device that suffocates gophers by injecting CO_2 into their burrows. This treatment worked well but cost about $300/application. The Division has now purchased its own CO_2 device, called the Eliminator. Because of

understaffing and underfunding, the Division has largely ignored gophers for many years. Staff will now use the Eliminator to reduce the gopher population around County buildings without having to use rodenticides.

- Pesticide use
  Four years ago, the Grounds Division consciously decided not to use any insecticides, miticides, fungicides, or rodenticides in their work. The Division has chosen to manage arthropod pests and plant diseases in County landscapes solely with good horticultural practices. If plants are severely affected, they are removed.

  Herbicides are the only pesticide used by the Division, and this year, their use has increased by 115 lbs. As noted last year, the Division is continuing to try to improve the condition of many of the County's properties in order to move away from crisis management and back to preventive maintenance. For a number of years the lack of funding made it impossible to properly manage weed problems around County buildings and in the Special Districts the Division is responsible for. Weeds that are left unmanaged for years produce huge amounts of seed that make the weed problem increasingly worse from year to year. As long as funding and labor remain below adequate levels, the Division will probably continue to use at least this level of herbicide because herbicide applications are substantially cheaper than other management methods that require more labor time.

Grounds Division Challenges

- Inadequate staffing for the Grounds Division
  Last year the Division was given permission to hire 4 permanent and 6 temporary workers. These personnel have not been hired yet because understaffing at the County's Human Resources Department is causing hiring bottlenecks throughout out the County. The Division still needs at least one more lead gardener, but this position will not funded until FY15-16 at the earliest.
- Inadequate funding to license all grounds staff
  It would be ideal to have all members of the grounds crew licensed by the Department of Pesticide Regulation; however, it would be extremely difficult to pay for the fees and their time to attend continuing education classes to maintain their licenses. Currently, staff who do apply herbicides and are not licensed must apply herbicides under the supervision of one of the three licensed staff members.

Public Works Department Roadside and Flood Control Channel Maintenance Division

IPM Program Highlights

- The Division participated in various aspects of the work undertaken by the three subcommittees of the IPM Advisory Committee.
- Staff participated in the annual habitat assessment refresher training
  This year, 40 Public Works Maintenance employees attended the annual refresher training in habitat assessment for endangered and threatened species in order to comply with the California Department of Fish and Wildlife (CDFW) Routine Maintenance Agreement (RMA). The RMA stipulates that before work can commence in an area, an assessment must be conducted to identify endangered species habitat. In FY 13-14 crews that were trained to identify potential habitat spent a total of 355 hours performing habitat assessments. As endangered species are identified, they are reported to CDFW, which then provides County staff with guidelines to move forward with work. These guidelines may include full time monitoring of the jobsite by a professional biologist.
- Flood control vegetation and erosion management using California natives
  The County Flood Control District is partnering with Restoration Trust, an Oakland-based non-profit organization promoting habitat restoration and stewardship, in a native planting experiment along Clayton Valley Drain (near Hwy 4 adjacent to Walnut Creek). The study involves three 20´ x 20´ test plots and

Clayton Valley Drain showing creeping wild rye plants (green) in among the dry annual grass weeds

one control plot that will compare the survival of two California natives: Santa Barbara sedge, (C*arex barbarae*) and creeping wild rye (*Leymus triticoides*). Planting was completed in December 2013. Santa Barbara sedge was planted on the lower terrace near the creek and the creeping wild rye was planted on the slopes of the channel.

These species spread from underground rhizomes that anchor the soil and thus provide erosion control. They are perennial species that stay green year around and thus are resistant to fire. The plants are compatible with flood control objectives since they do not have woody stems, and during flood events, they lie down on the slope, thereby reducing flow impedance. They are not sensitive to broadleaf-specific herbicides, and unlike non-native annuals, they provide carbon sequestration and remove as much as ½ ton of carbon per acre per year.

Restoration Trust will monitor these plots until 2018 to assess native plant survival and the degree to which they compete with the non-native annual species. In their first annual report, Restoration Trust noted that the 2013-2014 winter was extremely dry with rainfall only 60% to 65% of normal. The County Flood Control District managed and funded watering the plots through February. Without this effort, the plants would likely have died. Restoration Trust monitored the area in spring and summer of 2014 and found that given the lack of rainfall, the site in general is doing adequately. It may be necessary to replant the Santa Barbara sedge near the creek.

84 Lumber Ditch in Martinez before goats

- <u>Grazing as a vegetation management tool – lessons learned</u>
  Using grazing as a management tool is complicated and very dependent on site-specific conditions. Grazing is not appropriate in all situations and could not, for instance, be used on the side of County roads without endangering both the animals and motorists. Many factors raise or lower the cost of grazing, including the size of the parcel (at larger sites the cost of moving the goats in and out is spread over a number of acres), whether the animals can easily enter the site, the amount of fencing necessary, how many times the animals must be moved within the job site and the ease with which that can be done, whether water is available or must be trucked in, and the season in which the animals are being used (costs are lower when demand is lower, e.g., in fall and winter).

84 Lumber Ditch in Martinez after goats

By taking all of the above factors into consideration, the Division is beginning to use grazing more effectively and economically. The Division has found that the following situations are ideal for meeting fire prevention standards with grazing:

1. Sensitive sites with endangered or threatened species where mowing could kill animals and where herbicides are restricted
2. Sites where access is difficult for people or machines
3. Sites with steep slopes or uneven terrain that would have to be mowed by hand and that present dangerous working conditions for staff
4. Sites that are too wet for either hand or machine mowing

Fire prevention weed abatement is time-sensitive and must be finished by June 1 or earlier to prevent incurring fines from the Fire District.

Cost of Peak Season Grazing for Fire Prevention

Fiscal Year	Acres Grazed	Total Cost for All Acres Grazed	Cost/Acre
12-13	74	$88,100	$1190
13-14	113	$123,660	$1094

- Off season grazing

  In late summer of 2013 (FY 13-14), the Division used goats to graze 162 acres of the Walnut Creek flood control channel. This year (FY 14-15) the Division grazed 209 acres of Walnut and Grayson Creeks in late summer/early fall. This off season grazing benefits both the County and the grazer. It is less costly for the County because demand for grazing is low in the off season, and it provides forage for the grazing contractor (their animals must be fed in the off season as well).

  Weed abatement in flood control channels in the off season has goals and benefits that are somewhat different from weed abatement to conform to fire regulations. The reduction of vegetation

  1. lessens the late-season fire danger in the channels,
  2. allows for a more thorough inspection of the channels to comply with Army Corp of Engineers maintenance standards,
  3. reduces obstacles in the channels that could impede the flow of water during a rain event, and
  4. reduces cover and thus discourages homeless encampments.

  The cost/acre of off season grazing is considerably less than peak season (spring or summer) grazing: an average of $230/acre in FY 13-14 and $171/acre in FY 14-15.

Cost of Off Season Grazing

Fiscal Year	Acres Grazed	Total Cost for All Acres Grazed	Cost/Acre
13-14	162	$37,302	$230
14-15	209	$35,802	$171

- Grazing challenges

  The Division is becoming more skilled at picking the best locations for goat grazing. One to two acre sites are not economical because of the cost of getting the animals in and out. Unfenced areas along roadsides are not appropriate because of safety issues and because of the cost of fencing off a narrow band of land and continually moving animals along the road. In the winter, grazing animals cannot be used on the rain softened creek banks and the ground adjacent to the banks because of the danger of causing erosion.

- Grazing is one tool in the IPM toolbox

  Grazing is now one of the Division's established tools for vegetation management. Grazing is not appropriate in every situation, but its use by the Division has been expanding and evolving to include quite a number of different objectives. In the years to come, the Division will continue to refine the decision making process for deploying grazing in order to increase effectiveness and economy.

- Multi-year grazing study coming to a close

  The Contra Costa County Flood Control and Water Conservation District (Flood Control District) conducted the third year of a three year streambank vegetation management study comparing herbicide

application with grazing of sheep and/or goats. The study is examining the safety, costs, and efficacy of each method to meet the Flood Control District's vegetation management goals for the streambanks and floodplains of their engineered stream channels.

Although both sheep and goat grazing were effective in initially reducing vegetation to 4- 6" in height along the flood plain and streambanks, the vegetation in the floodplain grew back over the summer. Since this re-growth remained green throughout the summer, it did not pose a fire risk. Grazed plots also experienced an increase in native grass cover compared to the plot treated with herbicides.

Water quality has not been degraded by either grazing or herbicide applications. Herbicide chemicals were not detected in stream samples after application. Most nutrients were not detected during grazing treatments, and bacteria did not exceed water quality standards during or after grazing; however, enterococci values were higher this year, possibly due to drought conditions. Turbidity did not exceed water quality standards during either grazing or herbicide application.

More erosion features occurred in the grazing test plots than in the herbicide plots, plus more erosion areas appeared this year than last.

Staff at the County Watershed Program and LSA Associates are preparing the final report covering the entire study. The final report will be completed in January, 2015.

- Buffer zones for certain pesticides enjoined by the courts continue to be observed
  Several lawsuits brought by environmental organizations against the EPA have been temporarily settled by the delineation of buffer zones in and around habitat for a number of endangered or threatened species in the Bay Area. The Department continues to work within the guidelines of the injunctions to assess work sites and implement buffer zones before using any of the enjoined pesticides.

Roadside and Flood Control Maintenance Division Challenges

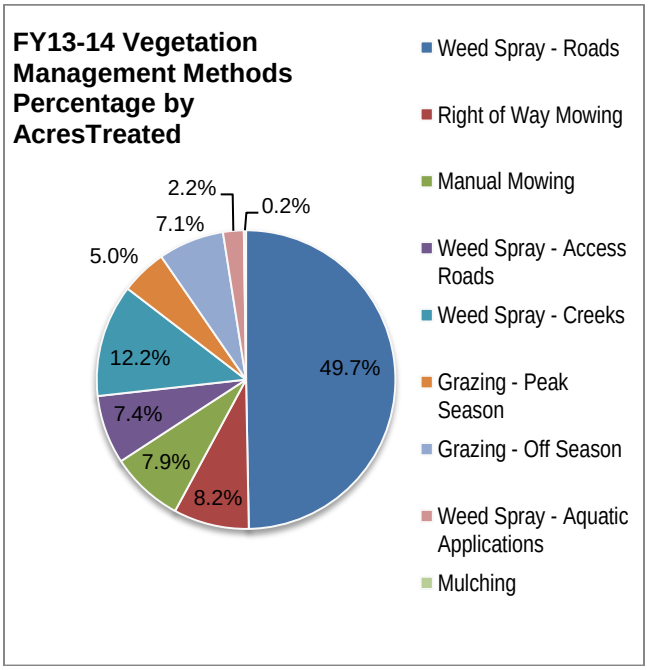
- Cost implications of regulations
  Compliance with RMA requirements has considerable cost implications. As mentioned above, work within CDFW jurisdiction requires a habitat assessment prior to start of work so that endangered species are not harmed. Crews again identified endangered species at a couple of job sites and consultation with CDFW resulted in using alternative work methods that were more costly.
- Cost implications of various management techniques
  In FY 13-14, 67% of the Division's expenditures on vegetation management was spent on non-chemical treatment methods, while the number of acres treated non-chemically was 28% of the total acres treated (see the chart on the next page for details).

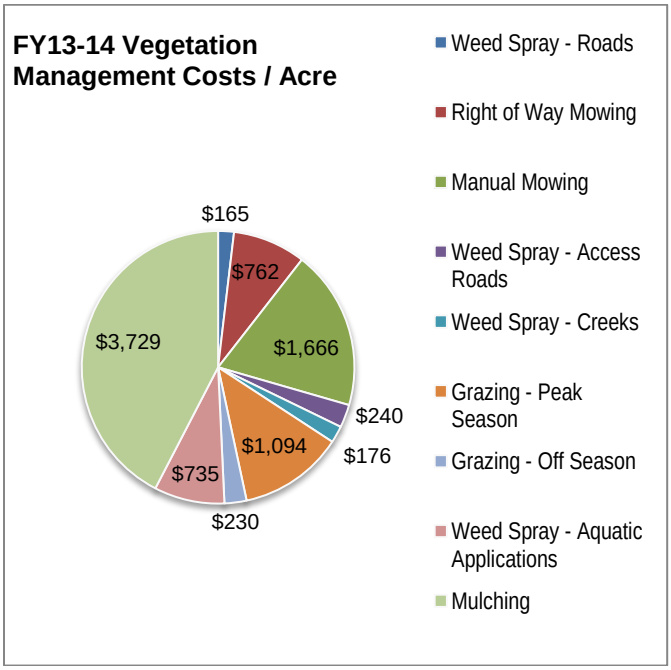
A Cost Comparison of Vegetation Management Methods for Roadsides and Flood Control Channels Fiscal Year 2013-2014

Vegetation Management Method	Acres Treated	% of Total Acres Treated	Total Cost for all acres treated	Cost/Acre	% of Total Cost for all acres treated
Weed Spray - Roads	1130	49.70%	$186,095	$165	19.90%
Right of Way Mowing	186	8.20%	$141,712	$762	15.10%
Manual Mowing	180	7.90%	$299,907	$1,666	32.10%
Weed Spray - Access Roads	169	7.40%	$40,547	$240	4.30%
Weed Spray - Creeks	277	12.20%	$48,770	$176	5.20%
Grazing – Peak Season	113	4.97%	$123,660	$1,094	13.22%
Grazing – Off Season	162	7.13%	$37,302	$230	3.99%
Weed Spray - Aquatic Applications	51	2.20%	$37,487	$735	4.00%
Mulching	5.4	0.20%	$20,136	$3,729	2.20%
Totals	2273.4		$935,616		

NOTE: The cost figures above for each method include labor, materials, equipment costs, contract costs (for grazing), and overhead, which includes training, permit costs, and habitat assessment costs. Licensing costs for staff members are paid by the individual and not by the County. The cost of the Vegetation Management Supervisor when he supervises work is not included in any of the figures, but is comparable among the various methods.

With limited budget, staff, and equipment, the Division must make strategic decisions about where to deploy their resources in order to meet their mandates of managing vegetation for fire and flood prevention and road safety. The Division is managing weeds in a biological system, and factors such as weather, weed growth patterns, timing for optimum weed susceptibility to the treatment method, and threatened and endangered species issues must also be factored into management decisions. The pie charts below further illustrate the cost of various management techniques and show how the Division has allocated resources.





Note: The legend to the right of each pie chart identifies slices starting from 12 o'clock and continuing clockwise.

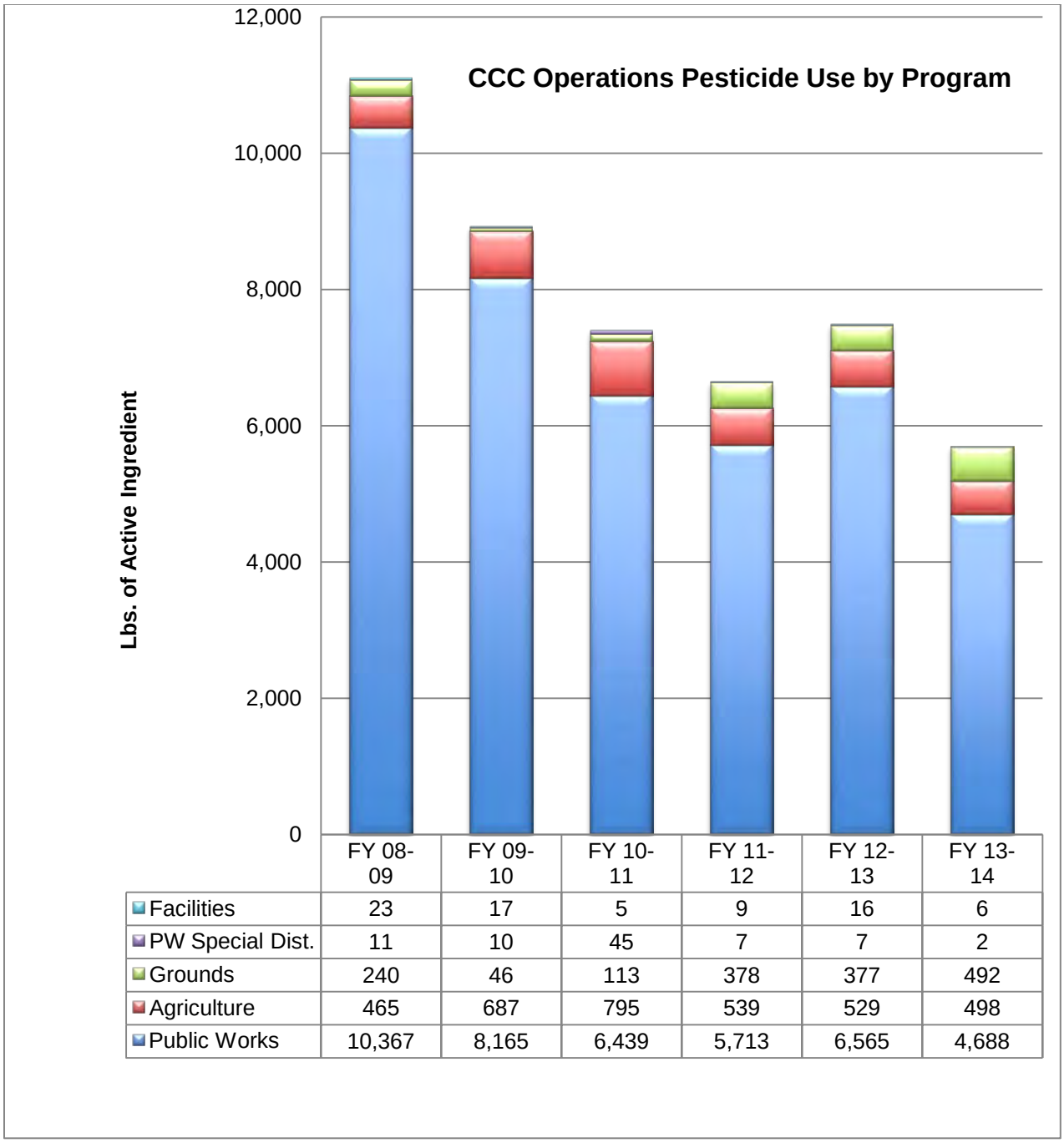
- Weather
  Mowing, as well as the application of herbicides, to manage weeds is highly dependent upon weather conditions. Weather can affect when herbicides can or must be applied and can also affect when mowing can or should occur. Weather can substantially alter the size of the weed load or its distribution over time. The Department has a limited capacity to use mowing because of a number of factors including vacancies in vegetation management staff, the Department's limited budget for weed abatement, and the limited number of tractor mowers (two). The Department faces a continued challenge of balancing the use of herbicides to control weed growth with the Department's capacity to mow or to graze with goats or sheep within the confines of the budget and the timeline to prevent fires.

  Using mowers during hot, dry weather also poses a hazard of its own: sparks caused by the metal mower blades striking rocks or metal debris can ignite tinder-dry grass.

- Staffing
  The Vegetation Management crew is still understaffed with only three personnel as compared to a staff of six five years ago.

Pesticide Use by Contra Costa County Operations

Starting in FY 00-01, the IPM Task Force annually reported pesticide use data to the Transportation, Water, and Infrastructure Committee for the County departments involved in pest management. The IPM Coordinator has continued this task. Below is a bar chart of pesticide use over the last 6 years. For information on pesticide use reporting and for more detailed pesticide use data, see Attachment C and the separate County Pesticide Use Spreadsheet.



	FY 08-09	FY 09-10	FY 10-11	FY 11-12	FY 12-13	FY 13-14
Facilities	23	17	5	9	16	6
PW Special Dist.	11	10	45	7	7	2
Grounds	240	46	113	378	377	492
Agriculture	465	687	795	539	529	498
Public Works	10,367	8,165	6,439	5,713	6,565	4,688

Increase in Pesticide Use by the Grounds Division

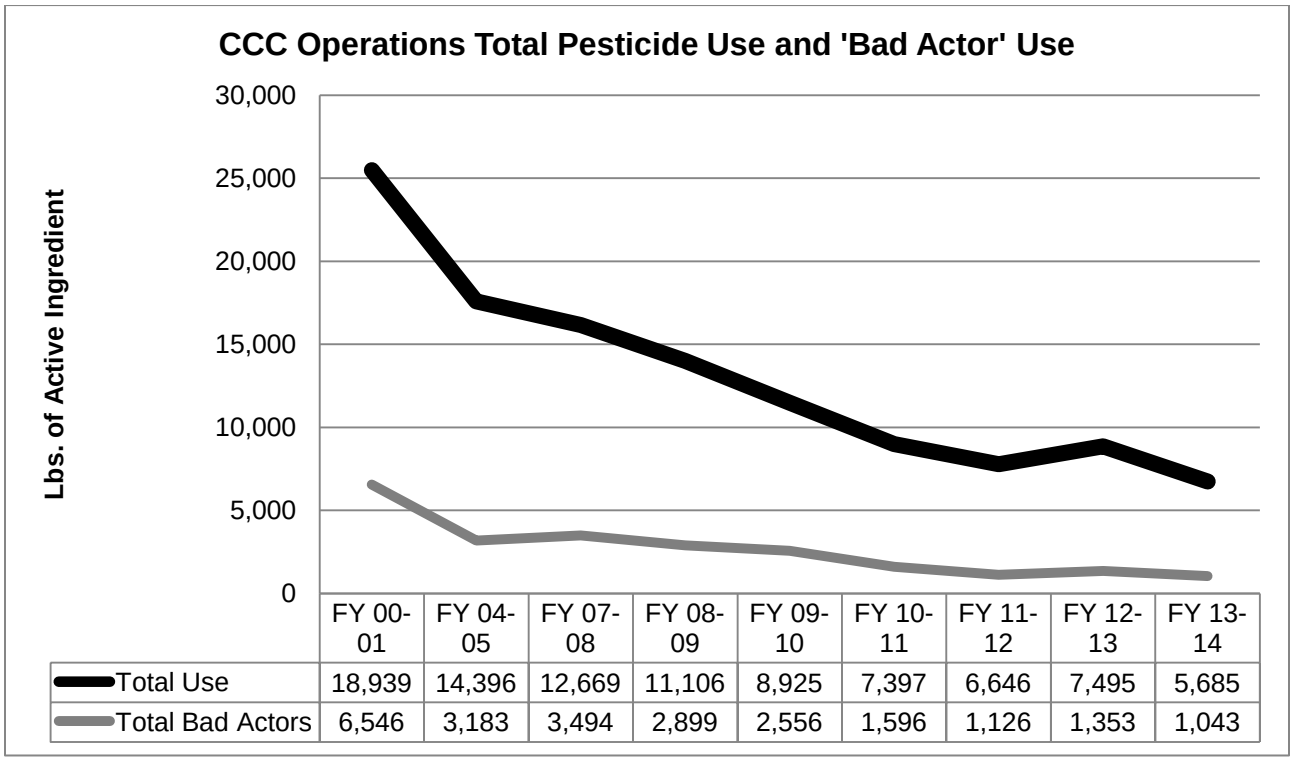
In FY 13-14 the Division's pesticide use increased by 115 pounds of active ingredient. Herbicide use (the Division only uses herbicide) is increasing as the Division tries to manage properties that have been neglected for years and have had no weed management at all. Over the years the weed seed bank at each property has increased tremendously. The Division is trying to gradually decrease the weed populations in order to return to preventive maintenance for weeds rather than crisis management.

Concern about "Bad Actor" Pesticides

There has been concern among members of the public and within the County about the use of "Bad Actor" pesticides by County departments. "Bad Actor" is a term coined by the Pesticide Action Network (PAN) and Californians for Pesticide Reform to identify a "most toxic" set of pesticides. These pesticides are at least one of the following: known or probable carcinogens, reproductive or developmental toxicants, cholinesterase inhibitors, known groundwater contaminants, or pesticides with high acute toxicity.

Parents for a Safer Environment has requested that additional pesticides be reported as "Bad Actors", but in 2013 after studying this request and consulting Dr. Susan Kegley, who was instrumental in developing the PAN pesticide database, the IPM Advisory Committee decided that the County will report as "Bad Actor" pesticides only those that are designated as such in the PAN database.

The County's use of these particular pesticides has decreased dramatically since FY 00-01 as shown in the chart below. Of the 31 "Bad Actor" pesticides used by the County since 2000, 22 have been phased out and one more is in the process of being phased out. In addition, two other pesticides that are not designated as "Bad Actors" by the Pesticide Action Network are being phased out because the County feels they are particularly problematic.



	FY 00-01	FY 04-05	FY 07-08	FY 08-09	FY 09-10	FY 10-11	FY 11-12	FY 12-13	FY 13-14
Total Use	18,939	14,396	12,669	11,106	8,925	7,397	6,646	7,495	5,685
Total Bad Actors	6,546	3,183	3,494	2,899	2,556	1,596	1,126	1,353	1,043

Rodenticide Use

The Department of Agriculture uses rodenticide for ground squirrels whose burrowing threatens critical infrastructure in the County, such as roads, levees, earthen dams, and railroad embankments. Special Districts uses rodenticides for gophers, moles, and voles at Livorna Park and around the playing field at Alamo School.

"First generation" vs. "second generation" anticoagulant rodenticides

Anticoagulants prevent blood from clotting and cause death by internal bleeding. In small doses they are used therapeutically in humans for a number of heart ailments. Vitamin K_1 is the antidote for anticoagulant poisoning, and is readily available. (There are some types of rodenticides for which there is no antidote.)

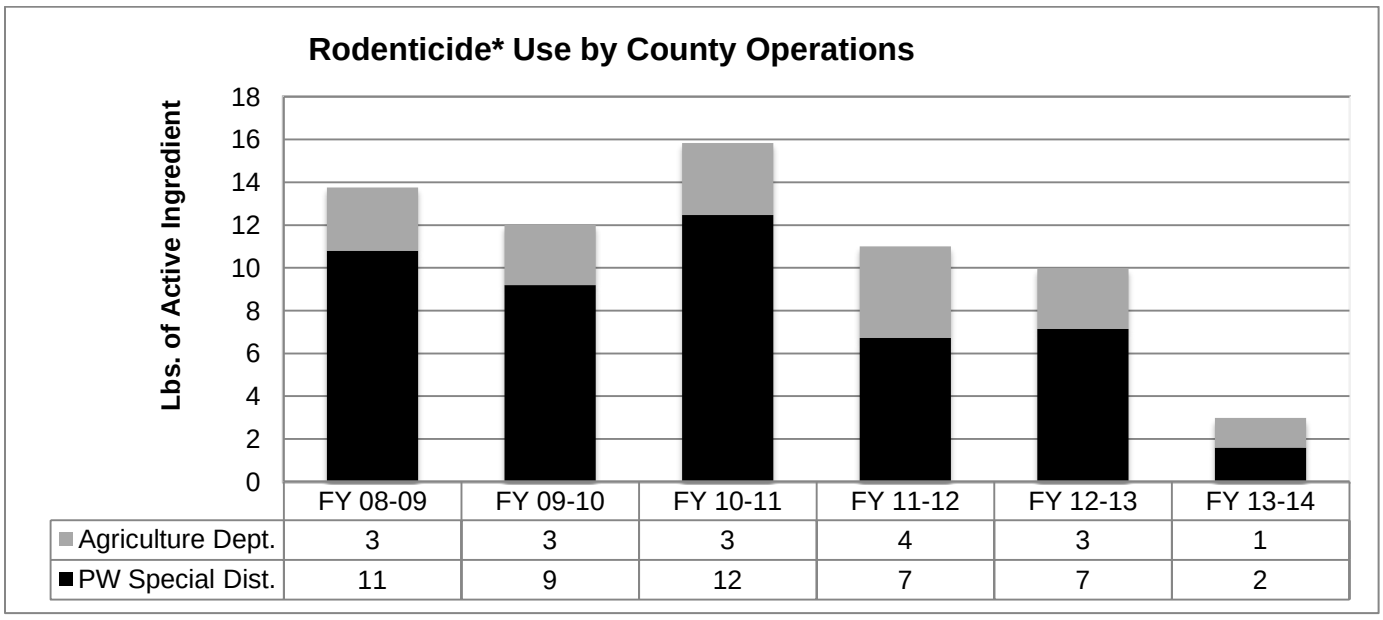
When anticoagulant rodenticides are necessary, the County uses first generation anticoagulant baits. First generation anticoagulants require multiple feedings over several days to a week to kill.

Second generation anticoagulants are designed to kill after a single feeding and pose a greater risk to animals that eat poisoned rodents. If the rodent continues to feed on a second generation anticoagulant after it eats a toxic dose at the first meal, it may build up more than a lethal dose in its body before the clotting factors run out and the animal dies. Residues of second generation anticoagulants may remain in liver tissue for many weeks. Because rodents poisoned by second generation anticoagulants can carry a heavier load of more toxic poison that persists in their bodies for a long period of time, the risk of death is increased for a predator that eats rodents poisoned by second generation anticoagulants.

The first generation materials are cleared much more rapidly from animal tissues and have a much reduced potential for secondary kill when compared to second generation materials. However, the first generation anticoagulants can also kill animals that eat poisoned rodents.

As noted earlier in this report, the Agriculture Department has revised its ground squirrel baiting procedure to reduce the amount of treated grain used. Because of this change, the Department's use of diphacinone active ingredient went from 3 lbs. last year to 1 lb. this year. The Agriculture Department also mitigates the risk of secondary poisoning by performing carcass surveys in all areas treated with anticoagulants whether or not it is required by endangered species restrictions.

Below, rodenticide use has been plotted separately from other pesticides used by the County.



	FY 08-09	FY 09-10	FY 10-11	FY 11-12	FY 12-13	FY 13-14
Agriculture Dept.	3	3	3	4	3	1
PW Special Dist.	11	9	12	7	7	2

* The Agriculture Department uses primarily diphacinone treated grain bait, but also some gas cartridges as fumigation agents that are included here as rodenticides.

More than 99.7% of the rodenticide used by Special Districts is aluminum phosphide, which is a fumigant and not an anticoagulant rodenticide. This year, only a 4 thousandths of an ounce of anticoagulant rodenticide active ingredient was used by Special Districts.

Trends in Pesticide Use

A change in pesticide use from one year to the next does not necessarily indicate a long-term trend. Long-term trends are more meaningful than short-term changes. It is important to understand that pesticide use can increase and decrease depending on the pest population, the weather, the invasion of new and perhaps difficult to control pests, the use of new products that contain small percentages of active ingredient, the use of chemicals that are less hazardous but not as effective, the addition or subtraction of new pest management projects to a department's workload, and cuts to budgets or staff that make it difficult or impossible to use alternate methods of control.

The County's pesticide use trend follows a trend typical of other pollution reduction programs. Early reductions are dramatic during the period when changes that are easy to make are accomplished. When this "low-hanging fruit" has been plucked, it takes more time and effort to investigate and analyze where additional changes can be made. The County is entering this period, and if further reductions in pesticide use are to be made, it will require time for focused study and additional funding for implementation.

Departmental Integrated Pest Management Priorities For 2015

Agriculture Department Priorities for 2015

- Continue the County's highly effective Noxious Weed Program
  Contra Costa's Noxious Weed Program has been in operation for 34 years. The Agriculture Department will be making some changes to the program in the coming years. The Department will not be taking on new weed projects, but will try to maintain what was previously achieved. The Department has been meeting with its partners, the Natural Resource Conservation Service and the Resource Conservation District to develop a new plan for the future. This will include having lessees develop better weed management plans and do more of their own weed work. The Agriculture Department will probably move to a more advisory role, but staff will continue to survey for "A" rated noxious weeds and perform identification.
- Continue attending IPM training and sharing the information with other Departments
  The Agriculture Department will continue to have staff attend outside IPM seminars and training sessions given on a variety of pest management issues. The Department will develop a training database so that personnel who return from IPM seminars and workshops can store training and outreach materials in a way that will be easily accessible to other County staff members. In addition, each staff person involved with pest management attends annual pesticide safety training.

Public Works Department Priorities for 2015

Facilities Division

- Continue working to fix structural deficiencies in County buildings
- Continue monitoring the bed bug situation in County buildings and providing awareness training if necessary

Grounds Division

- Continue removing hazardous trees and trees killed by the drought; where appropriate and where there is funding, trees will be replaced with drought tolerant species
- Continue diverting as much green waste as possible from the landfill by chipping prunings and using the material in place
- Continue to use woodchip mulch from tree companies as a weed suppressant wherever possible
- Continue to hand weed wherever and whenever possible; using mulch facilitates hand weeding
- Continue to educate the public to help them raise their tolerance of weeds
- Continue to conserve water as much as possible
- Continue to raise the level of service on County property

Roadside and Flood Control Maintenance Division

- Explore options to reduce grazing costs
  The Department will continue working with grazing contractors to develop a procedure to use goats and/or sheep during off peak seasons at a reduced cost in areas such as detention basins, flood control channels, and other secure locations.
- Continue to collect data from the two spray trucks equipped with data collectors and analyze data to ensure accuracy and usability of information.
- Continue to refine IPM practices
  The Vegetation Manager will continue to refine the Department's IPM practices and investigate new methods of weed control. With the successful grazing by goats and sheep along Walnut Creek, the Vegetation Manager will explore the feasibility of reseeding with a native rye grass in an effort to choke out fire prone weeds such as wild oats.

Attachment A. Pest Management Decision Making Documents

Contra Costa County

DECISION DOCUMENTATION for WEED MANAGEMENT: Artichoke Thistle

Date: 8/5/2014

Department: Agriculture

Location: Countywide

Situation: Artichoke thistle infestations throughout the County that threaten agricultural land, open space and wildlands.

What are the management goals for the weed?	Eradication in Contra Costa County and prevention of re-establishment. As properties become less infested, the Department adds new acreage that has not previously been treated.	
How often is the site monitored?	All historically treated artichoke thistle sites are monitored at least once a year. Currently the Department surveys over 220,000 acres (mostly private land, regional open space and parklands) each year. This monitoring includes the hundreds of acres that the Department has treated in past years. Previously treated sites are monitored because it can take in excess of 20 years to eradicate an infestation because of the residual seed bank longevity. This figure is far greater than many published estimates of 5 or more years; however, the Department's monitoring records and experience confirm the higher figure.	
Weeds have been identified as the following:	**Weed**: Artichoke thistle (*Cynara cardunculus*). It is a wild, non-native form of the cultivated globe artichoke. **Family**: Asteraceae **Habitat**: Open sites in grassland, pasture, chaparral, coastal sage scrub, riparian areas and abandoned agricultural fields. Often associated with areas impacted by historic or recent overgrazing. Grows best on deep clay soils. Does not tolerate heavy shade. **Origin**: Native to the Mediterranean region **Photos**: See page 5 **Weedy characteristics**: Highly invasive perennial that forms a deep fleshy taproot in the first year right after the cotyledon stage and before the rosette stage; roots can eventually reach 8 ft.; mature plants produce 100s of seeds that can remain viable for 15 to 20 years or more; formidable spines on the leaves and stems and on the bracts around the flowers impede the movement of livestock and make it impossible to hike through high densities of the plant; horses and cattle will not consume artichoke thistle and spines can cause injury to livestock; it has the potential to take thousands of acres of rangeland out of production through competition for space and soil moisture; dense colonies displace native vegetation and associated native animals, including endangered species, thus altering the natural environment of Contra Costa County. **CDFA Rating**: "B" (pest of known economic or environmental detriment and if present in California, is of limited distribution and is subject to action taken at the discretion of the County Agricultural Commissioner). This "B" rating actually reflects the fact that artichoke thistle has become too widespread and difficult to eradicate in many areas, and the authorities have opted for trying to prevent its spread and controlling it where feasible.	
Are populations high enough to require control? Explain	Yes. The Department's goal is eradication, and therefore the tolerance level is zero. In 1979, Contra Costa County was identified as one of the most heavily infested counties in the state. At that time, at least 100,000 acres of land were infested with artichoke thistle to one degree or another. Currently the Department estimates that only about 600 to 800 net acres are infested. Of that, 400 to 600 of those net acres have never been treated because of lack of resources at the Department.	
Is this a sensitive site?	Are any of the sites under management considered highly sensitive sites?	Yes

	Are any sites under management part of any of the court-ordered injunction?	Yes
	Are any of the sites known or potential habitat for any endangered or threatened species?	Yes
	Are any of the sites on or near an area where people walk or children play?	Yes
	Are any of the sites near a drinking water reservoir?	Yes
	Are any of the sites near a creek or flood control channel?	Yes
	Are any of the sites near crops?	Yes
	Are any of the sites near desirable trees or landscaping?	Yes
	Are any of the sites on soil that is highly permeable, sandy, or gravelly?	Yes
	At any of the sites, is the ground water near the surface?	Yes
	Are any of the sites near well heads? Restrictions are 100 ft around well heads.	Yes
Which cultural controls were considered?	**Mulching, weed barrier:** Not effective; not practical on rangeland and open space. **Planting Desirable Species:** Artichoke thistle does favor disturbed, open sites, so preventing overgrazing and keeping grasslands and other areas healthy and with dense plant cover could help *reduce* the invasion of artichoke thistle but will not control existing populations. Also, the Department has no control over the land stewardship practices at the sites it surveys and treats for artichoke thistle. **Burning:** Burning can be used to remove the above ground portions of the plant once it dries in the late summer, but burning will not control the plant, which will sprout from the root the next season. Burning may cause seeds in the seedbank to sprout, which could provide an opportunity for control of young plants, but the Fire Marshal and the Air District would not allow burning in the County. Even if burning were allowed by regulatory authorities, it would require considerable resources in time, money, and expertise not available to the Department, and ranchers and other landowners would most likely object. **CONCLUSIONS: None of these strategies is effective or practical.**	
Which physical controls were considered?	**Mowing by hand or by machine:** This is neither effective nor practical on rangeland and open space. **Digging by hand:** Digging the plant out is a viable option where only a few plants are involved, especially if they are in the seedling stage. In the first year, the plant forms an extensive taproot and the majority of this root must be removed in order to prevent resprouting. This method is extremely time- and resource-consuming because established plants must be dug out to a depth of 14-18 inches. When clay soils harden in the summer, this is an almost impossible task. It was used without success by East Bay Regional Park crews at Briones Regional Park after two previous years of herbicide treatment in the park by the Department. They found that the crews were not thorough in finding the artichoke thistles or in digging them out sufficiently deep enough to kill the plant. The Department was again brought in to resume their treatment program after the failure. **Discing or plowing:** Discing or plowing populations in wildlands or grazing lands is impractical and not advised by weed researchers. Although it is theoretically possible to exhaust the carbohydrate reserves of the plant's tuberous roots, this would require many years of continued effort and several carefully timed passes each season because artichoke thistle can resprout repeatedly. Discing and plowing also disturbs the soil and opens areas up to reinfestation by this species or others. Discing when seed is present increases infestation size. **Cutting flower stalks:** This can stop seed production in small populations where timely treatment is not possible, but will not control existing plants. **Grazing:** Cattle, sheep and horses generally avoid artichoke thistle because of its spiny foliage. Goat grazing can reduce seed production, but has not been shown to control the plant.	

	CONCLUSIONS: Mowing is not used because it is neither effective nor practical. Grazing is not an effective control and the Department does not have control over the management of the properties it surveys and treats. Digging by hand is too time consuming and expensive for the large number of acres involved in treatment, but it can be used in some selected sites if there are a very few artichoke thistle plants, especially if they are immature and if the site is particularly sensitive. In some areas, staff cut flower stalks if they encounter them when they are about to produce seed.
Which biological controls were considered?	**Biological controls available:** The artichoke fly (*Terellia fuscicornis*) was accidentally introduced into California, but is not a California Department of Agriculture (CDFA) approved biological control agent. Preliminary studies suggest that some native thistles (*Cirsium* spp.) may be vulnerable to attack by the fly. The fly's impact on artichoke thistle populations is unknown. Larvae feed only on mature flowerheads, thus commercial artichokes are not significantly affected since they are harvested while immature. This insect has not had any impact on artichoke thistle populations in Contra Costa County. **CONCLUSIONS: No effective biological controls are available**.
Which chemical controls were considered?	**Pre-emergent (residual) herbicide?** Yes **Post emergent (contact) herbicide?** Yes **Possible herbicide choices**: During many years of research, experience, and experimentation, including consulting the literature, researchers and colleagues about materials that are labeled for, and effective on, artichoke thistle, the Department has investigated the herbicide options listed below. The Department continues to consult researchers and colleagues, as well as new literature, to identify new choices that may be more effective or more environmentally friendly. **2,4-D**—The Department has not used this material for many years. It is only marginally effective, and there are safer and more effective alternatives. **Aminocyclopyrachor + chlorsulfuron**—This combination is not labeled for grazing lands and may suppress or injure certain annual or perennial grasses. Though effective, there are more environmentally friendly materials available for use on artichoke thistle. **Chlorsulfuron (Telar®):** This material kills many broadleaf plants and has a long soil residual. Though effective, there are more environmentally friendly materials available for artichoke thistle control, **Aminopyralid (Milestone®)**—This is a selective broadleaf herbicide generally safe on grasses. It has soil residual activity that will kill emerging seedlings. Rate: 5 to 7 oz. of product per acre. Timing: Pre and Post emergence in late winter or spring, ideally before bolting. Enjoined for endangered species? No Herbicide Resistance management group: O(4) **Clopyralid**—Aminopyralid has a longer soil residual and higher activity on artichoke thistle than clopyralid so this material is not used by the department. **Clopyralid + 2,4-D**—The Department has not considered this combination as it is felt by the department that there are safer and more effective materials available. **Dicamba type compounds** (for example, Clarity®)—These are very effective on emerged plants. They are selective to broadleaf plants and do not harm desirable grasses. They do not have soil residual properties and therefore are not effective on seedlings that emerge after treatment. Rate: 3 pints of product (Clarity®) per acre. Timing: Post emergence in late winter or spring, ideally before bolting but can be effective up to time of seed formation Enjoined for endangered species? No Herbicide Resistance management group: O(4) **Picloram**—Was used in the past and was very effective but is currently not registered for use in California.

	Triclopyr Amine—Though effective the department feels that there are more environmentally friendly materials available. Also some of these products are labeled "Danger" because they have the potential to cause permanent eye damage if the concentrated material enters the eyes of the applicator. **Triclopyr Ester**—This formulation of triclopyr is effective, however it has a high potential to harm non target and desirable vegetation including trees and thus will not be used by the department. **Triclopyr + 2,4-D**—Though effective there are more environmentally friendly materials available **Imazapyr**—Though effective there are more environmentally friendly materials available. This herbicide kills all vegetation and leaves bare earth. This leaves open areas where artichoke thistle or other weed seeds could sprout. **Glyphosate**—Effective and has a good toxicology profile; however, rangeland grasses are extremely sensitive to glyphosate thus damaging desirable rangeland forage and leaving open areas where artichoke thistle or other weed seeds could sprout. Rate: 2.4 to 3.2 quarts of product per acre. Timing: Post emergence in late winter or spring, ideally before bolting. Enjoined for endangered species? Yes, for California red legged frog Herbicide Resistance management group: G(9) **CONCLUSIONS: The department concluded that the least toxic and most efficacious materials are Milestone® (aminopyralid) and Clarity® (a dicamba type material). Often these materials are used together, though the Department is experimenting to determine the efficacy of aminopyralid-only treatments.** **Note: The Milestone®/Clarity® combination has been determined to be the safest and most effective treatment for both purple starthistle and artichoke thistle. This is fortunate as it saves much staff time in not having to change materials in areas where both of these species are found.** **Glyphosate is used in some sensitive areas such as where an artichoke thistle is in an orchard. It is also used on a property owned by the Town of Moraga and is sometimes used on artichoke thistle very late in the treatment season when plants are forming seed. Generally it is not the material of choice because it kills any desirable grass that is contacted by the material. Therefore, the general window of use is after the grasses dry out. This is a very short window of time in the very late spring. Glyphosate is a listed active ingredient in the California red-legged frog injunction. Use of glyphosate is restricted in specific, listed geographical areas, but there is a partial program exclusion for public agency run invasive species and noxious weed programs. Use around aquatic features in listed geographic areas in these programs is limited to hand held equipment, and herbicides cannot be applied within 15' of such features.** **Chlorsulfuron (Telar®) is sometimes used, but only when there is residual in the tank from treatment of perennial pepperweed or hoary cress, or if there are occasional artichoke thistles mixed in when treating these other two noxious weeds.**
Are adjuvants (drift retardants, surfactants, water conditioners, etc) used with any of the herbicides? If so, explain the choices.	Yes. Pro-tron®, a hydrolyzed vegetable oil adjuvant product, is added to the herbicide mix. Pro-tron® helps to break water tension and thus increase the efficacy of the herbicide on the plant surface. It also helps with plant and soil penetration and drift reduction. It is labeled as a "Caution" material, safest of the three label categories. Other surfactants are available; however, most are labeled "Warning" or "Danger" due to potential eye damage if the concentrate is splashed into the eyes of the applicator.
Which herbicide application methods are available for this chemical?	**Methods available:** Broadcast spray from helicopter, 200 gallon spray rig mounted on a 4WD truck; spot spray (directed spray) from backpack **CONCLUSIONS: When the noxious weed program first began, helicopters were used to spray the extensive infestations of artichoke thistle. This has not been necessary for many years. The majority of plants are spot-treated by staff using backpack sprayers either as they hike or as they ride ATVs through infested areas. On properties that are new to the program and have heavy populations, staff generally use a 200 gallon spray rig mounted on a 4WD truck and pull hose to reach infestations. The spray is directed only to the infested areas of the property.**
What factors were considered in choosing the pesticide application	The size of the noxious weed infestation and its location are the most important factors in considering the application method. The Department has limited resources and staff, and a limited window in the spring when treatment is most effective. The Department also considers safety to the applicator, to the environment, to non-

method?	target species and threatened and endangered species. It also considers the effectiveness of the method and the cost to the Department.
What weather concerns must be checked prior to application?	Wind is the primary concern. It can carry the herbicide off-site to non-target or sensitive areas. Mitigations such as using a very coarse spray and holding the backpack spray nozzle into the plant are used when wind is a concern. Materials used are rainfast in a relatively short time: one to two hours for Milestone® and Clarity® and about four hours for Roundup®. For Milestone®, rain anywhere from a few hours to a few weeks after treatment is desirable as it sets the material in the soil, which is needed to take advantage of the pre-emergent qualities of this product.
References	DiTomasso, Joseph M., et al. 2013. Weed control in Natural Areas in the Western United States. Univ. of CA WRIC. Bossard, Carla C., J.M. Randall, and M.C. Hoshovsky. 2000. Invasive Plants of California's Wildlands. U.C. Press, Berkeley. Cal IPC Artichoke thistle plant profile. http://www.cal-ipc.org/ip/management/plant_profiles/Cynara_cardunculus.php. Web page accessed 3/31/14.

Moraga Infestation

Wildcat Canyon, EBRPD

Wildcat Canyon, EBRPD

Pesticide Profile for: Aminopyralid (Milestone®)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Aminopyralid Triisopropanolamine salt (40.6% in formulated product, Milestone)
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Not listed
Prop 65	Not listed
Known Groundwater Contaminant (DPR 6800a list)	No Has the potential to move into groundwater (6800b list); however, it has never been detected in groundwater when used as labeled, and field experiments showed limited movement in the soil profile.
Mammalian Hazard	Tests were done with technical grade aminopyralid acid and not formulated product. Acute oral LD_{50}: >5000 mg/kg in rats (practically non-toxic)
Bird Hazard	Tests were done with technical grade aminopyralid acid and not formulated product. Acute oral LD_{50}: >2250 mg/kg (practically non-toxic) Subacute dietary LC50: >5496 mg/kg (practically non-toxic)
Aquatic Organism Hazard	Tests were done with technical grade aminopyralid acid and not formulated product Fish: 96-hr LC_{50} >100 mg/l (practically non-toxic) Amphibian: 96-hr LC_{50} >95.2 mg/l (practically non-toxic) Crustacean: 96-hr LC_{50} >100mg/l (practically non-toxic) Mollusk: 96-hr LC_{50} >89 mg/l (slightly toxic)
Bee Hazard	Tests were done with technical grade aminopyralid acid and not formulated product. Acute contact LD_{50}: >100 ug/bee (practically non-toxic) Acute oral LD_{50}: >117 ug/bee (practically non-toxic)
Persistence	Moderate; half-life of 35 to >103 days. EPA notes that their modeling using the longest half-lives did not result in aquatic concentrations that approach levels-of-concern for aquatic animals and plants.
Soil Mobility	Aminopyralid is soluble in water and adheres poorly to soils with or without organic matter. Mobility hazard for aminopyralid is considered high (Thurston Co, WA aminopyralid review)
Use in County by the Agriculture Department	Noxious Weed Program
Method of Application	Back pack; Power sprayer with hand held hose and in certain situations using a boom
Cautions	Use precautions are general (protective gloves, eye protection, long sleeves)
Rate Used in Co.	0.5oz/3gallon backpack; 5-7oz/acre for spray rig applications
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co. WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database

Pesticide Profile for: Clarity®

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	diglycolamine salt of 3,6-dichloro-*o*-anisic acid (58.6% in formulated product: Clarity®) This is a dicamba type herbicide.
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	Yes, for hazard to desirable plants
Cancer	US EPA Group D: Not classifiable as to human carcinogenicity
Prop 65	No
Known Groundwater Contaminant (DPR 6800a list)	Dicamba has not been found in ground water in California; however, it has the potential to move into groundwater (6800 b list). (see also Soil Mobility, below) The US Geological Survey monitored ground water at 2,305 sites in the US from 1992-1996 and dicamba was detected in 0.13% of sites. The highest concentration detected was 0.21ug/L. [from Pesticides in Ground Water of the United States, 1992-1996 in *Ground Water.* 2000. 38(6):858-863]
Mammalian Hazard	Acute oral LD_{50}: >2740 mg/kg in rats(practically non-toxic)
Bird Hazard	Acute oral LD_{50} = 968 mg/kg in bobwhite quail (slightly toxic)
Aquatic Organism Hazard	LC_{50}: 130 – 516 mg/L for formulated dicamba products with 24 to 96 hr exposure times for various fish (practically non-toxic) Clarity is high in hazard for aquatic plants.
Bee Hazard	>LD_{50} >100 ug/bee (practically non-toxic)
Persistence	Biotic or aerobic half-life is between 4 and 31 days (low to moderate persistence). Anaerobic half-life is 141 days (high persistence) Dicamba may volatilize slightly from plants and ground surface but that is not considered the major route of chemical dissipation or breakdown. Microbial activity is the primary route of degradation from soil. Laboratory and field studies show that dicamba is likely to break down in soil to half of its application concentration between one and 5 weeks. Dicamba is expected to degrade in aquatic systems even faster. The persistence hazard of dicamba is considered moderate. (Thurston Co, WA review of dicamba diglycolamine salt)
Soil Mobility	Low to medium leaching potential. Dicamba is mobile in soil but degrades rapidly. Low potential for runoff due to rapid degradation. (*Herbicide Handbook*, 9th Ed., Weed Science Society of America)
Use in County by the Agriculture Department	Noxious Weed Program
Method of Application	Back pack; Power sprayer with hand held hose and in certain situations using a boom
Cautions	Use precautions are general (protective gloves, eye protection, long sleeves) Respirator if used in a non-ventilated area
Rate Used in Co.	2oz/gallon for backpack sprayer; 3 pints/acre for spray rig applications
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database, *Herbicide Handbook*, 9th Ed. (2007) from the Weed Science Society of America

Pesticide Profile for: Roundup Pro Concentrate®

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Glyphosate (50.2% in formulated product, Roundup Pro Concentrate)
Injunction Restrictions	60 ft. buffer around California red-legged frog habitat; 15ft buffer for noxious weed programs
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Evidence of non-carcinogenicity in humans
Prop 65	Not listed
Known groundwater contaminant (6800a list)	No
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg in rats and mice (practically non-toxic)
Bird Hazard	Acute oral LD_{50} >1,000 mg/kg (slightly toxic)
Aquatic Organism Hazard	Fish: LC_{50} 86mg/L (slightly toxic) Crustacean: LC_{50} 281 mg/L (practically non-toxic) Mollusk: LC_{50} >10 mg/L (slightly toxic)
Bee Hazard	LD_{50}>100 ug/bee (practically non-toxic)
Persistence	A typical field half life is 47 days. The median half life in water varies from a few days to 91 days. Glyphosate is expected to degrade to half of the applied concentration within 60 days.
Soil Mobility	K_{oc} = 24,000 (potential to leach into groundwater is extremely low), from the OSU Pesticide Properties Database
Use in County by the Agriculture Department	Noxious Weed Program
Method of Application	Spot treatment with a backpack sprayer.
Cautions	Normal applicator precautions include wearing a long-sleeved shirt and long pants, chemical-resistant gloves made of any water proof material.
Rate Used in Co.	2-3 oz/gallon for back pack sprayers (except 10.5oz/gallon for pampas grass); 2.4-3.2quart/acre for power spray rig
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database

Pesticide Profile for: Pro-tron® (adjuvant)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Vegetable oil ethoxylates, tall oil fatty acids (95% as formulated)
Injunction Restrictions	No
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	No
Prop 65	Not Listed
Known Groundwater Contaminant (DPR 6800a list)	Not listed on the Department of Pesticide Regulation's Groundwater Protection list.
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic). Direct skin contact irritation potential.
Bird Hazard	Not found
Aquatic Organism Hazard	Not found
Bee Hazard	Not found
Persistence	Low
Soil Mobility	Not expected to occur in use situations.
Use in County by the Agriculture Dept.	Generally used in all herbicide applications by the Department. Pro-tron® helps to break water tension and thus increase the efficacy of the herbicide on the plant surface. It also helps with plant and soil penetration and drift reduction.
Method of Application	Generally, backpack directed spot treatment. Some uses are by power sprayer using directed hand-held spray nozzles or boom spray to directed target area.
Cautions	Applicator is required to use gloves and eye protection when mixing and applying; do not spray desired vegetation
Rate Used in Co.	0.33 ounce of formulated product/gallon of water
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation

Contra Costa County

DECISION DOCUMENTATION for WEED MANAGEMENT: Purple Starthistle

Date: 8/6/2014

Department: Agriculture

Location: Countywide

Situation: Purple starthistle (*Centaurea calcitrapa*) infestations throughout the County that threaten agricultural land, open space and wildlands.

What are the management goals for the weed?	Eradication in Contra Costa County and prevention of re-establishment. As properties become less infested, the Department adds new acreage that has not previously been treated. In 2013 the Department surveyed 210 distinct properties that were previously infested with purple starthistle. Of these, 71 (over 30%) were free of purple starthistle and had been free of it for one or more years. This demonstrates the progress toward eradication that has been accomplished by the Department over the years of the program.
How often is the site monitored?	All historically treated purple starthistle sites are monitored at least once a year. Currently the Department surveys over 220,000 acres (mostly private land, regional open space and parklands) each year. Approximately 30,000 acres of the total was previously infested with purple starthistle or is under current management. Monitoring includes the hundreds of acres that the Department has treated in past years. Previously treated sites are monitored because it can take in excess of 15 years to eradicate an infestation due to the longevity of the residual seed bank. In addition, there is the chance of reinfestation. Fifteen years is far greater than many published estimates of 3 years; however, the Department's monitoring records and experience confirm the higher figure. The Department has found that it is important to monitor and treat missed plants a second time, usually in late May or June, as resources allow. This is especially so in areas of high suppression that are closer to eradication and are typically treated by back pack spot treatment. The second treatment is needed because it is very easy to miss some rosettes that later bolt and produce seed and because there can be late germinating seed.
Weeds have been identified as the following:	**Weed**: Purple starthistle (*Centaurea calcitrapa*) is an introduced invasive noxious weed. It is not known how it was introduced, though likely from contaminated seed imported from areas where it is native. It is a highly invasive, mostly a biennial (meaning it takes 2 years to mature) species but can also mature from seedling to mature plant in one season. It displaces annual grasses, desirable vegetation and wildlife and decreases the production value of agricultural land. It also has allelopathic properties (it produces chemicals that suppress the growth of other plants). Its formidable spines and high densities can be an impenetrable barrier to the movement of wildlife and livestock in open rangeland areas as well as to horses and hikers in parkland areas. Seed can remain viable in the soil for ten or more years. **Family**: Asteraceae **Habitat**: Open sites in grassland, pasture, riparian areas and abandoned agricultural fields. Often associated with areas impacted by historic or recent overgrazing. Grows best on deep fertile alluvial or clay soils. It has a long, sturdy tap root. It can form dense mounding stands if left unmanaged. It does not tolerate heavy shade. **Origin**: Native to the Mediterranean region of southern Europe and northern Africa **Weedy characteristics**: Highly invasive biennial that forms a deep taproot that can reach 3-4 feet in length; mature plants produce 1000s of seeds that, in the experience of the Department, can remain viable for 10 or more years; formidable spines on the bracts around the flowers do not fall off the plants in autumn making any forage that grows in among the plants in the winter inaccessible to livestock; dense, spiny stands to 4 feet tall impede the movement of humans, livestock and wildlife; horses and cattle will not consume purple starthistle; and the spines can cause injury to livestock. Purple starthistle has the potential to take thousands of acres of

	rangeland out of production through competition for space and soil moisture, and dense colonies displace native vegetation and associated native animals, including endangered species, thus altering the natural environment of Contra Costa County. **CDFA Rating**: "B" (pest of known economic or environmental detriment and if present in California, is of limited distribution and is subject to action taken at the discretion of the County Agricultural Commissioner). This "B" rating actually reflects the fact that purple starthistle has become too widespread and difficult to eradicate in many areas, and the authorities have opted for trying to prevent its spread and controlling it where feasible.	
Are populations high enough to require control? Explain	Yes. The Department's goal is eradication, and therefore the tolerance level is zero.	
Is this a sensitive site?	Are any of the sites under management considered highly sensitive sites?	Yes
	Are any sites under management part of any of the court-ordered injunction?	Yes
	Are any of the sites known or potential habitat for any endangered or threatened species?	Yes
	Are any of the sites on or near an area where people walk or children play?	Yes
	Are any of the sites near a drinking water reservoir?	Yes
	Are any of the sites near a creek or flood control channel?	Yes
	Are any of the sites near crops?	Yes
	Are any of the sites near desirable trees or landscaping?	Yes
	Are any of the sites on soil that is highly permeable, sandy, or gravelly?	Yes
	At any of the sites, is the ground water near the surface?	Yes
	Are any of the sites near well heads? Restrictions are 100 ft around well heads.	Yes
Which cultural controls were considered?	**Mulching, weed barrier:** Not effective; not practical on rangeland and open space. **Planting Desirable Species:** Purple starthistle favors disturbed, open sites, so preventing overgrazing and keeping grasslands and other areas healthy and with dense plant cover could help *reduce* the invasion of purple starthistle but will not control existing populations. The Department has no control over the land stewardship practices at the sites it surveys and treats for purple starthistle. **Burning:** Burning can be used to remove the above ground portions of the plant once it dries in the late summer, but burning will not control the plant, which will sprout from the root of first year plants the next season. Burning may cause seeds in the seedbank to sprout, which could provide an opportunity for control of young plants, but the Fire Marshal and the Air District would not allow burning in the County. If burning were allowed by regulatory authorities, it would require considerable resources in time, money, and expertise not available to the Department. Most of the infested areas within the county are infested in scattered patches or scattered plants so burning would result in removal of valuable range forage. **CONCLUSIONS: None of these strategies is effective or practical.**	
Which physical controls were considered?	**Mowing by hand or by machine:** This is neither effective nor practical on rangeland and open space. Rosettes are usually too low to be affected by mowing. **Digging by hand:** Chopping the plant off an inch or so below the surface will kill an individual purple starthistle plant. This is a viable option where only a few plants are involved and where the seedbank is small. **Discing or plowing:** Discing or plowing populations in wildlands or grazing lands is impractical and not advised by weed researchers. Discing and plowing also disturbs the soil and opens areas up to reinfestation by this species or others. It also results in wind erosion and erosion by water on sloped ground. Discing when seed is present increases infestation size and distribution. **Grazing:** Cattle, sheep and horses generally avoid purple starthistle because of its spiny florets. Goat grazing can reduce seed production, but has not been shown to control the plant.	

	CONCLUSIONS: Mowing is not used because it is neither effective nor practical. Grazing is not an effective control and the Department does not have control over the management of the properties it surveys and treats. Chopping by hand is too time consuming and expensive for the large number of acres involved in treatment, but it can be used in some selected sites if there are a very few plants and a diminished or non-developed seed bank.
Which biological controls were considered?	**Biological controls available:** There is no biocontrol organism for purple starthistle.
Which chemical controls were considered?	**Pre-emergent (residual) herbicide?** Yes **Post emergent (contact) herbicide?** Yes **Possible herbicide choices**: During many years of research, experience and experimentation, including consulting the literature, researchers and colleagues about materials that are labeled for purple starthistle, the Department has investigated the possible herbicide options listed below. The Department continues to consult researchers and colleagues, as well as new literature, to identify new choices that may be more effective or more environmentally friendly. **2,4-D**—The Department has not used this material for many years. It is only marginally effective, and there are safer and more effective alternatives. **Aminocyclopyrachor + chlorsulfuron**—This combination is not labeled for grazing lands and may suppress or injure certain annual or perennial grasses. Though effective, there are more environmentally friendly materials available for use on purple starthistle. **Chlorsulfuron (Telar®):** This material kills many broadleaf plants and has a long soil residual. Though effective, there are more environmentally friendly materials available for purple starthistle control. **Aminopyralid (Milestone®)**—This is a selective broadleaf herbicide generally safe on grasses. It has soil residual activity that will kill emerging seedlings. Rate: 5 to 7 oz. of product per acre. Timing: Pre and Post emergence in late winter or spring, ideally before bolting. This material is also effective on maturing plants into early flower stage. Enjoined for endangered species? No Herbicide Resistance management group: O(4) **Clopyralid**— This material is not used by the Department because aminopyralid has a longer desired soil residual and higher activity on plants that have bolted. **Clopyralid + 2,4-D**—The Department has not considered this combination as it is felt by the department that there are safer and more effective materials available. **Dicamba type compounds** (for example Clarity®)—These are broadly very effective on emerged seedlings to matured plants. They are selective to broadleaf plants and do not harm desirable grasses. They do not have soil residual properties and therefore are not effective on seedlings that emerge after treatment. Rate: 3 pints of product (Clarity®) per acre. Timing: Post emergence in late winter or spring, ideally before bolting but can be effective up to time of seed formation Enjoined for endangered species? No Herbicide Resistance management group: O(4) **Triclopyr Amine**—Though effective, the department feels that there are more environmentally friendly materials available. Also some of these products are labeled “Danger” because they have the potential to cause permanent eye damage if the concentrated material enters the eyes of the applicator. **Triclopyr Ester**—This formulation of triclopyr is effective, however it has a high potential to harm non target and desirable vegetation including trees and thus will not be used by the Department. **Triclopyr + 2,4-D**—Though effective, there are more environmentally friendly materials available. **Imazapyr**—Though effective, there are more environmentally friendly materials available. This herbicide kills all vegetation and leaves bare earth. **Glyphosate**—Effective and has a good toxicology profile; however, rangeland grasses are extremely

	sensitive to this material. Glyphosate damages desirable rangeland forage and leaves open areas where other noxious or undesirable weed seeds could sprout. Rate: 2.4 to 3.2 quarts of product per acre. Timing: Post emergence in late winter or spring, ideally before bolting. Enjoined for endangered species? Yes, for California red legged frog. Herbicide Resistance management group: G(9) **CONCLUSIONS: The department concluded that the least toxic and most efficacious materials are Milestone® (aminopyralid) and Clarity® (a dicamba type material). Often these materials are used together, though the Department is experimenting to determine the efficacy of aminopyralid-only treatments.** **Note: The Milestone®/Clarity® combination has been determined to be the safest and most effective treatment for both purple starthistle and artichoke thistle. This is fortunate as it saves much staff time in not having to change materials in areas where both of these species are found.** **Glyphosate is used in some sensitive areas such as when purple starthistle is found in an orchard. It is also used on a property owned by the Town of Moraga and is sometimes used on purple starthistle very late in the treatment season when plants are forming seed. Generally it is not the material of choice because it kills any desirable grass that the material contacts. Therefore, the general window of use is after grasses dry out. This is a very short window of time in the very late spring. Generally the Department feels that Milestone and Clarity have less impact on the environment in rangeland and pasture use areas. Glyphosate is a listed active ingredient in the California red-legged frog injunction. Use of glyphosate is restricted in specific, listed geographical areas, but there is partial program exclusion for public agency run invasive species and noxious weed programs. Use around aquatic features in listed geographic areas in these programs is limited to hand held equipment, and herbicides cannot be applied within 15' of such features.** **Chlorsulfuron (Telar®) is sometimes used, but only when there is residual in the tank from a nearby treatment of perennial pepperweed or hoary cress; or if occasional purple starthistle is mixed in when treating these other two noxious weed types.**
Are adjuvants (drift retardants, surfactants, water conditioners, etc) used with any of the herbicides? If so, explain the choices.	Yes. Pro-tron®, a hydrolyzed vegetable oil adjuvant product, is added to the herbicide mix. Pro-tron® helps to break water tension and thus increase the efficacy of the herbicide on the plant surface. It also helps with plant and soil penetration and drift reduction. It is labeled as a "Caution" material, safest of the three label categories. Other surfactants are available; however, most are labeled "Warning" or "Danger" due to potential eye damage if the concentrate is splashed into the eyes of the applicator.
Which herbicide application methods are available for this chemical?	**Methods available:** Broadcast or spot treatment using a 200 gallon spray rig mounted on a 4WD truck; spot treatment (directed spray) from backpack **CONCLUSIONS: The majority of infested areas involve smaller patches or scattered plants. These are spot-treated by staff using backpack sprayers either as they hike or as they ride ATVs through infested areas. There are heavy populations on some properties that are new to the program where staff use a 200 gallon spray rig mounted on a 4WD truck with a boom sprayer or pull hose to reach infestations. The spray is directed only to the infested areas of the property.**
What factors were considered in choosing the pesticide application method?	The size of the noxious weed infestation and its location are the most important factors in considering the application method. The Department has limited resources and staff, and a limited window in the spring when treatment is most effective. The Department also considers safety to the applicator, to the environment, to non-target species and to threatened and endangered species. It also considers the effectiveness of the method and the cost to the Department.
What weather concerns must be checked prior to application?	Wind is the primary concern. It can carry the herbicide off-site to non-target or sensitive areas. Mitigations such as using a very coarse spray and holding the backpack spray nozzle into the plant are used when wind is a concern. Materials used are rainfast in a relatively short time: one to two hours for Milestone® and Clarity® and about four hours for Roundup®. For Milestone®, rain anywhere from a few hours to a few weeks after treatment is desirable as it sets the material in the soil, which is needed to take advantage of the pre-emergent qualities of this product.
References	DiTomasso, Joseph M., et al. 2013. Weed control in Natural Areas in the Western United States. Univ. of CA WRIC. DiTomasso, Joseph M., and Healy,Evelyn A.2007. Weeds of California and Other Western States. Univ. of CA Bossard, Carla C., J.M. Randall, and M.C. Hoshovsky. 2000. Invasive Plants of California's Wildlands. U.C. Press, Berkeley. Cal IPC Artichoke thistle plant profile. http://www.cal-ipc.org/ip/management/plant_profiles/Cynara_cardunculus.php. Web page accessed 3/31/14.

Mature Plants

Rosettes

Pesticide Profile for: Aminopyralid (Milestone®)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Aminopyralid Triisopropanolamine salt (40.6% in formulated product, Milestone)
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Not listed
Prop 65	Not listed
Known Groundwater Contaminant (DPR 6800a list)	No Has the potential to move into groundwater (6800b list); however, it has never been detected in groundwater when used as labeled, and field experiments showed limited movement in the soil profile.
Mammalian Hazard	Tests were done with technical grade aminopyralid acid Acute oral LD_{50}: >5000 mg/kg in rats (practically non-toxic)
Bird Hazard	Tests were done with technical grade aminopyralid acid Acute oral LD_{50}: >2250 mg/kg (practically non-toxic) Subacute dietary LC50: >5496 mg/kg (practically non-toxic)
Aquatic Organism Hazard	Tests were done with technical grade aminopyralid acid Fish: 96-hr LC_{50} >100 mg/l (practically non-toxic) Amphibian: 96-hr LC_{50} >95.2 mg/l (practically non-toxic) Crustacean: 96-hr LC_{50} >100mg/l (practically non-toxic) Mollusk: 96-hr LC_{50} >89 mg/l (slightly toxic)
Bee Hazard	Tests were done with technical grade aminopyralid acid Acute contact LD_{50}: >100 ug/bee (practically non-toxic) Acute oral LD_{50}: >117 ug/bee (practically non-toxic)
Persistence	Moderate; half-life of 35 to >103 days. EPA notes that their modeling using the longest half-lives did not result in aquatic concentrations that approach levels-of-concern for aquatic animals and plants.
Soil Mobility	Aminopyralid is soluble in water and adheres poorly to soils with or without organic matter. Mobility hazard for aminopyralid is considered high (Thurston Co, WA aminopyralid review)
Use in County by the Agriculture Department	Noxious Weed Program
Method of Application	Back pack; Power sprayer with hand held hose and in certain situations using a boom
Cautions	Use precautions are general (protective gloves, eye protection, long sleeves)
Rate Used in Co.	0.5oz/3gallon backpack; 5-7oz/acre for spray rig applications
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co. WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database

Pesticide Profile for: Clarity®

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	diglycolamine salt of 3,6-dichloro-*o*-anisic acid (58.6% in formulated product: Clarity®) This is a dicamba type herbicide.
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	Yes, for hazard to desirable plants
Cancer	US EPA Group D: Not classifiable as to human carcinogenicity
Prop 65	No
Known Groundwater Contaminant (DPR 6800a list)	Dicamba has not been found in ground water in California; however, it has the potential to move into groundwater (6800 b list). (see also Soil Mobility, below) The US Geological Survey monitored ground water at 2,305 sites in the US from 1992-1996 and dicamba was detected in 0.13% of sites. The highest concentration detected was 0.21ug/L. [from Pesticides in Ground Water of the United States, 1992-1996 in *Ground Water.* 2000. 38(6):858-863]
Mammalian Hazard	Acute oral LD_{50}: >2740 mg/kg in rats(practically non-toxic)
Bird Hazard	Acute oral LD_{50} = 968 mg/kg in bobwhite quail (slightly toxic)
Aquatic Organism Hazard	LC_{50}: 130 – 516 mg/L for formulated dicamba products with 24 to 96 hr exposure times for various fish (practically non-toxic) Clarity is high in hazard for aquatic plants.
Bee Hazard	>LD_{50} >100 ug/bee (practically non-toxic)
Persistence	Biotic or aerobic half-life is between 4 and 31 days (low to moderate persistence). Anaerobic half-life is 141 days (high persistence) Dicamba may volatilize slightly from plants and ground surface but that is not considered the major route of chemical dissipation or breakdown. Microbial activity is the primary route of degradation from soil. Laboratory and field studies show that dicamba is likely to break down in soil to half of its application concentration between one and 5 weeks. Dicamba is expected to degrade in aquatic systems even faster. The persistence hazard of dicamba is considered moderate. (Thurston Co, WA review of dicamba diglycolamine salt)
Soil Mobility	Low to medium leaching potential. Dicamba is mobile in soil but degrades rapidly. Low potential for runoff due to rapid degradation. (*Herbicide Handbook*, 9th Ed., Weed Science Society of America)
Use in County by the Agriculture Department	Noxious Weed Program
Method of Application	Back pack; Power sprayer with hand held hose and in certain situations using a boom
Cautions	Use precautions are general (protective gloves, eye protection, long sleeves) Respirator if used in a non-ventilated area
Rate Used in Co.	2oz/gallon for backpack sprayer; 3 pints/acre for spray rig applications
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database, *Herbicide Handbook*, 9th Ed. (2007) from the Weed Science Society of America

Pesticide Profile for: Roundup Pro Concentrate®

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Glyphosate (50.2% in formulated product, Roundup Pro Concentrate)
Injunction Restrictions	60 ft. buffer around California red-legged frog habitat; 15ft buffer for noxious weed programs
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Evidence of non-carcinogenicity in humans
Prop 65	Not listed
Known groundwater contaminant (6800a list)	No
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg in rats and mice (practically non-toxic)
Bird Hazard	Acute oral LD_{50} >1,000 mg/kg (slightly toxic)
Aquatic Organism Hazard	Fish: LC_{50} 86mg/L (slightly toxic) Crustacean: LC_{50} 281 mg/L (practically non-toxic) Mollusk: LC_{50} >10 mg/L (slightly toxic)
Bee Hazard	LD_{50}>100 ug/bee (practically non-toxic)
Persistence	A typical field half life is 47 days. The median half life in water varies from a few days to 91 days. Glyphosate is expected to degrade to half of the applied concentration within 60 days.
Soil Mobility	K_{oc} = 24,000 (potential to leach into groundwater is low), from OSU Pesticide Properties Database
Use in County by the Agriculture Department	Noxious Weed Program
Method of Application	Spot treatment with a backpack sprayer.
Cautions	Normal applicator precautions include wearing a long-sleeved shirt and long pants, chemical-resistant gloves made of any water proof material.
Rate Used in Co.	2-3 oz/gallon for back pack sprayers (except 10.5oz/gallon for pampas grass); 2.4-3.2quart/acre for power spray rig
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database

Pesticide Profile for: Pro-tron® (adjuvant)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Vegetable oil ethoxylates, tall oil fatty acids (95% as formulated)
Injunction Restrictions	No
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	No
Prop 65	Not Listed
Known Groundwater Contaminant (DPR 6800a list)	Not listed on the Department of Pesticide Regulation's Groundwater Protection list.
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic). Direct skin contact irritation potential.
Bird Hazard	Not Found
Aquatic Organism Hazard	Not Found
Bee Hazard	Not Found
Persistence	Low
Soil Mobility	Not expected to occur in use situations.
Use in County by the Agriculture Dept.	Generally used in all herbicide applications by the Department. Pro-tron® helps to break water tension and thus increase the efficacy of the herbicide on the plant surface. It also helps with plant and soil penetration and drift reduction.
Method of Application	Generally, backpack directed spot treatment. Some uses are by power sprayer using directed hand-held spray nozzles or boom spray to directed target area.
Cautions	Applicator is required to use gloves and eye protection when mixing and applying; do not spray desired vegetation
Rate Used in Co.	0.33 ounce of formulated product/gallon of water
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation

Contra Costa County

DECISION DOCUMENTATION for WEED MANAGEMENT: Japanese Knotweed

Date: 8/4/14

Department: Agriculture

Location: Lafayette and El Sobrante

Situation: Two Japanese knotweed (*Fallopia japonica;* syn. *Polygonum cuspidatum*) infestations were found in summer 2012. This is a CDFA "B" rated noxious weed.

What are the management goals for the site or weed?	To control and eradicate two Japanese knotweed infestations that exist in the County.
Were the sites monitored and what was found?	Yes, and the following isolated infestations were found: • Lafayette (SW Corner of Village Parkway & Mt Diablo Blvd.) When this site was first found in 2012, it covered a solid area about 15' x 40'. In addition, there was a very small outlying patch, about 8' x 4', sixty feet to the west of the main infestation. The main infestation was growing mostly in concrete rip-rap on the bank of the creek with some sprouts pushing through a concrete reinforcement wall and between the wall and hard packed decomposed granite. Bloom occurs from late June through early August and is heavily visited by the European honeybee. • El Sobrante (5691 Circle Drive) This site was discovered in 2012. It is on a 45-degree slope and sprouts were coming up next to and through the roadway asphalt. There were also some sprouts coming up adjacent to old concrete areas that existed from a previous structure. The infestation covered about 10' x 18'. Bloom occurs from mid June through early September. It was noted that early to full bloom is visited heavily by the European honeybee and late bloom is heavily visited by native bees.
Weeds have been identified as the following:	**Weed**: Japanese knotweed (*Fallopia japonica;* syn. *Polygonum cuspidatum*) There are two known sites in CCC: 1) Beth Slate, Agricultural Biologist with the Department, discovered the Lafayette site on June 29, 2012. A sample was taken, and the California Department of Food and Agriculture (CDFA) identified it as *Fallopia japonica* (CDFA pdr number 1649771) on July 2, 2012. 2) On July 16, 2012, Ralph Fonseca, Agricultural Biologist with the Department, discovered a second small site in El Sobrante during a Japanese dodder delimitation survey. CDFA identified the plant as *F. japonica* (CDFA pdr number 1641164) on July 19, 2012. On July 26, 2012, Vince Guise, Agricultural Commissioner, visited both sites with CDFA Botanist, Dean Kelch, who later identified the plant at the El Sobrante site as a Japanese knotweed/giant knotweed hybrid. Both Japanese knotweed and giant knotweed are CDFA "B" rated noxious weeds and are listed in the California Code of Regulations, section 4500, which is the California designated noxious weed list. As a "B" rated weed, treatment/eradication is the prerogative of the county agricultural commissioner. **Photos**: See page 5 **Family**: Polygonacae **Habitat**: Riparian areas/floodplains, forest edges, meadows, rights-of-way, and parks **Origin**: Native to Japan, China, and eastern Asia—apparently escaped from cultivation. It was introduced to the United Kingdom as an ornamental in 1825 and from there to North American in the same century. **Weedy characteristics**: This fast growing, herbaceous perennial can form dense thickets up to 9 feet high, and so thick that virtually all other plants are shaded out. These stands can significantly alter natural habitat. The plant has an extensive system of thick rhizomes that store large quantities of carbohydrates, and spread aggressively. Rhizomes are often 5-6 m long and have been documented to 20 m long. Japanese knotweed can reproduce from even just fragments of these rhizomes or from stem sections that can root at the nodes. The

<table>
<tr><td></td><td colspan="2">rhizomes and stem fragments can move great distances in flowing water and can be transferred in soil. Rhizomes can sprout through 2 inches of asphalt and rhizomes buried in soil to 1 m can regenerate. Seed production is rare in California, and seedlings generally do not survive well. If left unchecked, this plant can be very difficult to remove.</td></tr>
<tr><td>Are populations high enough to require control?

Explain</td><td colspan="2">Yes, the Department's goal is eradication and therefore, the tolerance level is zero. It is important to eradicate these infestations while they are still small and relatively easy to treat in order to prevent their spread.

Reasons for undertaking eradication:
• The plant is considerably invasive (it receives a "moderate" rating for invasiveness by the California Invasive Plant Council).
• It can cause harm to natural areas as well as horticultural areas by displacing native and horticultural species.
• It presents a threat to rare and endangered plant species that may be growing in the vicinity and can alter the environment, thereby threatening vertebrate and invertebrate species.
• Unless eradicated, there is the potential that plant enthusiasts could collect and propagate the plant thus contributing to the spread and environmental and horticultural harm.
• The two infestations are very limited.
• The Department has the resources and effective management tools to pursue eradication.</td></tr>
<tr><td rowspan="11">Is this a sensitive site?</td><td>Does this include highly sensitive areas?</td><td>No</td></tr>
<tr><td>Is this area part of any of the court-ordered endangered species injunctions?
Note: The Lafayette site is adjacent to Las Trampas Creek and is part of the salmonid injunction.</td><td>Yes</td></tr>
<tr><td>Is this a known or potential habitat for any endangered or threatened species?</td><td>No</td></tr>
<tr><td>Is it on or near an area where people walk or children play?
The Lafayette site is near a walking path. Treatment will not occur on the path or where the public is expected to have contact.</td><td>Yes</td></tr>
<tr><td>Is it near a drinking water reservoir?</td><td>No</td></tr>
<tr><td>Is it near a creek or flood control channel?</td><td>Yes</td></tr>
<tr><td>Is it near crops?</td><td>No</td></tr>
<tr><td>Is it near desirable trees or landscaping?</td><td>Yes</td></tr>
<tr><td>Is the soil highly permeable, sandy, or gravelly?</td><td>No</td></tr>
<tr><td>Is the ground water near the surface?</td><td>Unknown but not expected.</td></tr>
<tr><td>Are any of the sites near well heads?</td><td>No</td></tr>
<tr><td>Which cultural controls were considered?</td><td colspan="2">Mulching, weed barrier: Mulching with plastic sheets or fabric weed barriers for at least 2 years may provide some control, though success using this method has been reported to be poor. Weed barrier fabric has been reported to work better when laid loosely over the colony and walking on or otherwise crushing the stalks as they push up the fabric. Mendocino County reported that sprouts grew through tarps. This method is neither effective enough nor reliable enough for the Department's purposes.

Planting Desirable Species: This plant is an aggressive competitor, and establishing desirable vegetation that would out-compete Japanese knotweed would probably be impossible. The literature does not mention this as a viable control method. In addition, the County has no control over plantings in the areas where it is found.

Burning: This is not mentioned in the literature as a viable method. It is not practical in these areas and County has no control over infested sites.

Comments: In Mendocino County, CalTrans decided to try a combination of digging out rhizomes, tarping the area, and then repeated mowing. This combination is on-going although it has not been very effective and has been supplemented with stem injection of glyphosate.

Stassia Samuals, Plant Ecologist with the National Park Service, and Ray Harries with the Mendocino County Department of Agriculture, both have experience with digging, mowing, and tarping. They informed the Department that they had not had acceptable success with any of these methods.

Joe DiTomaso, California weed expert and UC Davis Weed Research Institute researcher, in personal conversation with Vince Guise, has said that grubbing and tarping will not work. Digging encourages spread and heavy growth because of the plant's ability to regenerate from small fragments.</td></tr>
</table>

	CONCLUSIONS: None of these strategies is effective or practical.
Which physical/mechanical controls were considered?	**Hand pulling/digging**: Japanese knotweed cannot be controlled this way because the extensive rhizomes are impossible to remove intact and fragments quickly resprout. In addition, the plants are growing adjacent to or in concrete or asphalt structures. **Mowing/cultivation by machine**: Mowing can reduce growth, but seldom, if ever, will it control the plant. Mowing that is repeated at least every 4 weeks and at least 7 weeks before senescence can suppress the plant. This method is highly labor intensive and would not eradicate the plants. **Grazing**: Neither Japanese knotweed nor giant knotweed is known to be poisonous to livestock, and they are, in fact, edible for humans. Grazing could provide some reduction on growth, but has not been shown to eliminate plants. Note: See also Cultural Controls, above. **CONCLUSIONS: None of these strategies is effective or practical for our purpose of eradication.**
Which biological controls were considered?	**Biological controls available:** There are no biological control agents available in the U.S. A sap-sucking psyllid (*Aphalara itadori*) has been released on Japanese knotweed in Europe. In the future this insect may be cleared for release in the U.S. There are other biological control agents under investigation, including a leaf spot pathogen in the genus *Mycosphaerella*. **CONCLUSIONS**: **No biological controls are available.**
Which chemical controls were considered?	**Pre-emergent (residual) herbicide?** There is no evidence of seed production at either of the two sites. Without a seed bank, pre-emergent herbicides are not appropriate. **Post emergent (contact) herbicide?** Yes **Possible herbicide choices:** After researching the literature and consulting with researchers and colleagues about materials that are labeled for Japanese knotweed, the Department has determined that the following are possible options: **2,4-D**—The Department does not use this material anymore and although it is somewhat effective for Japanese knotweed, it is not considered an option to use again. Also, it is enjoined for salmonids. **Dicamba**—Consultation with colleagues and the literature indicate that this material is not effective. **Triclopyr**—We prefer not to use this product because of the volatility of the material (especially the ester form) and the possible effects on nearby non-target plants. **Glyphosate Stem Injection**—Michelle Forys with California State Parks has used the injection method and said to us that injection is **not** her method of choice because it used what she felt were large amounts of glyphosate concentrate and it was very difficult to get to and treat each shoot. Though she found this method somewhat effective, she does not recommend it. The injection equipment cost was about $200, but she was willing to loan it to the Department if we chose to try this method. Joe DiTomaso was in agreement with Michelle Forys. Stassia Samuals and Ray Harries indicated to us that they had had some success with glyphosate stem injection and foliar spray. The Department decided against stem injection because of the large amounts of concentrate necessary, the staff time involved, and the marginal effectiveness. **Glyphosate Foliar Spray—**This is not as effective as other materials that could be used. Joe DiTomasso did not feel that this method was effective. **Chlorsulfuron—**This is not a good choice considering that a portion of the Lafayette site is very near the water. Also, though it would be legal to use, Japanese knotweed is not specifically mentioned on the label. **Imazapyr**—Joe DiTomaso and Chuck Morse, Agricultural Commissioner for Mendocino County, both recommended imazapyr as a more effective treatment. Japanese knotweed is specifically listed on the label. By label, the Habitat® formulation of imazapyr can be used near water at the Lafayette site. The Stalker® formulation of imazapyr is an oil-based product. Either Stalker® or Habitat® can be used at the El Sobrante site. Imazapyr is labeled "Caution" with that being the safest chemical category. It has very low nontarget animal/mammal toxicity.

	CONCLUSIONS: The Department has concluded that imazapyr is the safest and most effective material. **UC-IPM literature recommends a summer or fall treatment. This is when the plant juices will tend to move into the roots resulting in better translocation of the herbicide.** **Although there is no temperature restriction on the use of imazapyr, the Department feels that better results will be obtained if the temperature is below 90 degrees Fahrenheit. The Department also considers mandated Title 3 California Code of Regulations section 6614 restrictions that are intended to prevent drift, off-site movement and exposure to humans.** **Knotweed flowers are used heavily by honeybees and native bees, and though imazapyr is of very low toxicity to bees, the Department decided to delay the initial knotweed treatment in 2012 until after the bloom was over, and to treat in future years either before the bloom begins or wait until the bloom is over.** **Lafayette: In 2012, the Lafayette site was treated with Habitat on August 6. Bloom was 99% over and no honeybees were present. The daytime temperature was not projected to exceed 90 degrees and at the time of treatment (11 AM), the temperature was about 75 degrees. The high temperature for the day was recorded at 88 degrees. Two-thirds of a backpack sprayer of mixed Habitat was used.** **In 2013 the infestation was greatly reduced through the success of the previous year's treatment. There were only about six small runners of the plant in scattered areas of the original infestation. These were treated pre-bloom with Habitat on June 2.** **Monitoring in spring and summer of 2014 found no visible plant growth indicating that the goal of eradication at this site may have been achieved. There will be further site monitoring in future years.** **El Sobrante: In 2012 the site was monitored on August 6. The bloom on the main infestation was declining but still at about 50% with honeybees working the flowers. A small area in heavy shade that was not blooming was treated along with sprouts that were breaking through the road asphalt. One-tenth of a backpack sprayer of mixed Habitat® was used.** **The site was monitored again on August 16. Bloom was at approximately 30%. European honeybees were no longer visiting the flowers, but native bees were actively using them. Our speculation was that the flowers were no longer producing pollen, but were still producing nectar that is attractive to native bees. The application was postponed.** **On August 30, the plant was still in about 30% bloom with significant numbers of native bees visiting the flowers. The application was again postponed.** **On September 6, 2012 the site was monitored again. No flowers were present, so the site was sprayed with ½ of a mixed backpack of Stalker.** **In 2013 there were only about four runners under three feet long in scattered areas of the original infestation, including shoots that were pushing through the roadway asphalt. These were treated pre-bloom with Stalker on June 24.** **Monitoring in spring of 2014 found only a couple of sprout stalks breaking through the asphalt. The spray application was postponed until more emergent foliage was present, which allowed greater translocation of the herbicide to the underground rhizomes that are still present. Treatment occurred on July 11, 2014 with only 0.05 ounce of Stalker used on the non-blooming sprouts that were emerging through the asphalt.** **Further monitoring of both sites revealed that fruits were not forming on the plants. This indicates that seeding has not occurred in the past and that eradication may be implemented much more quickly because of the lack of a seedbank reservoir.**
Were adjuvants (drift retardants, surfactants, water conditioners, etc.) used with any of the herbicides? If so, explain the choices.	Pro-tron®, a hydrolyzed vegetable oil adjuvant product, is added to the herbicide mix. Pro-tron® helps to break water tension and thus increase the efficacy of the herbicide on the plant surface. It also helps with plant and soil penetration and drift reduction.
Which herbicide application methods are available for this chemical?	**Methods available:** Directed spot spray or injection. **CONCLUSIONS: A directed spot spray using a backpack sprayer is the most appropriate method considering the size of the infestations and the surrounding environment. As noted above, injection is difficult, uses large quantities of herbicide, would require new equipment, and is of questionable efficacy.**

What factors were considered in choosing the herbicide application method?	The size of the noxious weed infestations and their location are the most important factors in considering the application method. We also consider safety to the applicator, the environment, and nontarget species; endangered species; the effectiveness of the method; and the cost to the Department.
What weather concerns must be checked prior to application?	Wind that could cause non-target drift and the presence of bees are the Department's primary concerns. Though imazapyr is not known to be harmful to bees, it is prudent not to spray when they are actively working the blossoms. Wind can carry the herbicide off-site to sensitive native and ornamental plant areas so treatments occur when there is little or no wind.

State Botanist, Dean Kelch, with Japanese Knotweeed, El Sobrante, CA, July 26, 2012

Japanese Knotweed Leaves and Flowers, El Sobrante, CA, July 26, 2012 (This plant has been identified by Dean Kelch

State Botanist, Dean Kelch, with Japanese Knotweed, Lafayette, CA, July 26, 2012

Japanese Knotweed Leaves and Flowers, Lafayette, CA,

Pesticide Profile for: Imazapyr (Habitat® and Stalker®)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Imazapyr isopropylamine salt (28.7% in formulated product, Habitat; 27.6% in formulated product, Stalker)
Injunction Restrictions	Yes, for California red legged frog. However, neither of the two sites is within CRLF designated habitat.
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	Evidence of non-carcinogenicity for humans
Prop 65	Not Listed
Known Groundwater Contaminant (DPR 6800a list)	Not listed on the Department of Pesticide Regulation's Groundwater Protection list.
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic). Direct skin contact irritation potential. (Stalker MSDS)
Bird Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic) for mallard duck (Stalker MSDS) Bobwhite quail acute oral LD_{50} >2150mg/kg (practically non-toxic) and 8-day dietary LC_{50} >5000 (practically non-toxic) (Stalker MSDS)
Aquatic Organism Hazard	LC_{50} >100mg/l (practically non-toxic) for both tested fish (96 hours) and tested aquatic invertebrates (48 hours) (Stalker MSDS)
Bee Hazard	Acute contact LD_{50} >100ug/l (practically non-toxic)
Persistence	Field half-life ranges from 25-142 days, depending on soil characteristics and environmental conditions. (*Herbicide Handbook* 9th Ed. from the Weed Science Society of America) The primary route of degradation of imazapyr is by photolysis. Light can break down this chemical in a few days but, if it is kept out of sunlight the chemical is broken down very slowly by microbial degradation. If imazapyr is applied to sandy soils and leaches down below 18 inches (where microbial activity is limited) the chemical can be expected to persist for more than a year. (Thurston Co., WA pesticide review of imazapyr, 4/13/09) In aquatic environments imazapyr is expected to be low to moderately persistent, likely due to dispersion and chemical breakdown by sunlight. (Thurston Co., WA pesticide review of imazapyr, 4/13/09)
Soil Mobility	Imazapyr generally remains within the top 50 cm of soil in field dissipation studies. In forest dissipation studies, imazapyr did not run off into streams, and no evidence of lateral movement was observed. (2007 *Herbicide Handbook*-Weed Science Society of America) Imazapyr is considered very water soluble, adheres poorly to soil and organic matter, and has been found to leach into soils after terrestrial applications. Imazapyr is considered high in mobility hazard after terrestrial applications (Thurston Co., WA pesticide review of imazapyr, 4/13/09) Note that because imazapyr is highly soluble in water and is weakly sorbed to soil, the risk of its impacting surface water is low, unless excessive runoff exists.
Use in County by the Agriculture Dept.	Specific and focused spot applications for purple loosestrife and Japanese knotweed.
Method of Application	Generally, backpack directed spot treatment.
Cautions	Applicator is required to use gloves and eye protection when mixing and applying; do not spray desired vegetation; avoid potable and irrigation intakes (do not treat into water if within ½ mile upstream of such intakes)
Rate Used in Co.	1.3 ounce of formulated product/gallon of water
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database, *Herbicide Handbook*, 9th Ed. (2007) from the Weed Science Society of America

Pesticide Profile for: Pro-tron® (adjuvant)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Vegetable oil ethoxylates, tall oil fatty acids (95% as formulated)
Injunction Restrictions	No
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	No
Prop 65	Not Listed
Known Groundwater Contaminant (DPR 6800a list)	Not listed on the Department of Pesticide Regulation's Groundwater Protection list.
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic). Direct skin contact irritation potential.
Bird Hazard	Not found
Aquatic Organism Hazard	Not found
Bee Hazard	Not found
Persistence	Low
Soil Mobility	Not expected to occur in use situations.
Use in County by the Agriculture Dept.	Generally used in all herbicide applications by the Department. Pro-tron® helps to break water tension and thus increase the efficacy of the herbicide on the plant surface. It also helps with plant and soil penetration and drift reduction.
Method of Application	Generally, backpack directed spot treatment. Some uses are by power sprayer using directed hand-held spray nozzles or boom spray to directed target area.
Cautions	Applicator is required to use gloves and eye protection when mixing and applying; do not spray desired vegetation
Rate Used in Co.	0.33 ounce of formulated product/gallon of water
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation

Contra Costa County

DECISION DOCUMENTATION for WEED MANAGEMENT: Airports

Date: 6/17/2014

Department: Public Works Vegetation Management

Location: Buchanan and Byron Airports

Situation: Weeds on and off of pavement at airports

What are the management goals for the weed?	The management goals are to maintain the definition of the runways and to maintain security, safety and visibility at the airports. The Vegetation Manager and the airport staff work together to determine priorities. 1. Keep weeds out of pavement cracks and seams on runways (where planes land and take off) and taxiways (other pavement that planes use to move around the airport) 2. Maintain bare ground 50 to 75 ft on either side of runways (if a plane needs to leave the runway, it must be able to do so unimpeded) 3. Maintain bare ground approximately 20 ft on either side of taxiways (if a plane needs to leave the taxiway, it must be able to do so unimpeded) 4. Keep weeds out of parking areas for planes 5. Maintain bare ground on dirt aprons (road shoulders), 50 to 75 ft on each side 6. Maintain bare ground around signs, runway lights, windsocks, and instrumentation for safety and guidance. 7. Treat infields (non-paved areas between pavement) for broadleaf weeds to prevent any tall plants from growing above 2 to 3 ft; the airports regularly mow the infields with their own equipment to reduce wildlife habitat (wildlife can be a hazard to planes landing and taking off) 8. Maintain bare ground around perimeter fence lines for security (in order to be able to easily see the fence) 9. Leave grass in the infields tall enough to impede the germination and growth of broadleaf weeds and decrease the attractiveness to wildlife	
How often is the site monitored?	The airport staff continually monitor weed conditions and alert the Vegetation Manager of any incipient problems. The Vegetation Manager drives by from time to time to look at the airport from the outside, but no Public Works staff can enter or work at the airports without being escorted by airport personnel in an airport support vehicle. This increases costs and is not done unnecessarily.	
Weeds have been identified as the following:	Any broadleaf weeds or grasses.	
Are populations high enough to require control? Explain	Any vegetation in areas where safety is concerned must be eliminated. Vegetation can reach 2 to 3 ft in the infields as long as it is of uniform height.	
Is this a sensitive site? Note that the area *around* the Byron airport is sensitive—red-legged frog, kit fox & burrowing owl habitat; vernal pools	Are any of the sites under management considered highly sensitive sites?	No
	Are any sites under management part of any of the court-ordered injunction?	No
	Are any of the sites known or potential habitat for any endangered or threatened species?	No
	Are any of the sites on or near an area where people walk or children play?	No
	Are any of the sites near a drinking water reservoir?	No

	Are any of the sites near a creek or flood control channel? Buchanan is next to Walnut Creek with a levee between the airport and the flood control channel. Byron is near Brushy Creek, a seasonal creek.	Yes
	Are any of the sites near crops?	No
	Are any of the sites near desirable trees or landscaping?	No
	Are any of the sites on soil that is highly permeable, sandy, or gravelly?	No
	At any of the sites, is the ground water near the surface?	No
	Is there a well head near the site? It is outside the immediate fenceline of the airport, about ¼ mile away. Restrictions are 100 ft around well heads.	Yes
Which cultural controls were considered?	**Mulching, weed barrier:** Not practical at an airport because weeds would still grow in the soil that will inevitably collect on top of the mulch or weed barrier, and the mulch would blow off onto the pavement. Airport staff regularly sweep the pavement to remove anything that could compromise safety for the planes. **Paving the whole airport**: There would still be cracks and seams where weeds could grow. It would make more work for the Vegetation Management Crew and increase herbicide use. The cost of maintaining and replacing the additional pavement would be significant for the airport staff. **Planting Desirable Species:** Overseeding with ryegrass in the infields could eventually shift the plant population to something that wouldn't have to be mowed, but would probably not significantly change the amount of herbicide used since the ryegrass would still be susceptible to invasion by broadleaf weeds. Currently, the airports are actually slowly selecting for certain grasses in the infields by mowing and only treating for broadleaf weeds. **Burning:** Burning cannot be used at the airports. **CONCLUSIONS: Mulching, weed barriers, paving, and burning are not practical for the level of weed control needed or for the safety concerns at the airports. Overseeding with ryegrass is not an option at this time.**	
Which physical controls were considered?	**Mowing by machine:** Airport staff currently mow the infields; however, at the Byron Airport, they will be experimenting with not mowing the infields to try to reduce problematic weeds. By mowing, they have been selecting for difficult weeds, and last year, a dirty mower brought in more weeds, including *Dittrichia* (stinkwort). When they resume mowing, they will be careful to clean any mowers that are moved from one site to another. **Mowing by hand:** This is not economical because it would be slower, cost more money, and require that the runways be closed longer. **Discing or plowing:** Discing or plowing disturbs the soil and opens areas up to wind and water erosion and continued weed reinfestation. Discing when seed is present increases infestation size. Dust would blow onto the pavement during and after discing and might pose a visibility concern for aircraft during windy weather. Mowing is a better choice. **Grazing:** Grazing would be too slow and costly (requiring runways to be closed too long) and too hazardous (goats might get loose on the runways). **Crack sealing**: This is done to maintain the structure of the pavement, but budget and the issue of having to close runways prohibits doing this for weed abatement. **CONCLUSIONS: Mowing is used regularly by airport staff, but other physical controls are too costly and/or not appropriate at the airports.**	
Which biological controls were considered?	**CONCLUSIONS: No effective biological controls are available**.	

Which chemical controls were considered?

Pre-emergent (residual) herbicide? Yes, for runway shoulders, signs, lights, and fencelines.

Post emergent (contact) herbicide? Yes, as-needed in areas treated with pre-emergents, for weeds in pavement cracks, and for broadleaf weeds in the infields.

Note that the Vegetation Management crew tries not to treat more than 2 seasons in a row with herbicides that have the same mode of action as indicated by their "herbicide resistance management group" as noted on the label. This is to prevent weed resistance and to prevent selecting for weeds that the particular herbicide does not affect.

Possible herbicide choices

After research, extensive experience, consultation with colleagues, and reviewing labels, the herbicides below are chemical options the Department considers effective and economical. These are always under review to determine if there are better products available.

Note that pesticide labels contain a range of rates at which the material can be used. The rates in the chart below are generally in the middle of that range. Pesticides can be used below the label rate, but it is illegal to exceed the label rate. There is increasing research evidence that recurrent exposure to herbicides at rates below those on the label (rates that allow a portion of the weed population to survive) promotes herbicide resistance. Rates are chosen to be sufficient to kill the target weeds, but not to waste herbicide.

How Herbicide Combinations Are Used

Herbicide Combinations	Rates	Use	Application Method	Notes
Esplanade Roundup	5 oz/A 1.6 pt/A	In fall and winter for lights and fencelines and for aprons (road shoulders)	Large truck with boom or small pickup truck with OC-40 on the side	This combination is sprayed at 20 gal/A.
Polaris Roundup	50 oz/A 6 pt/A	Year around for cracks in pavement	Spot spraying while walking and pulling hose with a pin stream nozzle attached to a handgun	This combination is applied at 100 gal/A.
Oust ProClipse Roundup	4 oz/A 2 lbs/A 6 pt/A	In fall and winter around utilities, signs, wind socks, guidance lights and other areas that must be done by hand	Spot spraying while walking pulling hose	This combination is applied at 100 gal/A.
Oust Milestone	4.8 oz/A 5 oz/A	In fall and winter for aprons (road shoulders)	Large truck with boom	This combination is applied at 20 gal/A.
ProClipse Pendulum Telar	2 lbs/A ½ g/A 20 oz/A	In fall and winter for signs and lights	Large truck with boom	This combination is applied at 50 gal/A.
Milestone Vanquish	5 oz/A 1/8 pt/A	Generally in late spring/early summer for broadleaf weeds	Large truck with a rear fan spray	This combination is applied at 20 gal/A.

Herbicide Characteristics

Herbicide/ Signal Word*	Active Ingredient	Characterization	Enjoined for Endangered or Threatened Species?	Herbicide Resistance Mgmt Group
Esplanade/ Caution	Indaziflam	Pre-emergent herbicide for broadleaves and annual grasses	No	(29)
Milestone/ Caution	Aminopyralid	Broadleaf post-emergent herbicide	No	O(4)
Oust/Caution	Sulfometuron methyl	Pre-emergent herbicide for many annual grasses and certain broadleaf weeds	No	K_1(3)
Pendulum/ Caution	Pendimethalin	Pre-emergent or early post-emergent herbicide primarily for grass weeds but also certain broadleaf weeds	Yes, 100 ft buffer for bay checkerspot butterfly, 60+ft buffer for California red-legged frog and 60ft buffer for Salmonids	K_1(3)
Polaris/ Caution	Imazapyr, isopropylamine salt	Broadleaf and grass herbicide with pre-emergent and post-emergent capabilities; it has long soil residual activity	Yes, 60+ft buffer for California red-legged frog	B(2)
ProClipse/ Caution	Prodiamine	Pre- and post-emergent herbicide for many annual and perennial broadleaf and grass weeds	No	B(2)
Roundup/ Caution	Glyphosate	Non-selective post-emergent herbicide	Yes, 60+ft buffer for California red-legged frog	G(9)
Telar/Caution	Chlorsulfuron	Broadleaf post-emergent herbicide with long soil residual activity	No	B(2)
Vanquish/ Caution	Dicamba	Broadleaf post-emergent herbicide	No	O(4)

* A signal word is a description of the acute (short-term) toxicity of a *formulated pesticide product.* Formulated pesticide products contain both active and inert ingredients. Active ingredients kill or control the pest the product is designed for, while inert ingredients allow the pesticide to be effectively applied against the pest. Examples of inerts are solvents, carriers, stickers, and adjuvants. The acute toxicity is the toxicity of a chemical after a single or short-term exposure.

	CONCLUSIONS: The herbicide combinations above are used as appropriate. Pre-emergents are used preventively where no weeds can be tolerated (aprons, signs, lights, and fencelines). Cracks in the pavement are not treated preventively. These are treated as-needed and the crew waits until there is some green before treating with herbicides that kill on contact and have some pre-emergent effect. Infields are treated in late spring to early summer for winter annual broadleaves. The timing depends on the weather the previous year, the current weather, and what is already growing in the area. Throughout the year the airport staff and the Vegetation Manager monitor the property. Weeds that have broken through are treated as-needed with post-emergent contact herbicides.
Which herbicide application methods are available for this chemical?	**Methods available:** • Large truck (800 gal spray tank) with side boom used primarily for aprons—sprays an adjustable swath of up to 60 ft • Large truck (800 gal spray tank) with rear fan sprayer for infields—sprays a swath of 30 ft • Large truck (800 gal spray tank) with side arm sprayer that covers ~70 ft for fencelines and runway lights that are in a straight row • Small truck (100 gal spray tank) with side boom that sprays a swath of 8-12 ft for fencelines and runway lights that are in a straight row • Small truck (100 gal spray tank) with hose and handgun with fan nozzle for spot spraying signs, windsocks, utilities, weather equipment, etc; and for spot spraying cracks (pin stream nozzle) **CONCLUSIONS: All these methods are used in the appropriate situations.**
What factors were considered in choosing the pesticide application method?	Cost and effectiveness are the main considerations for work at the airports. Other factors are always considered, such as toxicity, signal word, environmental considerations (what is adjacent to the treatment area), odor, and mode of action (resistance management group).
What weather concerns must be checked prior to application?	Wind is more important when using the large truck with the arm or rear fan. At wind speeds of 4 to 5 mph, it is still possible to spray safely with a handgun. In general, a coarse spray can be used to reduce drift. Drift control products can also be added to the herbicide mix. Temperature is important for herbicides such as Vanquish that could volatilize and drift off-target. Crews look up wind speeds, temperatures and whether there is an inversion layer (that could also carry herbicides off-target). For pre-emergent herbicides, rainfall is very important. Pre-emergents are used preventively where no weeds can be allowed to grow, e.g., aprons, signs, lights, and fencelines. The crew aims to apply the herbicide in fall after the 1st rain but before the rain really starts to saturate the ground. Ideally there would be 1 to 1 ½ inches of rain in the previous month and a minimum of 1/2 inch of rain in the first 2-3 weeks following the application to set the pre-emergent in the seed germinating zone of the soil. Timing is critical for spraying infields. The soil must be dry enough to support the weight of a vehicle and dry enough to prevent the vehicle from tracking mud or rocks onto the runway. All runways must be free of debris and are regularly swept.
References	Weed Science Society of America: 2007. Herbicide Handbook, 9th Edition Jason K. Norsworthy, et al. 2012. Reducing the Risks of Herbicide Resistance: Best Management Practices and Recommendations. Weed Science Special Issue:31-62

Pesticide Profile for: Aminopyralid (Milestone®)

Note: Environmental fate and ecological toxicity studies are all done with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Aminopyralid Triisopropanolamine salt (40.6% in formulated product, Milestone)
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Not listed
Prop 65	Not listed
Known Groundwater Contaminant	No Has the potential to move into groundwater; however, it has never been detected in groundwater when used as labeled, and field experiments showed limited movement in the soil profile.
Mammalian Hazard	Acute oral LD_{50}: >5000 mg/kg in rats (practically non-toxic)
Bird Hazard	Acute oral LD_{50}: >2250 mg/kg (practically non-toxic) Subacute dietary LC50: >5496 mg/kg (practically non-toxic)
Aquatic Organism Hazard	Fish: 96-hr LC_{50} >100 mg/l (practically non-toxic) Amphibian: 96-hr LC_{50} >95.2 mg/l (practically non-toxic) Crustacean: 96-hr LC_{50} >100mg/l (practically non-toxic) Mollusk: 96-hr LC_{50} >89 mg/l (slightly toxic)
Bee Hazard	Acute contact LD_{50}: >100 ug/bee (practically non-toxic) Acute oral LD_{50}: >117 ug/bee (practically non-toxic)
Persistence	Moderate; half-life of 35 to >103 days. EPA notes that their modeling using the longest half-lives did not result in aquatic concentrations that approach levels-of-concern for aquatic animals and plants.
Soil Mobility	Aminopyralid is soluble in water and adheres poorly to soils with or without organic matter. Mobility hazard for aminopyralid is considered high (Thurston Co, WA aminopyralid review)
Use in County by the Public Works Dept.	Various (see decision-making documents)
Method of Application	Various (see decision-making documents)
Cautions	Use precautions are general (protective gloves, eye protection, long sleeves)
Rate Used in Co.	Various (see decision-making documents)
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co. WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database

Pesticide Profile for: Dicamba (Vanquish®)

Note: Environmental fate and ecological toxicity studies are all done with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	diglycolamine salt of 3,6-dichloro-*o*-anisic acid (58.6% in formulated product: Vanquish®) This is a dicamba type herbicide.
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	Yes, for hazard to desirable plants
Cancer	US EPA Group D: Not classifiable as to human carcinogenicity
Prop 65	No
Known Groundwater Contaminant	Dicamba has not been found in ground water in California; however, it has the potential to move into groundwater (6800 b list). (see also Soil Mobility, below) The US Geological Survey monitored ground water at 2,305 sites in the US from 1992-1996 and dicamba was detected in 0.13% of sites. The highest concentration detected was 0.21ug/L. [from Pesticides in Ground Water of the United States, 1992-1996 in *Ground Water.* 2000. 38(6):858-863]
Mammalian Hazard	Acute oral LD_{50}: >2740 mg/kg in rats(practically non-toxic)
Bird Hazard	Acute oral LD_{50} = 968 mg/kg in bobwhite quail (slightly toxic)
Aquatic Organism Hazard	LC_{50}: 130 – 516 mg/L for formulated dicamba products with 24 to 96 hr exposure times for various fish (practically non-toxic) Clarity is high in hazard for aquatic plants.
Bee Hazard	>LD_{50} >100 ug/bee (practically non-toxic)
Persistence	Biotic or aerobic half-life is between 4 and 31 days (low to moderate persistence). Anaerobic half-life is 141 days (high persistence) Dicamba may volatilize slightly from plants and ground surface but that is not considered the major route of chemical dissipation or breakdown. Microbial activity is the primary route of degradation from soil. Laboratory and field studies show that dicamba is likely to break down in soil to half of its application concentration between one and 5 weeks. Dicamba is expected to degrade in aquatic systems even faster. The persistence hazard of dicamba is considered moderate. (Thurston Co, WA review of dicamba diglycolamine salt)
Soil Mobility	Low to medium leaching potential. Dicamba is mobile in soil but degrades rapidly. Low potential for runoff due to rapid degradation. (*Herbicide Handbook*, 9th Ed., Weed Science Society of America)
Use in County by the Public Works Dept.	Various (see decision-making documents)
Method of Application	Various (see decision-making documents)
Cautions	Use precautions are general (protective gloves, eye protection, long sleeves) Respirator if used in a non-ventilated area
Rate Used in Co.	Various (see decision-making documents)
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews, *Herbicide Handbook*, 9th Ed. (2007) from the Weed Science Society of America

Pesticide Profile for: Glyphosate (Roundup®)

Note: Environmental fate and ecological toxicity studies are all done with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Glyphosate (50.2% in formulated product, Roundup Pro Concentrate)
Injunction Restrictions	60 ft. buffer around California red-legged frog habitat; 15ft buffer for noxious weed programs
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Evidence of non-carcinogenicity in humans
Prop 65	Not listed
Known groundwater contaminant	No
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg in rats and mice (practically non-toxic)
Bird Hazard	Acute oral LD_{50} >1,000 mg/kg (slightly toxic)
Aquatic Organism Hazard	Fish: LC_{50} 86mg/L (slightly toxic) Crustacean: LC_{50} 281 mg/L (practically non-toxic) Mollusk: LC_{50} >10 mg/L (slightly toxic)
Bee Hazard	LD_{50}>100 ug/bee (practically non-toxic)
Persistence	A typical field half life is 47 days. The median half life in water varies from a few days to 91 days. Glyphosate is expected to degrade to half of the applied concentration within 60 days.
Soil Mobility	K_{oc} = 24,000 (potential to leach into groundwater is extremely low) from the OSU Pesticide Properties Database
Use in County by the Public Works Dept.	Various (see decision-making documents)
Method of Application	Various (see decision-making documents)
Cautions	Normal applicator precautions include wearing a long-sleeved shirt and long pants, chemical-resistant gloves made of any water proof material.
Rate Used in Co.	Various (see decision-making documents)
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database

Pesticide Profile for: Chlorsulfuron (Telar XP®)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Chlorsulfuron (75% active ingredient in formulated product Telar XP)
Injunction Restrictions	This chemical is not part of any of the court injunctions.
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	No evidence of human carcinogenicity
Prop 65	Yes, listed for developmental, female. Note that developmental toxicity was seen at concentrations above the maternally toxic doses. (from Thurston Co., WA review of chlorsulfuron)
Known Groundwater contaminant	No
Mammalian Hazard	Acute oral LD_{50} for formulated product (75% chlorsulfuron) is 2493 mg/kg to 4147 mg/kg (practically non-toxic). "No observable effect levels of 100 ppm in the diet of rats (3 months) and 2500 ppm in the diets of mice (3 months) and dog (6 months). No observable effect levels of 100 ppm in the diet of rats for 2 years and 500 ppm in the diet of mice for 2 years." (from Cornell Chlorsulfuron – Herbicide Profile 3/85) The no observable effect level of 100 ppm in the diet of a rat is equivalent to ¼ oz. of chlorsulfuron per day in the diet of a 160 lb. human.
Bird Hazard	"Chlorsulfuron is practically non-toxic to birds and mammals on an acute exposure basis and is also practically non-toxic to birds on a subacute dietary exposure basis. (from EPA R.E.D. Facts for Chlorsulfuron May 30, 2005)
Aquatic Organism Hazard	"Chlorsulfuron is practically non-toxic to both freshwater and estuarine/marine fish on an acute exposure basis and is slightly toxic to estuarine/marine invertebrates." (from EPA R.E.D. Facts for Chlorsulfuron May 30, 2005)
Bee Hazard	"Chlorsulfuron is also practically non-toxic to honeybees on an acute contact basis." (from EPA R.E.D. Facts for Chlorsulfuron May 30, 2005)
Persistence	"Degradation by hydrolysis appears to be the most significant mechanism for degradation of chlorsulfuron, but is only significant in acidic environments (32 day half-life at pH = 5); it is stable to hydrolysis at neutral to high pH. Degradation half-lives in soil environments range from 14 to 320 days. (from EPA R.E.D. Facts for Chlorsulfuron May 30, 2005) Under growing season conditions, the half-life is 4-6 weeks. (from Cornell Chlorsulfuron – Herbicide Profile 3/85) "Terrestrial Field Test Half-life (days) = 36" (from Thurston Co., WA review of chlorsulfuron)
Soil Mobility	"Chlorsulfuron is likely to be persistent and highly mobile in the environment. It may be transported to nontarget areas by runoff and/or spray drift." (from EPA R.E.D. Facts for Chlorsulfuron May 30, 2005)
Use in County by the Public Works Dept.	At the airports it is used mainly as a spot treatment around signs and lights. It is not used on runways and infields.
Method of Application	Various (see decision-making documents)
Cautions	Do not use on irrigation canal banks due to sensitivity of crops. Normal applicator precautions include wearing gloves and eye protection and avoiding direct skin contact.
Rate Used in Co.	Various (see decision-making documents)
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews

Pesticide Profile for: Imazapyr (Polaris®)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Imazapyr isopropylamine salt (28.7% in formulated product, Habitat; 27.6% in formulated product, Stalker)
Injunction Restrictions	Yes, for California red legged frog. However, neither of the two sites is within CRLF designated habitat.
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	Evidence of non-carcinogenicity for humans
Prop 65	Not Listed
Known Groundwater Contaminant	Not listed.
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic). Direct skin contact irritation potential. (Stalker MSDS)
Bird Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic) for mallard duck (Stalker MSDS) Bobwhite quail acute oral LD_{50} >2150mg/kg (practically non-toxic) and 8-day dietary LC_{50} >5000 (practically non-toxic) (Stalker MSDS)
Aquatic Organism Hazard	LC_{50} >100mg/l (practically non-toxic) for both tested fish (96 hours) and tested aquatic invertebrates (48 hours) (Stalker MSDS)
Bee Hazard	Acute contact LD_{50} >100ug/l (practically non-toxic)
Persistence	Field half-life ranges from 25-142 days, depending on soil characteristics and environmental conditions. (*Herbicide Handbook* 9th Ed. from the Weed Science Society of America) The primary route of degradation of imazapyr is by photolysis. Light can break down this chemical in a few days but, if it is kept out of sunlight the chemical is broken down very slowly by microbial degradation. If imazapyr is applied to sandy soils and leaches down below 18 inches (where microbial activity is limited) the chemical can be expected to persist for more than a year. (Thurston Co., WA pesticide review of imazapyr, 4/13/09) In aquatic environments imazapyr is expected to be low to moderately persistent, likely due to dispersion and chemical breakdown by sunlight. (Thurston Co., WA pesticide review of imazapyr, 4/13/09)
Soil Mobility	Imazapyr generally remains within the top 50 cm of soil in field dissipation studies. In forest dissipation studies, imazapyr did not run off into streams, and no evidence of lateral movement was observed. (2007 *Herbicide Handbook*-Weed Science Society of America) Imazapyr is considered very water soluble, adheres poorly to soil and organic matter, and has been found to leach into soils after terrestrial applications. Imazapyr is considered high in mobility hazard after terrestrial applications (Thurston Co., WA pesticide review of imazapyr, 4/13/09) Note that because imazapyr is highly soluble in water and is weakly sorbed to soil, the risk of its impacting surface water is low, unless excessive runoff exists.
Use in County by the Public Works Dept.	Various (see decision-making documents)
Method of Application	Various (see decision-making documents)
Cautions	Applicator is required to use gloves and eye protection when mixing and applying; do not spray desired vegetation; avoid potable water and irrigation intakes (do not treat into water if within ½ mile upstream of such intakes)
Rate Used in Co.	Various (see decision-making documents)
Sources	Label, MSDS, EPA registration and re-registration documents, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews, European Union, University of Hertfordshire, U.K. Pesticide Properties Database, *Herbicide Handbook*, 9th Ed. (2007) from the Weed Science Society of America

Pesticide Profile for: Indaziflam (Esplanade®)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Indaziflam (19.05% in formulated product)
Injunction Restrictions	No
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	Not likely to be carcinogenic for humans
Prop 65	Not Listed
Known Groundwater Contaminant	Not listed.
Mammalian Hazard	Acute oral LD_{50} >2,000 mg/kg (practically non-toxic on an acute and chronic basis). No skin or eye irritation; non-sensitizing
Bird Hazard	Acute oral LD_{50} >2000 mg/kg (practically non-toxic both on an acute oral and subacute dietary exposure basis)
Aquatic Organism Hazard	Indaziflam is highly toxic (EC_{50}= 0.1 – 1 mg a.i./L) to freshwater and estuarine/marine fish, moderately toxic (EC_{50}= 1 -10 mg a.i./L) to highly toxic (EC_{50}= 0.1 – 1 mg a.i./L) to estuarine invertebrates, and slightly toxic (EC_{50}= 10 - 100 mg a.i./L) to moderately toxic (EC50= 1 -10 mg a.i./L) to freshwater invertebrates on an acute exposure basis. However, due to the use of indaziflam in the County and the chemical's subjectivity to aqueous photolysis, exposure to freshwater and estuarine/marine fish and invertebrates is expected to be limited.
Bee Hazard	Practically non-toxic (from the EPA Indaziflam Pesticide Fact Sheet, July 26, 2010)
Persistence	Indaziflam is moderately persistent to persistent in aerobic soil (half-lives > 150 days), persistent in anaerobic soil (stable), and persistent in aerobic (half-lives > 200 days) and anaerobic (stable) aquatic environments. Indaziflam is subject to aqueous photolysis in clear shallow waters (half-life < 5 days).
Soil Mobility	Indaziflam is expected to be moderately mobile to mobile in the soil (Koc < 1000 mL/g oc).
Use in County by the Public Works Dept.	Various (see decision-making documents)
Method of Application	Various (see decision-making documents)
Cautions	Applicator is required to wear a long-sleeved shirt and long pants, shoes plus socks, and chemical resistant gloves made of any waterproof material such as natural rubber >14 mils. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark.
Rate Used in Co.	Various (see decision-making documents)
Sources	Label, MSDS, EPA Pesticide Fact Sheet, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State)

Pesticide Profile for: Sulfometuron methyl (Oust®)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Sulfometuron methyl (75% in formulated product)
Injunction Restrictions	No
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	Toxicity testing indicates that sulfometuron methyl is not carcinogenic, mutagenic, neurotoxic, or known to cause developmental toxicity. Reproductive toxicity testing indicate that sulfometuron methyl is not a reproductive toxicant. (Thurston Co. pesticide review)
Prop 65	Not Listed
Known Groundwater Contaminant	Not listed.
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic). Slight skin and eye irritation; non-sensitizing
Bird Hazard	Acute oral LD_{50} >5000 mg/kg (practically non-toxic)
Aquatic Organism Hazard	LC_{50} >140mg/l (practically non-toxic) for both tested fish (96 hours) and tested aquatic invertebrates (48 hours)
Bee Hazard	Acute contact LD_{50} >100ug/l (practically non-toxic)
Persistence	Aquatic Field Test Half-life = 9 to 187 days Terrestrial Field Test Half-life = 44 to 128 days Biotic or Aerobic Half-life = 52 to 58 days Anaerobic Half-life = 283 days in soil The persistence of sulfometuron methyl varies in aquatic environments due to the faster rate of dissipation in acidic water and slower degradation in neutral or alkaline water. In soil, sulfometuron methyl is very mobile; field testing only took into account the chemical found in the upper 15cm of soil, which could account for the differences in degradation rates. When sulfometuron methyl leaches deeply into soil where there is little oxygen, it is expected to degrade very slowly. The persistence hazard for sulfometuron methyl is conservatively rated high. (Thurston Co. pesticide review)
Soil Mobility	Sulfometuron methyl is fairly water soluble, but does not bind well to soil with or without organic matter. The hazard for sulfometuron methyl to move off the site of application (or to leach into soil) with rain or irrigation water is rated moderate (OSU Extension Pesticide Properties Database).
Use in County by the Public Works Dept.	Various (see decision-making documents)
Method of Application	Various (see decision-making documents)
Cautions	Applicator is required to wear a long-sleeved shirt and long pants, shoes plus socks, and chemical resistant gloves. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark.
Rate Used in Co.	Various (see decision-making documents)
Sources	Label, MSDS, EPA Pesticide Fact Sheet, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews

Pesticide Profile for: Prodiamine (ProClipse®)

Note: Environmental fate and ecological toxicity studies are all performed with the technical grade active ingredient (as opposed to formulated product). Technical grade active ingredient is also used in evaluating carcinogenic potential. Human health-related acute toxicity studies [toxicity via ingestion, dermal exposure, and inhalation and eye irritation, skin irritation, and skin sensitization (allergic response)] are performed using the formulated product typically on rats or rabbits.

Active Ingredient	Prodiamine (65% in formulated product)
Injunction Restrictions	No
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	Prolonged overexposure to prodiamine may affect liver and thyroid. In animal studies with prodiamine, benign thyroid tumors were seen in rats, but none were observed in mice. Inhalation of excessive amounts of kaolin dust may produce coughing, sneezing and nasal irritation. This product contains clay. Crystalline silica (e.g., quartz) is a naturally occurring component of clay. Inhalation of crystalline silica may cause pulmonary fibrosis (silicosis). Crystalline silica has been classified by EPA as a possible human carcinogen, by IARC as carcinogenic to humans, by the U.S. National Toxicology Program as a known human carcinogen and by ACGIH as a suspected human carcinogen.(ProClipse MSDS)
Prop 65	Not Listed
Known Groundwater Contaminant	Not listed.
Mammalian Hazard	Acute oral LD_{50} >5,000 mg/kg (practically non-toxic). Non-irritating to skin and mild eye irritation; sensitizer
Bird Hazard	8-day dietary LC_{50} >10,000 ppm (practically non-toxic)
Aquatic Organism Hazard	LC_{50} >140mg/l (practically non-toxic) for both tested fish (96 hours) and tested aquatic invertebrates (48 hours)
Bee Hazard	Acute contact LD_{50} >100ug/l (practically non-toxic)
Persistence	Prodiamine does not bioaccumulate. It is persistent in soil and has an average half-life of approximately 120 days.
Soil Mobility	K_{oc} = 13,000 (potential to leach into groundwater is extremely low) from the OSU Pesticide Properties Database
Use in County by the Public Works Dept.	Various (see decision-making documents)
Method of Application	Various (see decision-making documents)
Cautions	Applicator is required to wear a long-sleeved shirt and long pants, shoes plus socks, and waterproof gloves. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark.
Rate Used in Co.	Various (see decision-making documents)
Sources	Label, MSDS, EPA Pesticide Fact Sheet, carcinogen lists (from EPA, International Agency for Research on Cancer, National Toxicology Program), Prop. 65, California Department of Pesticide Regulation, Oregon State University Pesticide Properties Database, National Pesticide Information Center (Oregon State), Thurston Co., WA Terrestrial Pesticide Reviews

Attachment B. Subcommittee Reports

Report of the Decision-Making Subcommittee

to the Contra Costa County IPM Committee.

Prepared by Tanya Drlik, IPM Coordinator

September 2014

Members

Carlos Agurto
Terry Davis—chair
Doug Freier
Vince Guise/Chad Godoy
Michael Kent
Cece Sellgren

The Decision-Making Subcommittee met five times in 2014: February 24, March 17, May 19, July 21, and August 11.

In conjunction with the Departments, the subcommittee discussed which pests or pest management situations should be documented this year.

Decision-making documents were developed for

- Japanese knotweed (Agriculture Department)
- Artichoke thistle (Agriculture Department)
- Purple starthistle (Agriculture Department)
- Weed management on Buchanan and Byron Airports (Public Works)

The subcommittee reviewed each document with the appropriate Department and made requests for a number of changes, clarifications, and improvements. Some of the improvements that were added are as follows:

- A box for the question, “Is there a well head nearby?”
- A statement under “Possible herbicide choices” that indicates that the Department has used research, experience, consultation with colleagues, and review of pesticide labels to determine which options it considers effective and economical.
- An additional statement under “Possible herbicide choices” that indicates that herbicide choices are always under review to find more effective and less hazardous products.
- An indication of the signal word on the label of each pesticide and an explanation of what a signal word is.
- Information about adjuvants and why they are added to the herbicide mix.
- Maps where possible and appropriate.

It was decided that any improvements would be added to documents going forward, and previous documents would be updated in the future. Decision-making documents are considered current as of the date on the document.

The current versions of the decision-making documents that were reviewed this year are attached.

Report of the Cost Accounting Subcommittee

to the Contra Costa County IPM Committee.

Prepared by Tanya Drlik, IPM Coordinator

September 2014

Members

Vince Guise/Matt Slattengren/Chad Godoy
Susan Heckly
Michael Kent
Allison Knapp/Joe Yee
Marj Leeds—Chair
Cece Sellgren

The Cost Accounting Subcommittee met five times in 2014: February 20, March 18, April 15, June 17, and August 19.

After considerable discussion during the first two meetings about the areas on which to focus the committee's attention, the committee agreed to investigate the cost of a long-term transition to more sustainable landscaping around County buildings that would require less maintenance, energy and water, and minimal or no pesticide use. The committee researched the costs of turf vs. ornamentals and the cost of artificial turf. Over the 5 meetings, the committee learned the following:

- The Grounds Division uses most of its herbicide on the Marsh Creek Firing Range where they must maintain bare ground because of fire and other safety regulations.
- The Grounds Division has quite a diverse portfolio of landscapes around County buildings as well as other sites to maintain—over 100 sites. It is extremely difficult to make generalizations about County landscapes because they are so varied, and the amount of funding is so different from one site to another.
- When Kevin Lachapelle took the position as Grounds Manager, he made the decision to stop using insecticides, miticides, or fungicides. The Grounds Crew tries to keep the landscapes healthy enough that these pests are not a problem, but if plants succumb to damage from insects, mites or fungus, they are removed.
- The Grounds Division uses only herbicides, and the majority of the herbicide is Roundup® (glyphosate) that is used in spot treatments around County buildings. These spot treatments are primarily in cracks and crevices in pavement. Cracks can be sealed in pavement, but this is expensive, has environmental consequences, and will always provide spaces for soil to collect and allow weeds to germinate. Pre-emergent herbicides are no longer used around buildings, so the amount of pre-emergent used is small.
- The Grounds Division has been de-landscaping buildings and medians (and covering the soil with mulch where feasible) over the last few years because of lack of funds for maintenance. Summit Center on Arnold Drive in Martinez is one site where this has been used extensively.
- Artificial turf is costly to install (around $25K for 1000 sq ft). Conversion to artificial turf would entail the substantial use of herbicide to kill any vegetation at the site. Artificial turf is a petroleum product, it still uses some water (for cleaning), it must be vacuumed and raked, weeds can grow on top of it when enough soil accumulates, in the summer it can increase the heat in the immediate vicinity, and it could pose environmental problems at the end of its life. In the best case, the return on investment is 20 years.
- Artificial turf might be appropriate at sites with tiny, odd-shaped pieces of turf that are difficult and expensive to maintain, if there is some pressing reason the turf is needed. Artificial turf has been used at some Head Start sites where they like to use it for play areas.
- The costs of maintaining different kinds of landscapes is complicated:
    - So much depends on the site, how it is planted, and with what.
        - Formal ornamental plantings with high water needs and fast-growing plants can take just as much or more water and maintenance as a similar area of turf.
        - Informal plantings with moderate water-use plants need less maintenance and water.

        - Informal plantings with drought-tolerant plants use much less water and need less maintenance.
        - If plants are chosen properly (right plant/right place) and are planted properly (enough room for each plant to reach its natural size), they can be left alone and require maintenance perhaps only 2 times per year.
        - Drought tolerant plants will need water for around 3 years to get established, but then should be able to make it on their own (although in severe drought, they may need supplemental water)
    - Other factors contribute to the cost of maintenance:
        - Deferring plant maintenance (which the County started doing during the recession) can greatly increase maintenance time when the decision is made to resume maintenance. Often plants have grown into a jungle that can take a huge amount of work to tame, and the site looks unattractive once the work is done.
        - Overplanted sites take much more maintenance and water because there are more plants to maintain, and often more kinds of plants that must be treated differently.
        - Plants in the wrong place increase maintenance—for example, if plants are too close together or too close to the building or the sidewalk, they will need constant pruning.
        - No-mow turf that is allowed to go dormant during the summer can use much less water and need much less maintenance, but people will have to accept brown grass in summer.
        - Old irrigation systems need much more maintenance because there are so many more problems as they age.
        - Drip irrigation can require much more attention than traditional sprinklers because the lines are delicate and vulnerable to vandalism, chewing from animals, clogging, or being accidentally cut by shovels or other tools.
- Determining the maintenance costs and herbicide use on any particular County site would be time consuming and would have to be done by hand. The Public Works accounting system would be unable to produce such a report electronically, and the data available in current reports are not suited to understanding the cost of maintenance, water, and equipment.
- People's expectations for the kind of landscapes around County buildings, and the way those landscapes will look, need to change.
- There are many County sites with dead and dying plant material. These are prime sites to examine for re-landscaping with drought-tolerant plants. The irrigation systems at those sites are designed for the old plant material, and the cost of fixing the irrigation would have to be factored in.

Suggestions from the committee

- The County could look for opportunities to change people's expectations regarding landscaping:
    - People cannot expect perfect turf, or any turf.
    - People cannot expect County landscapes to be weed-free.
    - During the dry season, and especially during times of drought, people cannot expect lush, green landscapes.
- The Grounds Division could find opportunities to educate building occupants and citizens, for instance, by using a sign at de-landscaped sites or areas with brown turf explaining that the County is saving water in time of severe drought.
- The County could consider developing a strategic plan for sustainable landscapes around County buildings.
- The County could adopt a policy specifying that any new landscapes that are created or any landscapes that are renewed should be planted with drought-tolerant plants that are appropriate to the site and planted with minimizing water use and lowering maintenance in mind. The policy would have to be general enough to accommodate the diverse uses of County landscapes.
- Since we are in the midst of a several year drought and the prospect for ample rain this winter is poor, this is not the time to begin extensive renovation projects.

Report of the Transparency Subcommittee

to the Contra Costa County IPM Committee.

Prepared by Patti TenBrook

September 2014

Members

Cheng Liao
Vince Guise/Chad Godoy
Scott Cashen
Cece Sellgren
Patti TenBrook—chair

The Transparency Subcommittee met four times in 2014: February 26, April 2, June 4, and August 6. Three main topics were addressed:

1) **Demonstration of the new pesticide use posting website**. At the April 2 meeting, Dan Jordan of Public Works demonstrated the web site. He noted that Public Works is hosting the website and currently there is no way for the Grounds Division, Pestec, or the Agriculture Department to add information. As of the last Transparency Subcommittee meeting on August 6, the website was not live.

2) **Separating Public Works pesticide use reports.** Parents for a Safer Environment (PfSE) had requested that Public Works divide their Pesticide Use Reports that are submitted to the California Department of Pesticide Regulation into use on roads, flood control channels, and real property.

   History

   - For a number of years, up until FY 2011-12, Public Works had submitted 3 separate hard copy use reports each month under these 3 categories.
   - Pesticide Use Reports are required by the state and are submitted to the state through the County Department of Agriculture.
   - All pesticide use reporting to the state is now done electronically. The state does not require Public Works to separate their pesticide use into categories, and in fact the data cannot be separated in the new system unless the Agriculture Department were to issue 3 separate permit numbers to Public Works for them to report under.
   - Reformatting of information is not required for public records requests.

   For the Department, separating their pesticide use into 3 categories would entail extra work for their very limited staff. The Department feels that separation into categories serves no practical purpose for them. Public Works has no need to separate the data on the Pesticide Use Reports because the Department collects separate data in Maintstar, the Department's computerized maintenance database.

   Maintstar is a work planning tool. Pesticide use information is collected by 4 different "Activity Codes" for weed spraying:

   a. Access (access roads along creek channels)
   b. Creek (banks of creeks and flood control channels)
   c. Aquatic (herbicides used for weeds growing in the water)
   d. Road (County roads other than those along channels)

   Joe Yee provided PfSE a copy of a 72-page Maintstar report on pesticides used in calendar year 2013 by the Public Works Road and Flood Control Maintenance Division. The report divides pesticide use by the Activity Codes mentioned above.

   Maintstar records the name of the pesticide used and the quantity but cannot report on the units for that quantity. It was not intended as a pesticide use reporting program.

The subcommittee would like to hear back from PfSE as to whether this report meets their needs.

3) **Process for addressing public concerns.** Jill Ray of Supervisor Andersen's office explained to the subcommittee that the IPM Advisory Committee takes concerns from the public at each meeting, and frequently works on them. If the public brings concerns that are not on the meeting agenda, the Committee can ask staff to research the topic and report to the Committee, and/or the Committee can add the topic to a future Committee agenda for discussion. The IPM Coordinator reports to the Transportation, Water and Infrastructure Committee (TWIC) about IPM Committee activities and public comment is allowed before and after that report. The Supervisors may direct the IPM Coordinator to do certain things and report back to TWIC, or they may ask the IPM Committee to review or work on an issue. Some issues might only be heard before TWIC; others might go to the full Board. The public is not always satisfied, but the Board of Supervisors is the final decision-making body. The Public can always go to the full Board of Supervisors with their concerns.

   Jill Ray also noted that in regard to the IPM ordinance vs. policy/administrative bulletin issue, both TWIC and the full Board of Supervisors were kept informed and followed the issue. The Board has accepted the IPM Administrative Bulletin and has not asked for more research on an ordinance. In Contra Costa County, Administrative Bulletins are the law.

   The committee discussed the meaning of "transparency" and, based on that discussion, has drafted a short reference document for IPM Committee participants (members, staff, and public). The document is attached to this report. It is intended as a reminder of why transparency is important, what is required by law, and what the CC County IPM Program is doing to implement those requirements.

Transparency for Contra Costa County IPM

Tools currently used to implement transparency:

1) IPM website
    a. Policies
    b. Reports in friendly formats
    c. Meeting agendas and minutes
2) E-mail
3) Public meetings
4) Decision documents
5) Posting at application sites
6) Responding to public records requests

Tools in the works:

1) Posting website

Challenge is to meet legal requirements within resource limitations.

California Law

California Public Records Act: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=06001-07000&file=6250-6270

Brown Act: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=54001-55000&file=54950-54963

Bagley-Keene Open Meeting Act: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=11001-12000&file=11120-11132

Sunshine Amendment (Article I, Section 3(b)): http://www.leginfo.ca.gov/.const/.article_1

Attachment C. Pesticide Use Reporting

(See separate PDF for Contra Costa County Operations Pesticide Use Data Spreadsheet)

History of Pesticide Use Reporting

Since the 1950s, the State of California has required at least some kind of pesticide use reporting, but in 1990, the comprehensive reporting program we have now went into effect.

California was the first state in the nation to require full reporting of all agricultural and governmental agency pesticide use. The current reporting system exempts home use pesticides and sanitizers, such as bleach, from reporting requirements. (Sanitizers are considered pesticides.)

What does "pesticide" mean?

The California Department of Pesticide Regulation (DPR) defines pesticide as "any substance or mixture of substances intended for preventing, destroying, repelling or mitigating insects, rodents, nematodes, fungi, weeds, or other pests. In California plant growth regulators, defoliants, and desiccants, as well as adjuvants, are also regulated as pesticides."

"Adjuvants" increase pesticide efficacy and include emulsifiers, spreaders, foam suppressants, wetting agents, and other efficacy enhancers. In FY 13-14, Contra Costa County operations used a total of 5,686 lbs. of pesticide active ingredient, which included 2,186 lbs. of spray adjuvant and growth regulator active ingredients that were used to prevent foaming, to reduce pesticide drift, and slow plant growth or were used as a surfactant.

How Pesticide Use is Reported to the State

Pesticide use data is reported monthly to the County Agriculture Commissioner. The data is checked and sent on to DPR, which maintains a database of pesticide use for the entire state. Although pesticide use is reported to DPR as pounds, ounces, or gallons of pesticide product, DPR reports pesticide use in its database as pounds of active ingredient.

DPR defines active ingredient as "[a]n agent in a product primarily responsible for the intended pesticidal effects and which is shown as an active ingredient on a pesticide label." (Since adjuvants are regulated as pesticides in California, the active ingredients of adjuvants are also included in DPR's database.)

How Pesticide Use is Reported by Contra Costa County Operations

The attached spreadsheet records pesticide use data only for County operations and not for any other agency, entity, company, or individual in the County.

Since DPR reports California pesticide use in pounds of active ingredient, Contra Costa County does the same. The County uses the same formula for converting gallons of pesticide product into pounds of active ingredient that the state uses:

Pounds of Active Ingredient =

gallons of product used X 8.33 lbs/gallon of water X the specific gravity of the product X the % of active ingredient in the product