Contra Costa County Integrated Pest Management Advisory Committee

2013 Annual IPM Program Status Report

to the

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

EXECUTIVE SUMMARY

This year, the IPM Advisory Committee continued to explore

- how pest management decisions are being made in the County,
- how to make the IPM Program more transparent, especially in the area of pesticide use, and
- additional metrics to comprehensively evaluate the IPM program (to augment pounds of pesticide used).

Last year, the Committee developed a form for documenting pest management decisions. This year, each of the departmental IPM programs developed at least one comprehensive decision making document for a particular pest, and the Agriculture Department developed two. 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.

The Committee addressed reporting of "Bad Actor" pesticides along with whether the County should develop an IPM Ordinance, both issues raised by Parents for a Safer Environment.

Pesticide use by County operations increased somewhat this year but is still 60% below the amount used in FY 00-01. The increase in FY 12-13 was almost entirely in the Public Works Roadside and Flood Control Channel Maintenance Division and was because increased staffing allowed the Division to do more work in flood control channels. The Division also used fewer pounds of pre-emergent herbicides which necessitates the use of more post-emergent herbicides because the crew must return one or more times to a site to achieve the same level of weed control. This year, the Annual Report contains more detailed information about pesticides used in the County than previous reports.

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 working with Supervisor Gioia's office and the City of Richmond, and Supervisor Mitchoff's office and the City of Concord to clarify responsibilities and policies in the cities and the County.

This fall, the Contra Costa County Department of Agriculture, Vince Guise, Agricultural Commissioner, was honored with a prestigious IPM Innovator Award from the California Department of Pesticide Regulation. Commissioner Guise and his department will be recognized in a ceremony in Sacramento this coming January. The Department continued work on its noxious weed management program, a program that is unique in the state in its scope and persistence. The Department surveyed over 217,000 acres of public and private land, and treated 322 net acres of weeds.

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. The Grounds Division has been able to increase their staffing this year, and because of the added staff they can once again work on improving the visual appearance of County grounds. The Roadside and Flood Control Maintenance Division used goats and/or sheep to abate weeds at 17 sites and is gaining knowledge and experience with this management method. The County Flood Control District is partnering with the non-profit Restoration Trust in an experiment along the Clayton Valley Drain to determine the feasibility and effectiveness of planting native grasses to outcompete exotic weeds.

HISTORY

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. A formal body, the Integrated Pest Management (IPM) Advisory Committee, was created by the Board of Supervisors in November 2009. This report is the fifth annual status report from the IPM Coordinator and the IPM Advisory Committee.

BACKGROUND

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.

COMMITTEE PRIORITIES FOR 2013

In January of this year, the IPM Advisory Committee made the decision to focus its work for the year on the following two IPM program features and to develop recommendations for the Departments of Agriculture and Public Works around these two topics:

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

B. Data management/IPM program evaluation—determining what data, other than pesticide use figures, can be used for a more comprehensive evaluation of the County's IPM programs

The Committee formed two subcommittees to work on these priorities.

2013 ACCOMPLISHMENTS OF THE IPM ADVISORY COMMITTEE AND THE IPM COORDINATOR

Accomplishments of the IPM Committee

The IPM Advisory Committee (the Committee) held six regular meetings and one extra meeting during 2013. The subcommittees held a total of 10 meetings to address the above priorities. The IPM Coordinator serves as staff to the Committee and the two 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
2. Reviewed at least one decision-making process for each IPM program
   - Agriculture Department:
     1. Perennial pepperweed near a remnant population of Contra Costa goldfields
     2. Ground squirrels on critical infrastructure
   - Facilities Division: Rats and mice in and around County buildings
   - Grounds Division: Weeds on Camino Tassajara medians
   - Public Works Roadside and Flood Control Channel Maintenance Division: Weeds on flood control channels

   These are detailed text documents developed by the Departments that follow a form devised by the IPM Coordinator and the subcommittee. (See Attachment A for the decision making documents completed this year.)

The Committee recommends to the Departments for 2014 that they

1. Continue to work on decision making documents for the types of pest management problems they have

The Committee understands that these documents are examples of how the Departments make decisions and are current as of the date on the document.

Priority B: Data Management/IPM Program Evaluation

Through the work of the subcommittee, the IPM Advisory Committee

1. Worked with each Department to complete the IPM Priority Assessment tool (see Attachment B) to assess the implementation of the elements of an IPM program, and for a second year to prioritize those elements

2. Worked with each Department to choose one priority that was not fully implemented and improve implementation during the year; considerable progress was made in the areas identified below
    - For the Agriculture Department: 1) more complete documentation of weed control activities on private land, including completing the development of base maps for all properties surveyed each year and 2) web posting for select pesticide use locations according to the County posting policy
    - For the Facilities Division: 1) improved communication with the pest management contractor, and 2) web posting of select pesticide use locations
    - For the Grounds Division: 1) increased staffing and 2) web posting of select pesticide use locations
    - For the Public Works Roadside and Flood Control Channel Maintenance Division: 1) design and implementation of a pesticide posting page on the County's website and 2) web posting of select pesticide use locations
3. Discussed additional metrics that could be used to evaluate IPM programs
    - Finding appropriate and useful metrics proved to be a difficult task. After a review of annual reports from other Bay Area counties, the subcommittee did not discover any unique or innovative metrics.
    - Contra Costa County has been reporting pesticide use data for County departments as the only metric in the IPM Annual Report, and pesticide use will continue to be reported.
    - The subcommittee agreed, however, that pesticide use data do not reveal whether the County is implementing IPM. Pesticide use is the result of a decision to manage a pest. IPM is a decision making process that can lead to a decision to manage a pest with a chemical. The amount of pesticide used in any one year is influenced by factors that have little to do with IPM implementation, such as weather conditions that influence the increase or decrease of a pest population; the use of new or different pesticides that are effective in ounces per acre rather than pounds per acre; the use of alternative pesticides that are less hazardous but also less effective so that more material is needed for control; the addition or subtraction of pest management projects to/from a department's workload, and budget or staff cuts that make it difficult or impossible to use alternate methods of control.
    - Cost weighs heavily in the departments' choices of pest management methods. Costs must be balanced with efficacy; with feasibility; with hazards to the public, to staff, and to the environment; and with available funding and staff time. The County has still not recovered from the 2007 financial crisis, and budgets are still restricted. The subcommittee concluded that tracking and reporting costs for various management methods is important.
4. Discussed additional items and metrics that can be included in the Annual Report
    - Tasks Departments have undertaken as a result of recommendations from the IPM Committee
    - Graphs of pesticide use for each Departmental IPM program
    - The spreadsheet used to calculate pesticide use for each IPM program
    - Photos and graphs that illustrate points in the report
    - Hours spent monitoring and engaging in other pest management activities
    - Acres under various management methods

The Committee recommends to the Departments for 2014 that:

1. Using the IPM Priority Assessment Tool, the Decision Documents produced for the Decision Making subcommittee, and the IPM Annual Report, they identify one significant pest management problem and determine costs to implement a more robust IPM approach that is cost effective over time.
2. Continue updating and using the IPM Priority Assessment Tool.

Other Accomplishments of the IPM Committee

Reporting "Bad Actor" Pesticides

The Committee held a special meeting of the Data Management subcommittee in March to resolve the issues raised by Parents for a Safer Environment of how to report "Bad Actor" pesticides in the Annual Report. Dr. Susan Kegley from the Pesticide Research Institute was invited as the guest speaker. Dr. Kegley was instrumental in developing the Pesticide Action Network's pesticide database that coined the term "Bad Actor." The Pesticide Action Network is a non-profit advocacy group. The result of deliberations in both the subcommittee and the full Committee was that the County will report as "Bad Actors" only those pesticides designated as such in the Pesticide Action Network's database.

Rodenticides

The Committee heard a presentation from the state Department of Fish and Wildlife on the hazards to wildlife of anti-coagulant rodenticides. The Committee provided feedback and encouragement to the Mt. Diablo Audubon Society on components of their "Don't Take the Bait" campaign that focuses primarily on the more toxic and problematic "second generation" rodenticides. The Committee also heard reports from the Agriculture Department on their program to protect critical infrastructure such as levees, flood control banks, roads, bridge abutments, and railroad berms from ground squirrel burrowing. The IPM Coordinator reported on rodenticides use by contractors to Special Districts.

IPM Ordinance vs. IPM Policy

In 2011, after much research and deliberation, the IPM Committee saw no advantage to creating an IPM ordinance and voted unanimously to recommend that the County develop an Administrative Bulletin as a complement to the County's existing IPM policy to be used as the administrative vehicle for implementing the County's IPM program. The Committee also voted to review the ordinance issue in 2013.

At their September and November meetings the Committee reviewed and discussed the issue. In November, the Committee voted unanimously to continue to use the IPM Administrative Bulletin to complement the County's IPM policy. The Committee noted that they had done their due diligence on the issue, that they believed there was ample justification for continuing to use the IPM Administrative Bulletin and IPM Policy as they are, and that they supported the opinions of County Counsel in the matter. Various members said that there was no compelling argument that an IPM ordinance would provide added value for the County.

Accomplishments of the IPM Coordinator

In addition to staffing the IPM Advisory Committee and working on both 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, and it is generally acknowledged that there are numerous apartment complexes in Concord with severe infestations throughout the complex.

Stunning success in bed bug prevention in County-operated homeless shelters

In 2011 the IPM Coordinator, with the help of Health Services staff, developed a bed bug prevention protocol for group living situations. During 2012, the Concord shelter began implementing the protocol. In mid-2012 the shelter was able to purchase new metal beds and new mattresses with the help of a generous donor who was alerted to the problem through a member of the Bed Bug Task Force. In the fall of 2012, staff thoroughly cleaned the Concord shelter and installed the metal beds. These beds have slick surfaces that bed bugs find difficult to climb, and the metal beds provide far fewer hiding places for bed bugs than the old wooden beds. The new mattresses have few places for bed bugs to hide and can be easily cleaned. With the implementation of the prevention protocol, the bed bug population declined sharply, and since the installation of the metal beds and new mattresses in fall of 2012, staff have not seen any bed bugs in the facility. The Brookside shelter in Richmond was fortunate to implement the prevention protocols before they ever had a bed bug infestation, and that shelter remains bed bug free, even without metal beds.

New homeless shelter bed

Because of the transient nature of their clients, homeless shelters are at extremely high risk for the introduction and continued re-introduction of bed bugs. It is a testament to the diligence of the staff at the County's two homeless shelters in enforcing prevention and educating clients that the shelters remain bed bug free.

County works to secure research funds to help low income residents of apartment complexes

In 2012 the IPM Coordinator partnered with the University of California Cooperative Extension, the Michael Chavez Center, and two pest management companies in a research proposal designed to compare the efficacy of IPM methods and conventional methods of bed bug management in multi-family dwellings. The site of the study was to be Contra Costa County. This proposal was not funded, but a revised proposal that includes statewide partners and study sites in Contra Costa County and southern California has been submitted to a new funder.

In an effort 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 every other month 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 43 bed bug complaints that came to the attention of the IPM Coordinator
- Provided advice to the Contra Costa District Attorney's office in a case involving bed bug complaints from the Extended Stay America in Pleasant Hill
- Developed and presented a bed bug awareness training to around 200 pest management professionals at a Pesticide Applicators Professional Association seminar in Walnut Creek
- Provided advice to the Lily Mae Jones housing complex in Richmond on bed bug prevention
- Worked with the Health Services media department to write a column on avoiding bed bugs while traveling, for publication in local papers and online

- Worked with the offices of Supervisors Mitchoff and Gioia to aid cities in their districts with bed bug problems
- Provided interviews to Contra Costa media on the bed bug problem
- Attended the Global Bed Bug Summit in December to increase her knowledge of all aspects of the problem

General Outreach/Advising on IPM by the IPM Coordinator

- Worked with the Public Works Department, Supervisor Andersen's office and residents of Canyon to resolve weed and herbicide issues along the County road.
- 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
- 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 professions
- 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
- Coordinated a noxious weed awareness presentation by Vince Guise, Contra Costa Agricultural Commissioner, for landscape maintenance personnel in the cities of San Pablo and El Cerrito
- Gave an IPM presentation to the Crockett Improvement Association.
- Gave an IPM presentation to Pleasant Hill Parks maintenance personnel
- Responded to a number of requests for pest management information from County staff and citizens

Conferences and Trainings Attended

- Weed Science Society Annual Conference
- San Francisco IPM Conference
- Alameda County Bed Bug Training for Property Owners
- Least Toxic Pest Management Workshop put on by Parents for a Safer Environment
- Global Bed Bug Summit

Pesticide Hazard Identification

- Completed a pesticide hazard identification process for the County and screened each pesticide used by County operations.
- Presented the process to the IPM Advisory Committee at the beginning of the year.

2013 DEPARTMENT IPM PROGRAM HIGHLIGHTS AND CHALLENGES

Agriculture Department

IPM Program Highlights

- The Department won a prestigious IPM Innovator Award from the California Department of Pesticide Regulation for their outstanding work in and commitment to integrated pest management. Only about four to nine recipients are chosen each year from the entire state, and this is the first time the award has been given to a county Department of Agriculture.
- The Department actively worked on both subcommittees of the IPM Advisory Committee and has agreed to the Committee's recommendations to the Departments.

The Department updated its IPM Priority Assessment Tool at the beginning of the year and created two decision making documents, one on managing ground squirrels in critical infrastructure and one on managing perennial pepperweed that is threatening a remnant population of the endangered wildflower, Contra Costa goldfields. (See Attachment A.)

- <u>All historically treated noxious weed sites were surveyed and treated again this year</u>
  In order to achieve eventual eradication of target noxious weeds, all sites that have not been declared eradicated must be surveyed each year and treated if necessary. Significant progress was made in the Department's eradication and control effort this year. The department program involves 18 target terrestrial noxious weed species. This year the Department surveyed over 217,000 acres and treated a total of 322 net acres. (See Attachment C for details.)

  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. The program involved over 6,444 hours of direct field time by staff. Of this, approximately 90-95% of the time was spent in surveying and monitoring with the remainder being spent on treatment actions.


Rangeland infested with artichoke thistle

- 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.

  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 eradication 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 where these is 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 179 net acres of artichoke thistle.

- <u>Japanese dodder (*Cuscuta japonica*)</u>
  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.

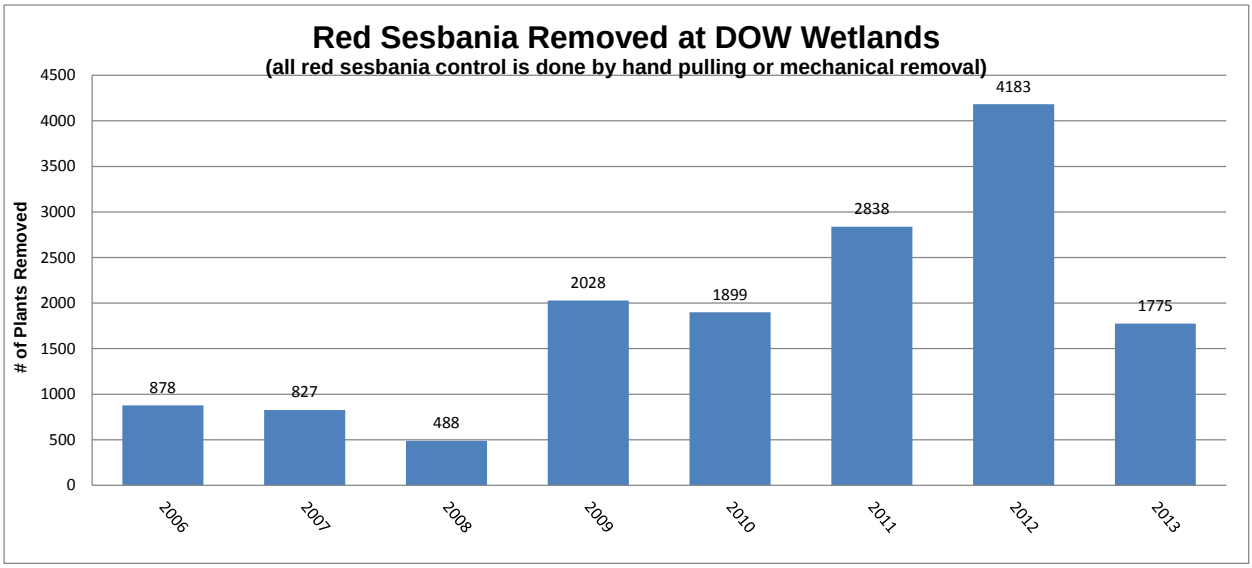
  Forty-six of the 49 historically infested properties in the county have been free of Japanese dodder for three or more years, which meets the criteria for eradication on these properties.


First Japanese dodder find in CCC, 2005

- Red sesbania (*Sesbania punicea*)
  This was the eighth 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.

  All historic sites were surveyed this year, and a total of 2,198 plants were removed from all sites, compared to 4,293 last year. See the graph below of the number of plants removed from DOW wetlands since 2006. 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 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 7.5 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. The last two years, removal of all plants was done by hand without the use of herbicide.

Unfortunately, the numbers removed went from 42 last year to 547 this year. The Department has made the decision that it will need to return to chemical treatment until the population diminishes to the point where it is again feasible to use hand removal.

- 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.

  Last year's treatments were very successful with only a few small Japanese knotweed plants found and treated this year.

  Two woolly distaff thistle (*Carthamus lantanis*) 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 this year indicating that the discovery of the infestation last year was at the very earliest stage and was prior to any seed set.

- South American Spongeplant (*Limnobium laevigatum*)
  With the successful passage of AB1540 (Buchanan) last year, the responsibility and mandate to aggressively treat this aquatic noxious weed species lies with the state Department of Boating and Waterways (DBW). Unfortunately, South American spongeplant was found for the first time in Discovery Bay. This represents a significant expansion of this Delta threatening aquatic pest. The DBW is aware of and is treating this extension of the still incipient infestation.

- Departmental IPM plan updated
  The Department performed a detailed review and revision of the Department's IPM plan. Numerous photographs were added, text was expanded and edited to improve clarity, detailed information about the Department's ground squirrel live trapping study was added, and descriptions of the two new noxious weeds discovered in the County last year were added along with text describing the decision making process for treatment of the two new weeds.

- 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.

  This year the Department has modified its ground squirrel treatment procedure for safety and efficiency, and is working to apply bait more precisely and to reduce 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.

  The Department also worked with the Public Works Department to produce a map that is marked with all the areas treated with diphacinone grain bait for ground squirrels.

- 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 56,770 shipments and rejected 238 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 5,585 traps and staff serviced those traps 68,684 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. This 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 two subcommittees of the IPM Advisory Committee and has agreed to the Committee's recommendations to the Departments.

  The Division updated their IPM Priority Assessment Tool and as a result, met with Pestec, the County's structural IPM contractor, to discuss improvements in communication.

  Pestec prepared an IPM decision document for managing rats and mice and met with the Decision Making subcommittee to explain the document. (See Attachment A.)
- Pestec, the structural IPM contractor, is providing excellent service
  The Division hired Pestec IPM Providers in December 2009 for the County's structural pest management. They continue to do an outstanding job in the County and are very responsive to the County's needs. Pestec has an excellent relationship with their customers in County buildings.
- County authorizes funds for maintenance to County-owned buildings
  In 2007 the County hired ISES Corporation to perform a facilities condition analysis on 89 of the County's buildings (about 2.9 million square feet). The analysis noted deficiencies in accessibility,

electrical systems, the exterior structure, fire and life safety issues, plumbing, and HVAC systems. ISES rated each building they inspected on a "facilities condition needs index" (FCNI). The breakdown for the building ratings is as follows:

- 15 buildings—excellent condition
- 33 buildings—good condition, renovations occur on schedule
- 27 buildings—fair conditions, in need of normal renovation
- 7 buildings—below average condition, major renovation required
- 5 buildings—poor condition (4 of these building were constructed between 1901 to 1941, and ISES noted that historic buildings often rate in this category)
- 2 buildings—complete facility replacement indicated

The combined FCNI for the 86 buildings was "good condition, renovations occur on schedule" indicating that this group of County buildings is in better than average overall condition. ISES also noted in their report that "while Contra Costa County has done a good job of maintaining building systems, many high cost systems are due for replacement within the next 10 years. The County would be wise to prepare itself for these expenditures, as these aging systems will not provide reliable and efficient service too much further beyond their statistical life cycles."

ISES identified $251 million in deferred maintenance and capital renewal projects that they recommended completing in the next 10 years. Because of the financial crisis, the County was unable to budget any funds toward the work until FY 12-13. For FY 13-14, the County has set aside $10 million for additional work. The Board of Supervisors understands that the County will have to commit more funds in the following years. These projects will take priority in the Facilities Division workload.

Another 55 buildings (about 1.1 million square feet) will be assessed soon.

- <u>Correcting structural deficiencies in buildings continues</u>
  The Facilities Division is still understaffed and has an extensive backlog of work orders. Facilities has 7 carpenters (along with two temporary hires for Health Services projects) for the 361 buildings comprising more than 4.7 million square feet that the County maintains. There is a backlog of over 500 work orders just for carpenters.

  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. In FY 13-14, they will have added priorities from the Facilities Condition Analysis Report.

- <u>Owls in downtown Martinez</u>
  The "boneyard" on the roof of the County Administration building at 651 Pine in Martinez is still being used by owls as a dining area, probably because the spot is quiet and well protected from wind. The remains of hundreds of meals litter the area, along with new whitewash (excrement) and pellets (a regurgitated mass of undigested parts of the owl's food). Most likely the owls are nesting nearby and feeding on small rodents like rats and mice, as well as birds such as starlings.


Remains of owl meals atop the Co. Administration Bldg

- <u>Structural IPM program pesticide use remains low</u>
  In FY 12-13, 16 lbs. of active ingredients were used in approximately 2.75 million square feet of County buildings. These pesticides are almost exclusively deployed as baits in bait stations or in cracks and crevices. Pestec continues to successfully manage rats and mice exclusively with traps.

- Increase in service calls involving ants, cockroaches, bees and yellowjackets, and spiders
  In FY 12-13, the Facilities Division received 154 additional calls for service for various pest problems. These are calls for service that are outside the regularly scheduled monitoring service of the pest control contractor. This is an increase from the 126 calls received last year. Of the 154 calls this year, 28% were for ants, 18% for bees/yellowjackets, 15% for cockroaches, and 8% for spiders. These percentages are similar to last year. Six out of the 14 buildings that called 4 or more times were Head Start buildings, which by their nature often have more food and habitat available.

- 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 east 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 since September 2012. To date, the Brookside Shelter has not had a bed bug infestation.

  It is unlikely that the shelters will remain permanently free of bed bugs because the chances for new introductions are so high with the daily influx of new clients, but any new introductions will be quickly found. 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.

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 various aspects of the work undertaken by the two subcommittees of the IPM Advisory Committee and has agreed to the Committee's recommendations to the Departments.
  The Grounds Division updated their IPM Priority Assessment Tool, and prepared a decision making document for vegetation management on medians along Camino Tassajara. (See Attachment A for the decision document.)

- Division staffing has increased
  Currently the Division has 15 permanent employees and 6 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. At the level of service that the Division is asked to provide, the current crew is adequate; however the majority of County properties are still underfunded for full landscape maintenance.

- 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. This ranges from small things such as planting colorful annuals at the Contra Costa Regional Medical Center after a hiatus of many years, to major projects such as Summit Center on Arnold Drive in Martinez. Summit Center was originally designed and landscaped as a commercial office park that would have had ample resources for landscape maintenance. Over the last 5 years the County did not have the funds to maintain the landscaping at Summit Center, and the grounds became seriously weed infested. In 2010, the Grounds Division began killing vegetation around the building and in the parking lot to reduce the landscape maintenance requirements. All the turf in the parking lot and entry way medians is now gone, which has allowed the Grounds crew time to tackle the very weedy areas. Many of these areas are now mulched with wood chips, and as time and funding allow, mulch will be applied to more areas.

  
  Mulched and newly planted entry way to Summit Center on Arnold Dr. in Martinez

  Since January 2012, the Division has been using organic fertilizers. Staff continue to see a difference in the quality and health of the turf and the soil where they use fertilizer. Because there were a number of complaints about the smell of the product at some of the health clinics the manufacturer remedied the problem.

- New equipment purchased
  This fall the Division purchased a new Bobcat tractor that provides them with a smaller, more maneuverable and versatile tractor than the much larger tractor they currently own. The new tractor is small enough to pass through a 36" opening for work in the many playground areas maintained by the Division throughout the County. It can be used to dig holes for trees, and it can grab and lift 1000 lbs. so that staff can pull felled trees to the chipper. The tractor will enable staff to complete many projects more efficiently and cost-effectively because manual labor costs will be reduced.

- Turkeys at Hidden Pond Special District
  Last year 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 scattering mulch, the Division experimented with two different scare tactics used in vineyards to chase away turkeys. One is 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 is a bird scare windmill that combines sound and reflected light to repel birds.

  A year later, it appears that the scare kites have been effective in deterring the turkeys. Staff saw damage abate and remain low after the kites and windmill were installed, but recently when the kites were removed, staff found new turkey damage. The kites were removed because they had been shredded by a year of wind, but the Division has ordered three new kites to install at the site.

- Water use efficiency
  The Contra Costa Water District (CCWD) has a water budget program that can help customers use water efficiently. A number of County properties in central and east County have been evaluated and have a water budget developed by CCWD. If the County exceeds its water budget for a particular property, CCWD sends a notice to the Grounds Division, which investigates the problem. Most often the problem proves to be a break in the irrigation system that had gone undetected. Last year the Division received four notices from CCWD, but this year it has not received any.

- Pesticide use

Pesticide use by the Grounds Division remained the same as last year as the Division continues to try to improve the condition of many of the County's properties. 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 provide huge amounts of seed that make the weed problem increasingly worse from year to year. While funding and labor remain below adequate levels, the Division will probably continue at least this level of herbicide use because herbicide applications are substantially cheaper than other management methods that require more labor time.

- Disking or flail mowing on County parcels
  This year the Division has hired a contractor to disc or flail mow empty parcels of land that the Division is responsible for. The Grounds Manager is experimenting with an early season disking or mowing to remove weed seed heads before they are mature in an effort to reduce the weed pressure on these parcels. This year, a second disking or mowing was required to keep the vegetation at an acceptable height for the Fire Marshal.

Grounds Division Challenges

- Inadequate funding for landscape maintenance in the County
  This year the Division was allowed to hire 4 permanent and 6 temporary workers, and now the Division needs at least one more lead gardener because of the additional staff and the increased funding that is providing more landscape maintenance hours at some buildings.
- 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 two subcommittees of the IPM Advisory Committee and has agreed to the Committee's recommendations to the Departments.
- Staff participated in the annual habitat assessment refresher training
  This year, 40 Public Works Maintenance crew members 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. This year crews that were trained to identify potential habitat spent a total of 404 hours performing habitat assessments. As habitats 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 licensed biologist.
- Flood control vegetation and erosion management using California natives
  The County Flood Control District will be 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 will involve three 20' x 20' test plots and one control plot that will compare the survival of three different California natives: Santa Barbara sedge, (C*arex barbarae*), field sedge (*Carex praegracilis*), and creeping wild rye (*Leymus triticoides*) planted by seed and by plugs. Planting will begin in December 2013. The photo below shows the results of a similar study three years after planting.

Comparison planting of creeping wild rye (background) and non-native annuals on flood terrace in the east Delta, 3 years after planting

These species spread from underground rhizomes that anchor the soil and thus provide erosion control. They are all perennial species that stay green year around and 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 for 5 years after the plantings to assess native plant survival, their degree of competition with the non-native annual species, and the relative success of seeding versus planting plugs.

- Grazing as a vegetation management tool – lessons learned so far

  In 2012, the Division used goats and/or sheep to abate weeds at 17 sites where the animals grazed a total of about 96 acres. The total cost was approximately $107,000, with an average cost of $1,108 per acre. The sites range in size from 1 acre to 13 acres. 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 the road without endangering both the animals and motorists. Many factors raise or lower the cost of grazing, including the size of the parcel, 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 winter). The average cost per acre for the grazing at these 17 sites was about 33% more than mowing, but the extra cost is justified at some locations for two reasons, 1) presence of endangered species such as California red legged frog and 2) steep or rugged terrain that poses a high probability of worker injury while abating weeds with machine or handheld power tools.

84 Lumber Ditch before goats

84 Lumber Ditch after goats

- Multi-year grazing study continues

  The Contra Costa County Flood Control and Water Conservation District (FCD) conducted the second 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 District's vegetation management goals for streambanks and floodplains of the District's engineered 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.

Water quality has not been degraded by either grazing or herbicide applications. Herbicide chemicals were not detected in stream samples after application. Nutrients were not detected during grazing treatments, and bacteria did not exceed water quality standards during or after grazing. Turbidity did not exceed water quality standards during either grazing or herbicide application.

More erosion features occurred in the goat grazing test plots than in either the sheep plots or the herbicide plots during the first year, perhaps because goats pull vegetation up from the ground, while sheep tend to sheer the vegetation with their teeth. Vegetation has grown back on the bare ground.

The third and final stage of the study will be conducted in winter and spring of 2014. 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 Creeks Divisions 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 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

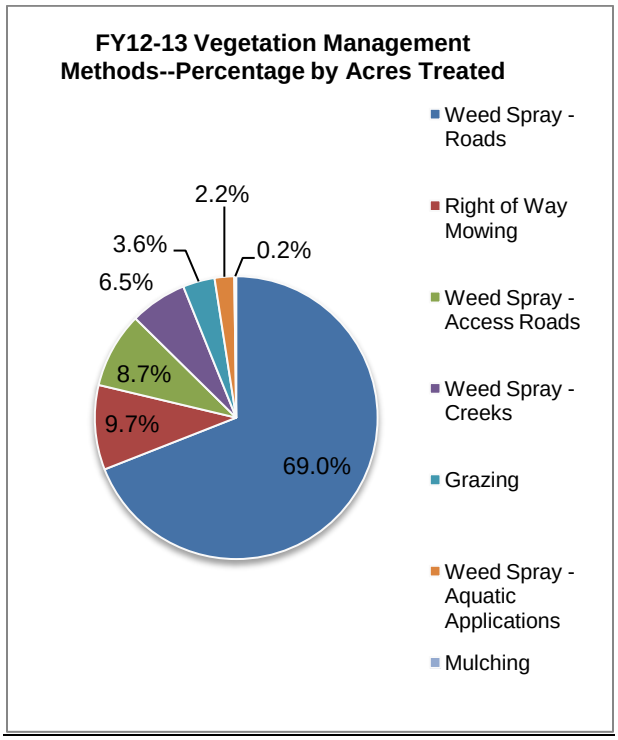
  In FY 12-13, 46% of the Division's expenditures on vegetation management was spent on non-chemical treatment methods, while the number of acres treated non-chemically was 14% of the total acres treated (see the chart below for details).

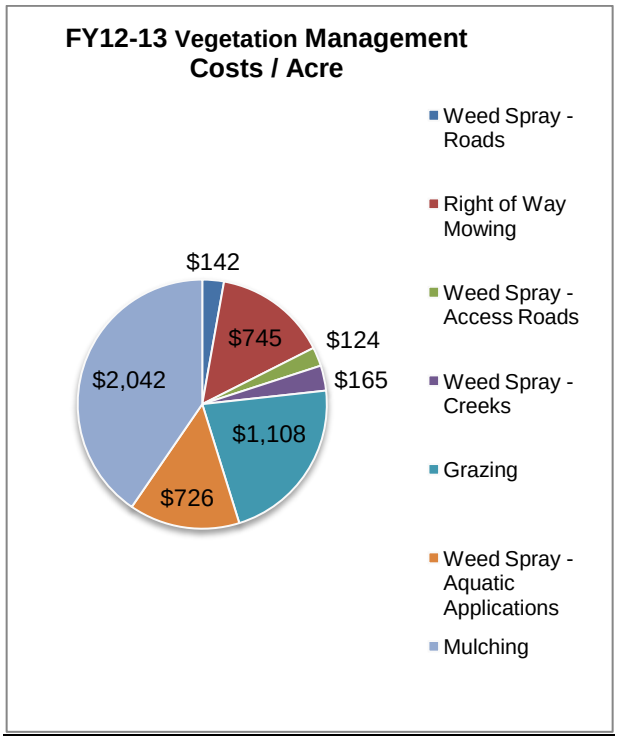
Fiscal Year 2012-2013					
Vegetation Management Method	**Acres Treated**	**% of Total Acres Treated**	**Total Cost for all acres treated**	**Cost/Acre**	**% of Total Cost for all acres treated**
Weed Spray - Roads	1819	69.0%	$257,599	$142	38.7%
Right of Way Mowing	255	9.7%	$189,891	$745	28.6%
Weed Spray - Flood Control Access Roads	228	8.7%	$28,257	$124	4.2%
Weed Spray - Creeks	172	6.5%	$28,324	$165	4.3%
Grazing	96	3.6%	$106,335	$1,108	16.0%
Weed Spray - Aquatic Applications	59	2.2%	$42,831	$726	6.4%
Mulching	5.7	0.2%	$11,637	$2,042	1.8%
Totals	2634.7		$664,874		

NOTE: The cost figures above for each method include labor, materials, equipment cost, contract costs (for grazing), and overhead, which includes training, permit costs, habitat assessment costs, and permit 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 a 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 timeline to prevent fires.

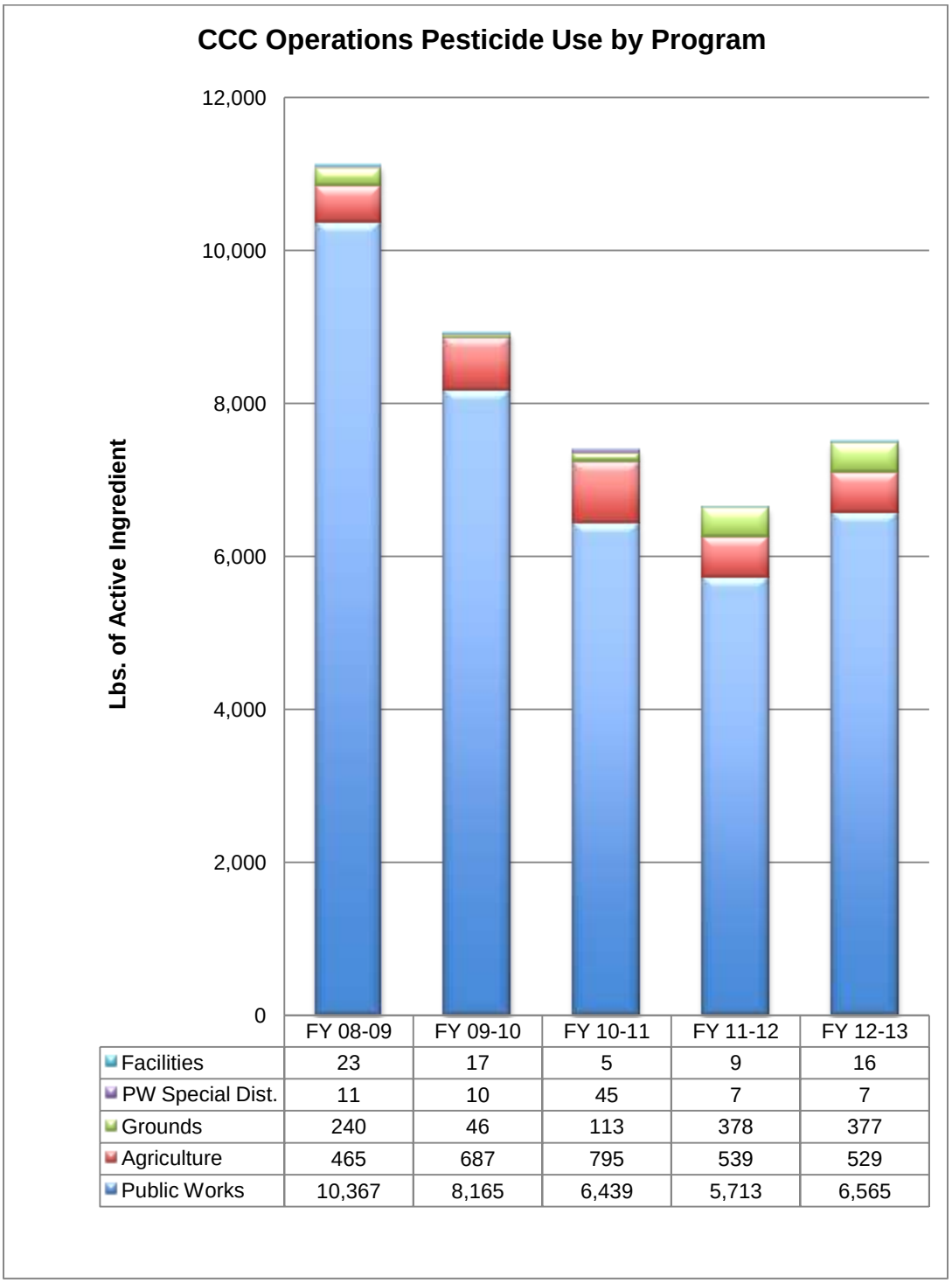
  Using mowers during hot, dry weather also poses a hazard of its own: sparks caused by the metal mower blades striking rocks or metal debris can ignite tinder-dry grass. During one mowing operation this year, the mower blades started a grass fire that quickly got away from the crew and required professional fire fighters to extinguish the resulting 240 acre blaze. The crew has begun taking a spray truck with plain water in the tank to put out small grass fires more effectively.

- Staffing

  The Vegetation Management crew is still understaffed with only 4 personnel as compared to a staff of 6 four years ago.

PESTICIDE USE BY THE COUNTY OF CONTRA COSTA

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 5 years. For more detailed pesticide use data, see Attachment D.



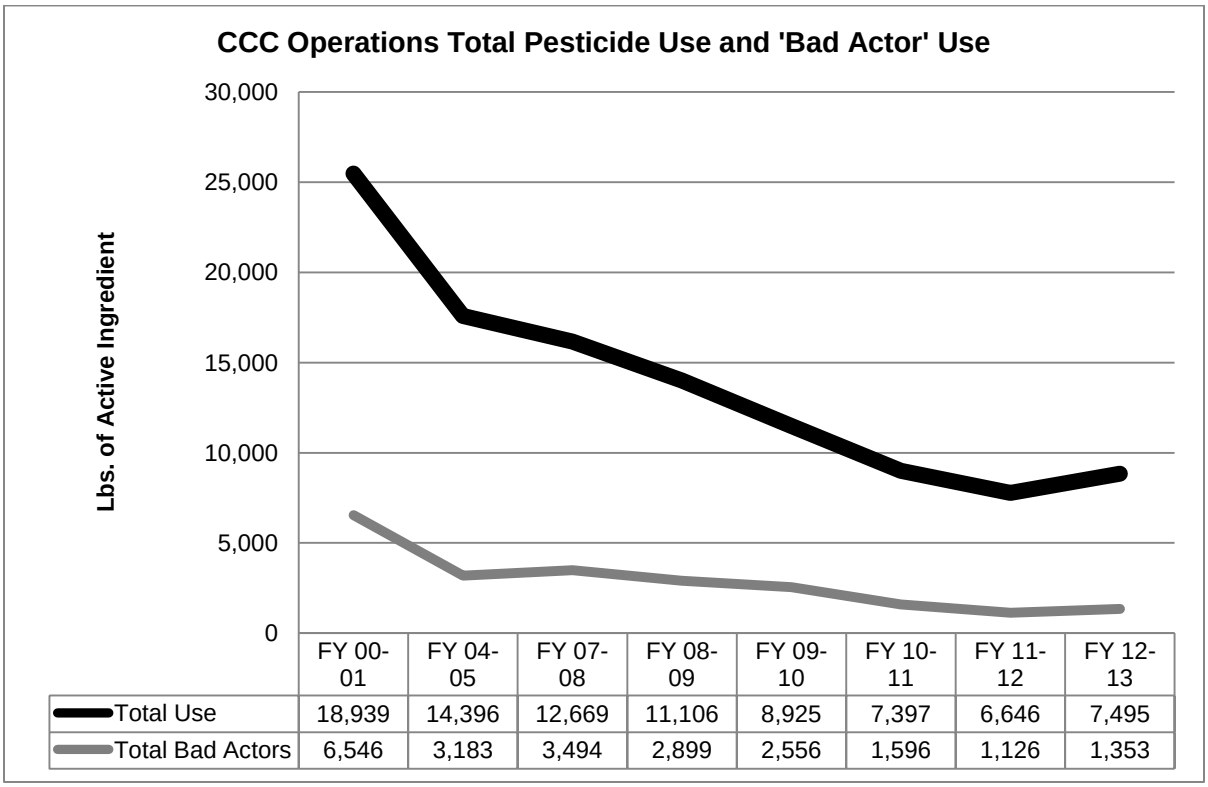
	FY 08-09	FY 09-10	FY 10-11	FY 11-12	FY 12-13
Facilities	23	17	5	9	16
PW Special Dist.	11	10	45	7	7
Grounds	240	46	113	378	377
Agriculture	465	687	795	539	529
Public Works	10,367	8,165	6,439	5,713	6,565

Increase in Pesticide Use by the Public Works Roadside and Flood Control Channel Maintenance Division
In FY 12-13 the Division's pesticide use increased by 852 pounds of active ingredient. There are at least two reasons for this, 1) the Division's staffing has increased and allowed them to perform more weed abatement in the County's flood control channels and 2) because of weather and timing factors, the Division applied fewer pounds of pre-emergent herbicides (herbicides that prevent weed seeds from germinating). This necessitated the use of more pounds of post-emergent herbicides (herbicides that kill growing weeds) because post emergent herbicides must often be applied two or more times to achieve the same degree of control as with pre-emergent herbicides.

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 to be reported as "Bad Actors", but 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
Total Use	18,939	14,396	12,669	11,106	8,925	7,397	6,646	7,495
Total Bad Actors	6,546	3,183	3,494	2,899	2,556	1,596	1,126	1,353

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 rodenticides are necessary, the County uses first generation anticoagulant baits. First generation anticoagulants require multiple feedings over several days to a week to kill. This is different from second generation anticoagulants that are far more toxic and can kill within days of a single feeding if enough bait is ingested.

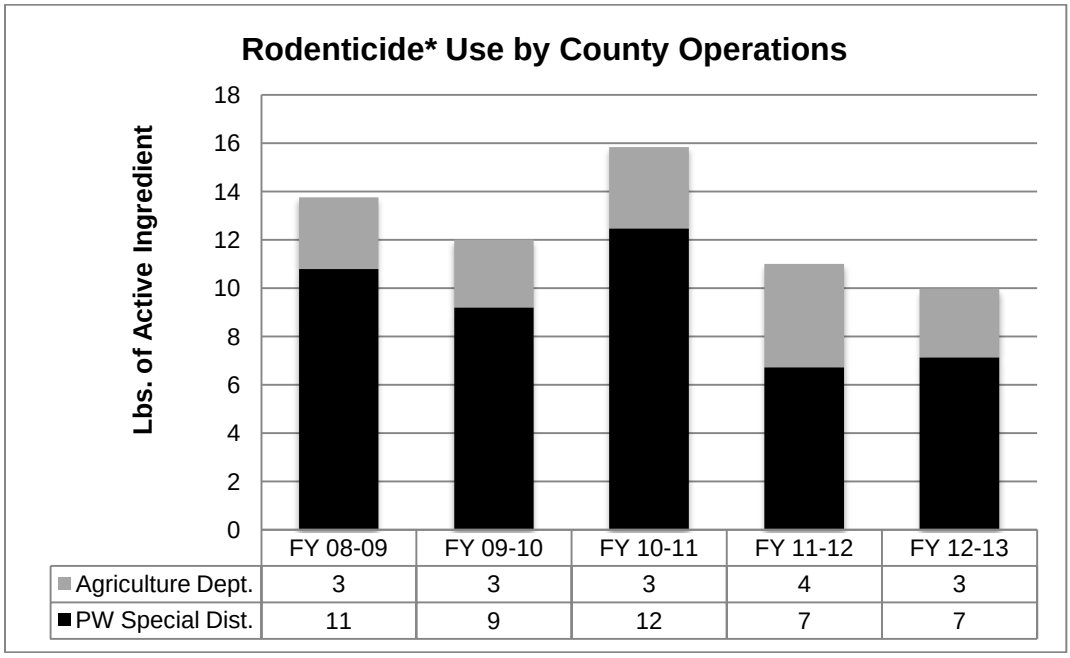
Second generation anticoagulants pose a greater risk to animals that eat poisoned rodents. If the rodent continues to feed on the single-dose anticoagulant after it eats a toxic dose at the first meal, it may build up more than a lethal dose in its body before the clotting factors run out and the animal 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 California Department of Pesticide Regulation understands the hazards of second generation anticoagulants and is moving to restrict their use.

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.

The Agriculture Department 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
Agriculture Dept.	3	3	3	4	3
PW Special Dist.	11	9	12	7	7

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

More than 99.9% of the rodenticide used by Special Districts is aluminum phosphide, which is a fumigant and not an anticoagulant rodenticide. Each year, only a few hundredths of an ounce of anticoagulant rodenticide active ingredient is 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 2014

Agriculture Department Priorities for 2014

- Continue the County's highly effective Noxious Weed Program
  Noxious, invasive weeds cost Californians at least $82 million per year in monitoring, control, and outreach. Every year, invasive weeds ruin thousands of acres for recreation and agriculture and for native California plant and animal habitat. Some noxious weeds increase the fuel load in urban and rural areas, and some suck up prodigious amounts of scarce water. Early detection and control of these weeds greatly reduces their impact and the cost to manage them.

  Contra Costa's highly effective Noxious Weed Program has been in operation for 34 years. A major objective of the Agriculture Department is to continue to monitor and treat targeted noxious weeds on all historic sites before the weeds set seed. Preventing seed set is the most important factor in reducing weed populations and in depleting existing seed banks. By doing this, the hours of labor needed and amounts of herbicides applied in successive years to a particular area will be reduced. These reductions allow the department to add previously untreated sites to the noxious weed program bringing local eradication of the targeted weed species one year closer.

- Continue work on the pesticide screening process
  The Department will work with the IPM Coordinator to screen all pesticides used by the Department.

- 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 2014

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 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 Channel Maintenance Division

- Explore options to reduce grazing cost
  The Department will work 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 grazing study
  The County Watershed group will continue a multi-year study of grazing and chemical weed control methods.
- 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.

LIST OF ATTACHMENTS

ATTACHMENT A.

Pest Management Decision Making Documents

- **Agriculture Department—Page 31**
  - Perennial pepperweed near a remnant population of Contra Costa goldfields
  - Ground squirrels on critical infrastructure
- **Facilities Division—Page 45**
  - Rats and mice in and around County buildings
- **Grounds Division—Page 51**
  - Weeds on Camino Tassajara medians
- **Public Works Roadside and Flood Control Channel Maintenance Division—Page 59**
  - Weeds on flood control channels

Contra Costa County

DECISION DOCUMENTATION TREE for WEED MANAGEMENT

Date: 5/31/13

Department: Agriculture

Location: N/S Highway 4 and extending through the town of Rodeo

Situation: A perennial pepperweed (*Lepidium latifolium*) infestation is threatening the highly endangered Contra Costa goldfields (*Lasthenia conjugans*) at a remnant population site along Hwy 4 near the I-80 interchange. The infestation also threatens the riparian corridor, upland range and open areas nearby.

What are the management goals for the site or weed?	To control and ultimately eradicate the sporadic perennial pepperweed infestation that has started in this area.	
Was the site monitored and what was found?	Yes, and the following isolated infestations were found: 1. in the immediate vicinity of the CC goldfields population 2. east of the CC goldfields population on a Hwy 4 right-of-way across from Franklin Canyon Golf Course 3. one area near Rodeo Creek in the populated area of the town of Rodeo 4. in a Caltrans area near a pond at Willow Ave and Hwy 4 5. between the eastbound and westbound lanes of Hwy 4 at and near the Oak Harbor Freight Co. office Note: The infestation on the Caltrans right-of-way across from Franklin Canyon Golf Course has been treated for the last 2 years by our Department. The Oak Harbor Freight infestation was treated by our Department for the first time last year.	
Weeds have been identified as the following:	**Weed**: Perennial pepperweed (*Lepidium latifolium*) **Family**: Brassicaceae **Habitat**: Many different areas and habitats, including wetlands, riparian areas, meadows, vernal pools, salt marshes, flood plains, sand dunes, roadsides, pasture land, irrigation ditches, ornamental plantings, and agronomic crops. **Origin**: Native to Eurasia **Weedy characteristics**: Prolific seeder; lab tests suggest that seeds germinate readily with fluctuating temperatures and adequate moisture; fortunately seeds do not appear to remain viable in the soil for extended periods. It reproduces primarily vegetatively from roots and root fragments. Large root fragments can survive desiccation on the soil surface for extended periods, and fragments as small as ½ to 1 inch long and 2 to 8 mm in diameter can develop into new plants. Rhizomes extend to a depth of up to eight feet. Flooding, soil movement and human and animal activities disperse seeds and root fragments.	
Are populations high enough to require control? **Explain**	Yes, our goal is eradication and therefore, the tolerance level is zero. It is important to eradicate the infestations in this area while they are still small and relatively easy to treat in order to protect the isolated population of the highly endangered Contra Costa goldfields. Perennial pepperweed can rapidly form dense stands that displace desirable vegetation and wildlife. It spreads easily and once established it is persistent and difficult to control. The plant extracts salts from deep in the soil and when the plant dies, deposits the salts on the surface of the soil thus inhibiting the germination and growth of other species that are sensitive to salinity.	
Is this a sensitive site?	**Does this include highly sensitive areas?**	Yes

	These areas are in and near critical habitat for CC goldfields. Part of the area is within California red-legged frog listed geographic area. Within this area, and with the noxious weed program partial exemption, 2,4-D, glyphosate and imazapyr use is not allowed within 20' of a water feature. Infestation is also near habitat for the Alameda whipsnake and California tiger salamander.	
	Is this area part of any of the court-ordered endangered species injunction? The area enjoined for a number of pesticides for the California red-legged frog and the Alameda whipsnake is south and east of the Franklin Canyon Golf Course and Hwy 4.	No
	Is this a known or potential habitat for any endangered or threatened species? See above.	Yes
	Is it on or near an area where people walk or children play?	No
	Is it near a drinking water reservoir?	No
	Is it near a creek or flood control channel? Near Rodeo Creek.	Yes
	Is it near crops?	No
	Is it near desirable trees or landscaping? There are trees along the creek, but no landscaping anywhere near.	Yes
	Is the soil highly permeable, sandy, or gravelly?	Probably, along the creek.
	Is the ground water near the surface?	Unknown, but likely near the creek.
Which cultural controls were considered?	**Mulching, weed barrier**: Not effective; not practical in open fields or on creek banks **Planting Desirable Species:** Establishing desirable vegetation in disturbed areas can suppress perennial pepperweed and slow reinvasion after control, but the County has no control over the areas in question. **Burning**: Not effective at reducing stands, but it is helpful at removing accumulated thatch. Not practical in these areas and County has no control over infested sites. **CONCLUSIONS: None of these strategies is effective and/or practical**.	
Which physical/mechanical controls were considered?	**Hand pulling**: Seedlings are easily controlled by hand, but seedlings are rarely encountered. Established plants cannot be controlled this way because shoots quickly resprout from vast root reserves. Hand pulling exacerbates the problem plus the area is too large for hand pulling. **Mowing/tilling by machine**: Tilling typically increases the infestation by spreading root fragments. Mowing stimulates perennial pepperweed to resprout and produce new growth. Mowing can be helpful for removing thatch created by accumulated old stems. This can help prevent shading of desirable species. Combining mowing with herbicides has been shown to be effective. For best results, plants should be mown at the bolting or flower bud stage and herbicides applied to the resprouting shoots once they have reached the flower bud stage. Any mowing is difficult in wild land areas and depending on the time of year can cause a fire. There also exists increased hazard of mechanical and other injury to the operator. **Grazing**: Cattle, sheep and goats will graze this weed, especially rosettes in early spring. When stands are dense, it becomes difficult for most animals to graze. Sheep and goats permanently maintained in a pasture suppress this weed's growth, but once animals are removed, plants quickly resprout. This technique could not be used near the Contra Costa goldfields. This technique could be used in some areas as a management tool; however, it is not compatible with the eradication goal of perennial pepperweed. **CONCLUSIONS: None of these strategies is effective or practical for our purposes.**	
Which biological controls were considered?	**Biological controls available:** Biological controls are being evaluated for use in the U.S., but currently none are available. Finding biological control agents for perennial pepperweed is complicated by the fact that this weed is in the same family as broccoli, cabbage, cauliflower, and many other food plants. Researchers must take great care not to introduce a pest on food plants. Department staff have observed a powdery mildew and a native	

	dodder that attack perennial pepperweed and appear to weaken the plants somewhat, though not to the extent that either would be an effective biocontrol agent. **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:** **2,4-D—**We have not tried this and do not want to because there are safer and more effective alternatives. **Glyphosate**—Will not kill seeds or inhibit germination the following season. It is not selective and therefore kills grasses and other plants. This opens the treated area to other weeds. Our trials have shown it to have limited effectiveness. Rate: 2 to 4 qt. product (Roundup ProMax)/acre; spot treatment: 2% product v/v Timing: Postemergence from seedling to bloom; most effective at flower bud or flowering. It is sometimes used in conjunction with mowing or a mowing/wiping technique. Enjoined for endangered species? Yes **Imazapyr—**It is non-selective, has long soil residual activity, and leaves more bare ground than other treatments, even a year after application. Our trials have shown it to be very effective. However, we feel there is a more environmentally friendly treatment options (chlosulfuron). Rate: 1 to 2 qt. product/acre Timing: Postemergence from seedling to bloom; most effective from flower bud to flowering Enjoined for endangered species? Yes **Triclopyr**—Our trials have shown limited effectiveness. The product has a higher toxicity "Warning" label. It has a greater potential to cause offsite drift problems. **Chlorsulfuron**—Has long soil residual activity and is generally safe on grasses. U.C Extension research in Southern California has shown Telar to be the most effective herbicide for perennial pepperweed. Our trials have shown it to be very effective as well. Telar has a "Caution" label. Rate: 1 to 2.6 oz. product/acre Timing: Postemergence from seedling to flowering. Most effective at flower bud or flowering. Enjoined for endangered species? No **CONCLUSIONS: We feel that chlorsulfuron (Telar) is the safest effective material. It is also cost effective. It does not injure grasses and therefore allows us to maintain the competitive vegetation in the area and to prevent unsightly bare patches and browned-out areas around the treated weeds.** **Our ideal treatment time is from late May to early June when plants are beginning to flower, though Telar can be used effectively even into the fall. Perennial pepperweed plants are also easier to see when they are in flower.**
Which herbicide application methods are available for this chemical?	**Methods available:** Broadcast or spot spray (directed spray) **CONCLUSIONS: We will use a directed spray to visible perennial pepperweed plants and the immediate vicinity. Chlorsulfuron that falls on the ground near the weeds will prevent perennial pepperweed seeds from germinating. Our work will mostly be done with a backpack sprayer, but depending on the density of the weed patches, we may need to use a hose pulled from a truck. We consider both of these methods spot treatments.**
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 considerations; 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. The Contra Costa goldfields are far enough away from the perennial pepper weed populations that the herbicide will not affect them under our normal treatment protocol. If any perennial pepperweed is found within the goldfield site or close enough to present a concern, the Department will consult with the Department of Fish and Wildlife.
Maps	See attachment for a map of habitat for the Contra Costa goldfields and nearby habitat for the Alameda whipsnake and the California red-legged frog. See attachment for a map of the pesticide use limitation area for the Alameda whipsnake under the endangered species injunction.
References	DiTomasso, Joseph M., et al. 2013. Weed control in Natural Areas in the Western United States Pest Notes. 2004. Perennial Pepperweed, Pub 74124. UC Statewide IPM Program, UC Davis Cal IPC Perennial pepperweed plant profile. http://www.cal-ipc.org/ip/management/plant_profiles/Lepidium_latifolium.php. Web page accessed 5/15/13.

Pesticide Profile for: Telar DF

Active Ingredient	Chlorsulfuron (75% active ingredient in formulated product Telar DF)
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 chlorsuolfuron, 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 Agriculture Dept.	Noxious weeds, particularly perennial pepperweed
Method of Application	Spot treatment of individual plants or groups of plants with a backpack sprayer or a hose pulled from a truck.
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.	Up to 3 ounces per net acre treated. (1/4 ounce per 3 gallon backpack)
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

Contra Costa County

DECISION DOCUMENTATION TREE for GROUND SQUIRREL MANAGEMENT

Date: 7/29/201

Department: Agriculture

Location: County wide

Situation: Ground squirrel management to protect critical infrastructure and human health

What are the management goals for the sites?	Maintain a squirrel-free buffer area around critical infrastructure (levees, earthen dams, canals, road ways, train berms, bridge abutments); protect children from rattlesnakes attracted to ground squirrels living near a community pool and playground in one homeowners' association; protect foundations and retaining walls from being undermined by ground squirrel burrowing at or near homes adjacent to open space	
Who has jurisdiction over the areas in question?	The Department has no jurisdiction over any of the areas treated. We are contracted by a number of entities to perform ground squirrel management on land under their jurisdiction: CCC Public Works Department, CC Water District, the U.S. Department of Interior Bureau of Reclamation, the BNSF Railroad, Central and Ironhouse Sanitation Districts, CalTrans, the City of Concord, and a homeowners' association.	
How often are sites monitored?	Each year the sites are monitored for activity prior to treatment.	
The problem species has been identified as the following:	**Ground Squirrel** (*Spermophilus beecheyi*) California ground squirrels are known to be carriers of bubonic plague, tularemia and many other transmissible diseases. Burrowing by ground squirrels can be very destructive causing severe erosion and loss of structural integrity. Ground squirrels are a problem in levees, in flood control facilities and canals, in earthen dams, on roads, on railroad berms, around foundations and retaining walls, and in landscaping where they chew on irrigation lines.	
What is the tolerance level for this species?	**Tolerance level**: any activity within the desired buffer zone (approximately 100 linear ft.) justifies treatment. Ground squirrels within this area have the potential to cause damage by burrowing (or presenting the disease/rattlesnake threat). The Army Corps of Engineers regularly inspects Contra Costa levees, and they do not want the levee system compromised by ground squirrel burrowing. Burrows can destroy the levee system and can also create habitat for burrowing owls. When protected species are living in burrows on the levees, the Public Works Department cannot perform maintenance or other work on the levees. If the County does not manage ground squirrel burrowing on the levees, the Corps could view this as lack of due diligence on the part of the County and could decertify the levee system. Decertification of a flood control facility results in the denial of emergency funds to the County in the event of a serious flood. The County would have to provide all emergency management funds alone. The Bureau of Reclamation inspects Contra Costa Water District canals and requires the District to manage squirrels whose burrowing can compromise the earthen canal embankments and create pathways for water leakage that can undermine the structural integrity of the canals. Ground squirrel burrowing is the biggest threat to California levees. The burrow of one ground squirrel can be long enough to perforate a levee. Shorter burrows may be close enough to each other to perforate a levee. Many burrows in close proximity can create voids that are prone to collapse. High water can go into burrows and compromise the structure of the levee. Even one colony of ground squirrels can cause considerable damage. The longer a ground squirrel population inhabits a levee, the more likely the burrows are to be extended. Research has shown that burrows are shorter where squirrels are regularly controlled. Squirrel populations on levees that persist at high densities over time are more likely to make longer and more interconnected burrows. This same burrowing and resulting pathways for water erosion can cause damage to or sudden failure of roadsides and other structures.	
Are these sensitive sites?	Are any of the sites part of any of the court-ordered injunctions regarding threatened and endangered species?	Yes

	a) There is San Joaquin kit fox habitat along Vasco Road and some other, mostly East County, roads, but there are no known active dens (from our observation and observations of others) in the areas where we bait for ground squirrels. Restrictions prohibit use of aluminum phosphide, chlorophacinone, diphacinone, gas cartridges (and several rodenticides not used by the Department) within 700' of known San Joaquin kit fox dens. The Endangered Species Act requires prebaiting and carcass survey in habitat areas. b) Alameda whipsnake habitat is near some areas that are treated. Use of diphacinone and gas cartridges is prohibited within 100' of coastal sage and northern coastal sage flora in these areas. c) California tiger salamander habitat is near some areas that are treated. Use of diphacinone or gas cartridges are prohibited within 200' of certain water features in these areas, as listed in the injunction. d) California red-legged frog habitat is near some treated areas. Use of gas cartridges is prohibited by the Endangered Species Act within 500' of certain water features in these areas. Are there other species to be aware of? a) Burrowing owls live in abandoned ground squirrel burrows. These owls are predominantly, but not exclusively, in East County. Gas cartridges must be used only in <u>active</u> ground squirrel burrows; Conibear traps should only be used in <u>active</u> burrows.	
	Is there known or potential habitat for any endangered or threatened species at any of the sites? See above.	Yes
	Are any of the sites in or near an area where people walk or children play? The area adjacent to the EBRPD's trail along Marsh Creek is treated and posted. The Contra Costa Fair Grounds has problems with ground squirrels. Our department has treated there in the past but not in the last 4-5 years. We may be asked to treat again if the problem becomes serious enough.	Yes
	Are any of the sites near a drinking water reservoir? Yes, the earthen dam sides (the sides away from the water) of Mallard reservoir and CC Water District canal embankments are treated.	Yes
	Are any of the sites near a creek or flood control channel?	Yes
Which cultural controls were considered?	**Burrow destruction**: Ground squirrels work hard on their burrows and do not readily give them up. They continue to improve their burrows through multiple years and generations, creating complex systems that can be anywhere from 3 to 135 feet long and 2 to 4 feet deep. It has been observed that when burrows are abandoned, new squirrels will reinfest the area and occupy the old burrows. Destroying the burrows can slow or prevent the reinfestation of ground squirrels. Burrow destruction can be accomplished by deep ripping of the soil. Some burrows can be destroyed or partially destroyed as a result of the explosion that occurs when using the O_2 plus propane treatment method. In an unpublished study conducted at UC Davis, it was found that of various methods of preventing reinfestation, ripping the burrows to a depth of 18 inches was a relatively effective method for reducing reinvasion into old burrows. Burrow destruction by either method will kill any other species (including rare and endangered species such as the burrowing owl, San Joaquin kit fox, California red-legged frog, California tiger salamander and Alameda whipsnake) living in the burrows and/or will destroy potential habitat for them. **Planting desirable species:** Research has indicated that tree cover and leaf litter have a negative influence on probability of the occurrence of ground squirrel burrows on levees, and that the effect was significant on both the land side and the water side of the levee. This probably is the result of tall woody vegetation obscuring the view of the sky and hence of raptors that might prey on the squirrels. **CONCLUSIONS: We do not use burrow destruction because it is impractical in the areas the Department treats. There is also the danger of killing or displacing rare and endangered species. Burrow destruction**	

	may damage the infrastructure the Department is trying to protect. If the area is preferred habitat, ground squirrels would return and dig new burrow systems. **Revegetation is not compatible with the program due to expense. Also, at present, the Army Corps of Engineers does not allow trees on levees, but the research may have implications for management in the future.**
Which physical controls were considered?	**Shooting**: Shooting controls squirrels in small numbers. Squirrels often come to recognize this activity and become gun shy. They may learn to retreat to their burrows any time a vehicle drives into the area or they hear a gunshot. There are safety concerns, and this is a time-intensive method. **Live Trapping**: Trapping can be done anytime squirrels are present. Most traps require the use of bait, which may be of limited effect during certain times of the year. Bait must be at least as appetizing as what the squirrels are currently feeding on. Best overall results come from trapping squirrels just before they have their young, although trapping anytime squirrels are active can be effective. Trappers with SWAT Pest Control in Santa Clara County have found that July, August, and September are best for trapping ground squirrels. They find it very difficult to entice squirrels into traps in the spring because of the abundant green vegetation, which the squirrels prefer. Live trapping requires a method of euthanization, since it is illegal to relocate trapped squirrels. Handling the traps prior to euthanization can expose staff to fleas and ticks living on the animals. Our in-house trial of live trapping showed this method to be very expensive and time consuming. The Department of Fish and Wildlife mandates that traps be checked and animals removed at least once a day, which was the protocol we followed. UC recommends checking and removing squirrels twice a day, which would greatly increase the cost. Besides cost, we found a number of other problems with live trapping in the 2012 experimental study that our department performed: • Squirrels fought inside the traps and were bloodied and wounded by these encounters. • Four squirrels were found dead in the traps probably from either fighting or heat stress. • Anxious squirrels gnawed on the bars of the trap cutting their mouths. • The traps consistently needed maintenance and modification in order to attract squirrels. At the end of the study, the traps had to be thoroughly cleaned because of the dried blood and powerful smell. • Although signs were posted warning the public to leave traps alone, two traps were found with their tops open in what must have been an attempt by passersby to release the squirrels. This vandalism is worrisome not only because it impeded the trapping, but also because it exposed the public to bites, scratches, and zoonotic diseases. In addition, it is an indication that trapping would not be well-accepted by the public and would result in complaints. • The week after the trapping trial, ground squirrels were back using the burrows in the buffer zone. Costs: Our 2012 study showed that the cost for us to live trap ground squirrels along one linear mile of roadway was $5,074 compared to $220 per linear mile for baiting. For comparison purposes, quotes were obtained from commercial pest control operators that could treat using non chemical live traps or other methods. The quotes ranged from $90 to $125/hr plus mileage for nonchemical ground squirrel control using live traps or other methods. At 139 hours per linear mile for the five days of trapping this would amount to $12,524 to $17,394 per linear mile plus mileage. We also received two quotes of $20 and $25/ground squirrel captured. These quotes on the per squirrel basis convert to a per linear mile rate of $13,360 and $16,700 respectively considering that the equivalent of 668 squirrels were captured per linear mile in our trial. From UC Agriculture and Natural Resources Best Management Practices for Ground Squirrels: "Trapping is not the most effective method of control, mainly because of the high labor required to achieve good results. But it may be an ideal method to use when other methods are not appropriate." **Kill trapping**: As with live trapping, kill trapping can be done any time of year. Box and tunnel traps are baited to entice squirrels in, and Conibear traps are placed over the burrow entrance and the squirrel passes into the trap on exiting the burrow. Kill traps are very strong and can injure fingers and hands. **CONCLUSIONS:** **Shooting: We do not use this method. It is impractical on a cost basis and is not effective over large areas. There are also safety concerns.** **Live trapping: We do not currently use this method. Live trapping may be a viable option for small, especially sensitive sites that require treatment, but over large areas (in 2012, the Department treated 925 linear miles of critical infrastructure buffer area), the high cost would not be a responsible use of the**

	public funds entrusted to our Department. The method was not found to be effective in the treatment area due to the rapid reinfestation into the burrows by ground squirrels from the surrounding area. This does not happen with baiting. There are also issues with humaneness of this approach and exposure to the public. **Ventura County has stated that trapping would play a small role in their ground squirrel IPM plan because of the extensive labor required.** **Kill trapping: We do not use this method. With kill trapping, there is too much risk of capturing nontarget animals, and kill traps present a danger to children or adults who might tamper with traps. It would also be very costly.**
Which biological controls were considered?	**Biological controls available:** There are a number of animals that prey on ground squirrels, including rattlesnakes, coyotes, bobcats, mountain lions, red-tail hawks, red-shoulder hawks and golden eagles. Snakes and bobcats are better than other predators at taking ground squirrels. According to SWAT Pest Control trapper observations, hawks may not take many ground squirrels because the ground squirrels flick their tails to fool the hawk and many times the bird gets just a piece of the tail. Most owls are not large enough to take ground squirrels and their nocturnal hunting habits do not coincide with the diurnal activities of ground squirrels. The great horned owl is the exception as it has been found to very occasionally take a ground squirrel. Predators can prune the ground squirrel population, but they cannot provide the degree of control necessary in the specific locations we are contracted to treat. The Department continues to monitor the raptor perches that we erected in 3 areas in 2009, but we have not found that they attract the raptors that could feed on ground squirrels in the numbers that would be required for the degree of control necessary. **CONCLUSIONS**: **There are no effective biological controls available.**
Which chemical controls were considered?	*Burrow fumigation methods:* **Gas cartridge**: The cartridge (made from sodium nitrate, charcoal, and cardboard) releases carbon monoxide gas into the burrow system. This method is only effective when the soil moisture is high in either winter or spring. Gas cartridges are more effective when used prior to breeding or emergence of young. The timing, though, conflicts with other programs for which staff are needed such as the noxious weed program, the pesticide use enforcement program and the pest exclusion program. There are endangered species restrictions and concerns to consider prior to use. **Aluminum phosphide**: Aluminum phosphide reacts with moisture in the soil and in the atmosphere to produce phosphine gas. This fumigant is only effective when soil moisture is high and so has the same timing issues as above. Aluminum phosphide is a restricted use material, and is a hazard to the applicator. We have endangered species concerns and restrictions to consider prior to use. **CO and CO_2**: These fumigants require a CO or CO_2 generating device, which is difficult to move from burrow to burrow during treatment. These must be used when soil moisture is high, and they have the same timing issues as above. Use of CO_2 for ground squirrels is not registered through the Department of Pesticide Regulation. *Explosive devices:* **O_2/propane explosive devices**: This method is more destructive, poses hazards to the applicator from flying debris, and would damage levees, berms and embankments. There is also the difficulty of getting the device to the burrows. *Anticoagulant treated grain bait:* **Diphacinone treated grain bait**: Diphacinone is applied to oat kernels that are rolled and dyed blue to make them less attractive to non-target species. Treated grain baits take advantage of the ground squirrel's highly developed seed foraging abilities. Diphacinone is a first generation anticoagulant that prevents blood from clotting and causes death by internal bleeding. First generation anticoagulants require multiple feedings over several days to a week to kill. This is different from second generation anticoagulants that are far more toxic and can kill within days of a single feeding if enough bait is ingested. Second generation anticoagulants pose a greater risk to animals that eat poisoned rodents. If the rodent continues to feed on the single-dose 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, so a predator that eats many poisoned

	rodents may build up a toxic dose over time. However, even the first generation anticoagulants may be poisonous to animals that eat poisoned rodents. The first generation materials break down much more rapidly in animal tissues and have a much reduced potential for secondary kill when compared to second generation materials. To mitigate for this the Department performs carcass surveys in all areas treated whether or not it is required by endangered species restrictions. **CONCLUSIONS:** **Gas cartridges: The department uses these in some instances, but the cost is high, we have endangered species restrictions to consider prior to use and staff is generally engaged in other program critical activities in winter and spring when gas cartridges can be used effectively. The department does use this method in certain instances in late winter/spring. Major considerations for use are sensitivity of the site and available staff time. Our employees are specifically trained to distinguish the difference between active and inactive ground squirrel burrows. Due to concerns over burrowing owls, we only treat active burrows and will not use gas cartridges in sensitive areas of other endangered species that may inhabit ground squirrel burrows.** **We do not use other fumigation methods because they have the same limitations as gas cartridges. Gas cartridges are much safer than aluminum phosphide. CO & CO_2 are impractical due to the difficulty in getting a CO or CO_2 producing device to the burrows.** **Diphacinone is our material of choice. It is both effective and is labeled "Caution" which is the least toxic pesticide label category. In certain areas we have endangered species considerations/mitigations that we follow.**
Which application methods are available for this rodenticide?	Methods available: **Bait Station—**.005% diphacinone is registered for use in bait stations (and for broadcast baiting small areas by hand) **Broadcast—**.01% diphacinone is registered for hand or mechanical broadcast baiting over larger areas **CONCLUSIONS:** **Bait Station: We do use this method in a very few specific situations. In general, though, there are a number of concerns with this method: bait can spill or be kicked out of bait stations; cattle can damage stations resulting in spillage; children or adults may tamper with bait stations; dominant ground squirrels may gorge on bait and prevent other squirrels from eating it and individual ground squirrels consuming large quantities of bait increases the risk of higher exposure levels to non target predators; much larger quantities of bait are used in bait stations as compared to broadcast treatment; rain damaged or moldy bait must be disposed of as hazardous waste.** **Broadcast: This is generally our method of choice. It is the safest method for the environment and the applicator.** **The Department's typical protocol for ground squirrel baiting is as follows:** **1. Ground squirrel work is conducted in late June, after forage grasses have dried, to early October depending on when fall rains begin.** **2. On Friday, staff "prebait" by putting out untreated, clean rolled oats. This increases foraging activity so that our treatment can be more highly focused, and we can use the least amount of treated bait necessary.** **3. On Monday, staff make the 1st application of treated bait along a 12 to 15 ft. swath around/along the critical infrastructure to be protected. Applications are made only where ground squirrels are observed actively taking the "prebait."** **Bait is spread at the labeled rate, which equates to 2-3 treated kernels per square foot. The oat kernels have been rolled and dyed which makes them less attractive to nontarget animals.** **Bait applications are made using a Hurd Spreader mounted on the back of a truck or an ATV. Some smaller applications are made by hand spreading the bait. Two staff members ride in the truck so that one person can focus on looking for squirrel activity and operating the spreader while the other drives.** **4. On Wednesday, staff broadcast the 2nd application of treated bait to the same 12 to15 ft. swath.** **5. On Friday, staff perform a survey of the treated areas to remove any squirrels that may die above ground. This reduces nontarget exposure potential. In 2012, on 925 linear miles of roadway, staff found only 6 squirrel carcasses. In Ventura County's 2007 Field Trial using broadcast baiting, they found no above ground carcasses at any of their 3 test sites.**

	Any heavily infested areas with continued squirrel activity are treated a 3rd time.
What factors were considered in choosing the pesticide application method?	Safety to the applicator, the environment, and nontarget species; endangered species considerations; the effectiveness of the method; and the cost to the Department.
What weather concerns must be checked prior to application?	**Gas cartridges**: Dry weather and dry ground greatly decreases effectiveness. At the same time the potential of starting a wildfire from this method increases. **Dipacinone**: The main concerns are rain or heavy dew that will render broadcast bait ineffective and can cause the bait in bait stations to mold.
References	Salmon, T. & P. Newman. Date? Bait and bait application methods for ground squirrel control: reducing non-target hazards. UC Coop Ext. Berentsen, AR & T. Salmon. 2001. The structure of California ground squirrel burrows: control implications. Transactions of the Western Section of the Wildlife Society, 37:66-70. Van Vuren, DH & M. Ordenana. 2012. Burrow dimension of ground squirrels. California Levee Vegetation Research Program, UC Davis. Van Vuren, DH & M. Ordenana. 2011. Habitat associations of burrowing mammals along levees in the Sacramento Valley, CA. California Levee Vegetation Research Program, UC Davis. Marsh, RE. 1994. Current (1994) ground squirrel control practices in California. Proceedings of the Vertebrate Pest Conf. 16:61-65, UC Davis. Stone, WB, JC okoniewski, & JR Stelelin. 2003. Anticoagulant rodenticides and raptors: recent findings from New York, 1998-2001. Bulletin of Environmental Contamination and Toxicology, 70:34-40 Rattner, BA, KE Horak, SE Warner, DD Day & JJ Johston. 2010. Comparative toxicity of diphacinone to northern bobwhite (*Colinus virginianus*) and American kestrels (*Falco sparverius*). Poceedings of the 24th Vertebrate Pest Conf. pp 146-152, UC Davis. Riley, SPD, C Bromley, RH Poppenga, FA Uzal, L Whited, RM Sauvajot. 2007. Anticoagulant exposure and notoedric mange in bobcats and mountain lions in urban Southern California. J. of Wildlife Mgmt, 71(6):1874-1884. Lima, LL & T Salmon. 2010. Assessing some potential environmental impacts from agricultural anticoagulant uses. Proceedings of the 24th Vertebrate Pest Conf. pp. 199-203, UC Davis. McMillin, S. (CA Dept. of Fish and Wildlife). 2013. Personal communication. UCANR Ground squirrel best management practices. http://ucanr.edu/sites/Ground_Squirrel_BMP/. Webpage accessed 5/31/13. Pest Notes. 2010. Ground squirrel, Pub 7438. UC Statewide IPM Program, UC Davis.

Pesticide Profile for**: Diphacinone treated grain bait**

Active Ingredient	Diphacinone .01% or .005%
Injunction Restrictions	This chemical is enjoined in particular locations for the following endangered species: Alameda whipsnake, California tiger salamander, salt marsh harvest mouse, and San Joaquin kit fox.
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	Yes - federally restricted (can only be used by, or under the direction of, licensed or certified applicators)
Cancer	Not listed
Prop 65	Not listed
Known Groundwater Contaminat	No "Based on the available data, little if any contamination of surface and ground waters is expected for brodifacoum, bromadiolone, chlorophacinone and diphacinone. These chemicals, although persistent, tend to be relatively immobile in soil and fairly insoluble in water." [from USEPA Reregistration Eligibility Decision Facts for Rodenticide Cluster, July 1998]
Mammalian Hazard	Highly toxic by ingestion with oral LD_{50} values for technical diphacinone of 0.3 to 7 mg/kg in rats, 3.0 to 7.5 mg/kg in dogs. [EXTOXNET Diphacinone Pesticide Information Profile, 1993]
Bird Hazard	"Diphacinone is slightly toxic to birds. The oral LD_{50} for diphacinone in mallard ducks is 3158 mg/kg, and in bobwhite quail is 1630 mg/kg." [EXTOXNET Diphacinone Pesticide Information Profile, 1993]
Secondary Poisoning	"The Agency believes that there is a high risk of secondary poisoning, especially to mammals, from the use of these rodenticides outdoors (i.e., "around" buildings) in rural and suburban areas. The available data indicate that brodifacoum, bromadiolone, and 0.01% a.i. chlorophacinone and diphacinone baits may pose a secondary hazard to avian and/or mammalian predators that feed on poisoned rodents. Brodifacoum and bromadiolone likely pose the greatest secondary risks, because they are more acutely toxic, especially to birds, more persistent in animal tissues, and can be lethal in a single feeding. In contrast, chlorophacinone and diphacinone tend to be less toxic to birds, less persistent in the tissues of primary consumers, and must be eaten over a period of several days to cause mortality. Therefore, a predator feeding only once on a poisoned carcass may not die if the rodent was poisoned with diphacinone or chlorophacinone, but is more likely to die if the rodent was poisoned with brodifacoum or bromadiolone." [from USEPA Reregistration Eligibility Decision Facts for Rodenticide Cluster, July 1998]
Aquatic Organism Hazard	"Diphacinone is slightly to moderately toxic to fish. The 96-hour LC50 for technical diphacinone in channel catfish is 2.1 mg/l, for bluegills is 7.6 mg/l, and for rainbow trout is 2.8 mg/l. The 48-hour LC50 in Daphnia, a small freshwater crustacean, is 1.8 mg/l." [EXTOXNET Diphacinone Pesticide Information Profile, 1993]. The method of use of the treated bait will preclude waterway contamination.
Bee Hazard	No data found though bee hazard is not expected considering the treatment method
Persistence	"Diphacinone is rapidly decomposed in water by sunlight." [EXTOXNET Pesticide Information Profile, 1993]
Soil Mobility	"Diphacinone has a low potential to leach in soil." EXTOXNET Pesticide Information Profile, 1993]
Use in County by the Department	Ground squirrel management to protect critical infrastructure.
Method of Application	The Agriculture Department mechanically broadcasts the majority of the diphacinone treated bait it uses. Occasionally bait is applied in bait stations.
Special Cautions	Wear gloves and eye protection when directly handling or applying treated bait.
Rate Used in Co.	2-3 treated kernels of grain per sq. ft. (10 lbs. per swath acre)
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), EXTOXNET (a coalition of a number of Cooperative Extension offices across the country); Thurston Co., WA Terrestrial Pesticide Reviews; European Union; University of Hertfordshire, U.K. Pesticide Properties Database

Contra Costa County
DECISION DOCUMENTATION TREE for COMMENSAL RODENT MANAGEMENT

Date: 5/29/2013

Department: Facilities Division

Location: County wide

Situation: Rat and mouse management to protect food, infrastructure and human health & safety in and around County buildings

What are the management goals for the sites?	Prevent rats and mice from entering County buildings; prevent rodent complaints in County buildings, remove rodents from buildings if they get in; and comply with Health Department regulations.	
Who has jurisdiction over the areas in question?	The County has jurisdiction over the facilities in question.	
How are the sites monitored and how frequently?	All County buildings that receive regular services under the pest management contract are monitored by technicians from Pestec, the County's structural IPM contractor. Some locations within the County elect to have "per-call" services, only requesting services when County staff determine it necessary. It is also the responsibility of all County staff and building occupants to continually monitor and report signs of rodent activity to the Facilities Division. Monitoring is done by visual inspection. Monitoring frequency depends on the type of building and its use and can range from twice a week to monthly. As a monitoring aid, Pestec has placed rodent bait stations around various County buildings. Detex Blox® (non-toxic feeding blocks) are placed inside the bait stations along with a T-Rex® snap trap that that is not set. Pestec technicians regularly inspect the feeding blocks for evidence of rodent gnawing. When evidence of feeding is detected, the snap traps are set. (More on trapping below under physical controls.) Buildings with kitchen or food handling facilities are monitored more frequently and with closer scrutiny.	
The problem species have been identified as the following:	**Roof rat** (*Rattus rattus*); **Norway Rat** (*Rattus norvegicus*); **house mouse** (*Mus musculus*) Rats and mice can damage structures by gnawing and can cause electrical fires by chewing off insulation around electrical wires. These rodents can chew on, nest in, and excrete wastes in sensitive electronic devices. They eat human and animal food and contaminate surfaces and food with urine and feces. They also carry a number of human diseases, and house mouse urine contains a protein that can trigger severe asthma or allergic reactions in susceptible people. These rodents are carriers of ectoparasites such as fleas and mites that can bite people, and they are implicated in the transmission of 55 different human pathogens.	
What is the tolerance level for these species?	**Tolerance level**: The tolerance level outside of buildings for rats and mice varies. There is a zero tolerance for Norway Rat burrows within 500ft from an occupied structure on County property. There is also a zero tolerance for the sighting of a roof rat during the day on County property. Mouse population tolerances are undetermined. The tolerance level for rodents inside buildings is zero. Any feeding activity on Detex Blox outside and any sightings or evidence of rodents inside County buildings justifies treatment (education, sanitation, clutter control, pest proofing, vegetation management, trapping).	
Are these sensitive sites?	Are any of the sites part of any of the court-ordered injunctions regarding threatened and endangered species? The County does not normally use rodenticides for the control of rats or mice, but might use a rodenticide in the event of a public health emergency. The injunctions exempt "The use of the Pesticides covered under Section 3 above	Possibly

	[applicable rodenticides are brodifacoum, bromadiolone, bromethalin, cholecaliciferol, difenacoum, difethialone, and warfarin] for: "--the purpose of public health vector control when such a program is administered by public entities; or "--use by certified applicators for control of a vector pest when such control is necessary to respond to a federally or state declared public health emergency." Are there other sensitive species to be aware of? In urban areas, pets as well as birds of prey, and sometimes wild mammalian predators feed on rodents. Pets and other urban wildlife could feed directly on rodenticides if the rodenticides were not secured inside a tamper-resistant bait station.	
	Is there known or potential habitat for any endangered or threatened species at any of the sites? See also above.	Possibly
	Are any of the sites in or near an area where people walk or children play? County buildings in general are sensitive sites because people work in the buildings. Head Start facilities are especially sensitive because of the children who spend many hours of their day in the buildings. Buildings with kitchens or food handling facilities are also especially sensitive. Extra care must be taken at Head Start sites to make sure children cannot access snap traps. Inside offices, snap traps for mice are set in concealed or out-of-the way locations and occupants are informed of their location.	Yes
	Are any of the sites near a drinking water reservoir?	N/A
	Are any of the sites near a creek or flood control channel?	N/A
Which cultural controls were considered?	**Educating custodial staff and building occupants on proper sanitation and its critical role in rodent control** ● Store food properly, especially at night. Proper food storage is in the refrigerator or cooler or in glass, metal or heavy plastic with a tight-fitting lid. ● Limit areas for eating and storing food. Building occupants should be strongly discouraged from keeping food in their desks. ● Keep eating and cooking areas clean. ● In food handling and preparation areas, regularly steam clean appliances and hard-to-reach areas that may accumulate food debris. ● Limit food waste to designated garbage receptacles. ● Remove all garbage from buildings at the end of the day, and store in receptacles that will prevent rodent access. ● Outside, make sure all refuse goes into the proper receptacles. Do not allow any food wastes to accumulate outside of dumpsters or other garbage cans. ● Keep garbage can and dumpster lids closed. ● Regularly clean waste receptacles and dumpsters. **Preventing rodent access to structures** ● Educate Facilities maintenance personnel about the importance of and reasons for rodent proofing. ● Make general building repairs and seal large and small holes in structures, both inside and out. Mice can squeeze through a hole that a pencil can fit in, and rats can enlarge that size hole by gnawing until they can fit through also. ● Seal vents with ¼" hardware cloth. ● Seal gaps where pipes and wiring enter the structure. ● Weather strip doors and windows, and use door sweeps, metal kick plates, or raised metal door sills to prevent rodent entry. Openings around doors should be less than ¼".	

	• Repair broken sewer pipes. • Install threaded caps on drains, and make sure that the traps in little used drains are kept filled with water. • Make sure air conditioning units are well-sealed, especially those on the roof. • Trim tree and large shrub branches 3 to 6 feet from buildings to prevent rodents from using the branches to access upper levels of structures. **Limiting availability of shelter/harborage for rodents** • Trim bushes and ground covers at least 2 feet from the structure to decrease cover for rodent runways, to prevent hidden access to buildings, and to make inspections easier. • Remove ivy and other vines from outside walls. • Eliminate dense plantings, especially next to structures. In landscaping, break up dense plantings with pathways, stretches of lawn, or very low ground cover to decrease cover for rodent runways. • Eliminate plantings of Algerian ivy (*Hedera canariensis*) and date palms because rats can live in and feed on these plants. If it isn't possible to immediately eliminate these plantings, work toward that goal. In the meantime, shear ivy very close to the ground. • Remove rock and wood piles and construction debris. • Reduce clutter and debris that can provide hiding places for rodents. Items such as paper, cloth, carpeting, and insulation are ideal nesting materials for rodents and should be stored in rodent-proof containers if mice or rats are making use of them. • Seal holes in structures that allow rodents access to shelter or harborage in the buildings. • Keep weedy grasses trimmed low and/or eliminate them to reduce harborage and food from seeds. **CONCLUSIONS: All of these tactics are very important in reducing the number of rodents in and around structures. All of these tactics are used where appropriate in the County.**
Which physical controls were considered?	Trapping requires more time, effort, and skill than other control methods, but has several advantages: you can see your success, rodents do not die in walls or other inaccessible places and cause odor and fly problems, and no rodenticides are necessary. **Live Trapping**: Multiple catch live traps for mice can be useful in certain situations and can save labor in setting individual traps. They do not need to be baited and can be used at any time of the year. It is important to use a sufficient number of traps to resolve the problem in a timely manner. The mice must be humanely euthanized and should not be released alive outside the building because they will return to cause more problems. For rats, snap traps are much easier to use and more effective than live traps. Rats are much larger than mice and present more problems for humane euthanization. Glue boards can successfully catch mice, but are not as effective for rats. Rats may pull themselves free of the glue, and if the board is not anchored, the rat may drag it away with only a tail or a foot caught. Glue boards are generally considered inhumane because rodents caught in the glue usually die slowly and with much struggle. **Kill trapping**: Snap traps are effective for both rats and mice, and can be used both indoors and out at any time of the year. In general, they should be baited with something that is attractive to the target animal. Indoors, traps must be placed where they will not attract attention and where children and adults will not accidentally encounter them. Trap placement is crucial for success and in general, it is important to use more, rather than fewer traps. Traps set inside a building should be inspected within one week to remove any rodents that were caught. Outdoors, when feeding is detected on a Detex Blox inside a rodent bait station, the T-Rex® trap inside the station is baited and set. T-Rex traps are the best choice for using inside a bait station. The station must be large enough to accommodate the trap. Pestec uses Protecta Sidewinder® Bait Stations, but other brands that will easily accommodate the trap with its jaws open will work. The bait stations are inspected within a week to remove trapped rodents. At this point, the bait is refreshed and the traps are reset. When no more rodents are being trapped, the traps are deactivated and the technician goes back to monitoring the station for feeding activity. Electronic traps are also available for rats and mice. These electrocute the rodent and need batteries to operate. They are also 7 to 8 times more expensive than a T-Rex trap. Pestec is testing the various brands for use in the County. **CONCLUSIONS: Trapping is very effective and is the only method of direct control used in the County, barring a public health emergency. Pestec has experimented with 2 brands of multiple catch traps**

	(Victor® Tin Cat and Kness® Ketch-All) for mice along with various set ups for the traps. They have not found them as effective as snap traps, but continue to test multiple catch traps.
Which biological controls were considered?	**Biological controls available:** There are a number of animals that prey on rats and mice, including cats and owls Predators can prune rat and mouse populations, but they cannot provide the degree of control necessary in the specific locations. Cats and dogs are often found living in close association with an infestation of rats or mice. **CONCLUSIONS**: **There are no biological controls that can effectively manage the County's rat and mouse populations in specific areas; however, natural predators can aid the County's efforts considerably. Owls living on the roof of the County Administration Building at 651 Pine in Martinez have left a huge number of rodent bones on the roof.**
Which chemical controls were considered?	Repellents will be considered for rat and mouse control when trapping and exclusion are insufficient. Repellents may include DeTour, an EPA exempt pesticide, or other repellents that are tested and found to be more efficacious and still within Pestec's IPM certification guidelines. **CONCLUSIONS:** **The County does not use rodenticides to control rats and mice, but in the event of a public health emergency, the County would use all available means to control rats and/or mice, including rodenticides, if necessary.** **A first generation anticoagulant, such as warfarin, would be chosen. Warfarin is readily accepted by both rats and mice, it effectively kills these rodents, and it has a wide margin of safety because it requires multiple daily sequential feedings for toxicosis, and it has a readily available and easily administered antidote (Vitamin K). First generation anticoagulants also pose less of a secondary poisoning risk.** **If rodenticides must be used, they will be used according to the Greenshield IPM Certification Standards as follows:** i.) used only after reasonable measures are taken to correct conducive conditions including preventing access to water, food or garbage; removing clutter; sealing cracks or holes in foundations, sidewalks; removing tall weeds; and trimming shrubs to expose ground and discourage rat burrowing; and ii.) in bait-block form and placed in a locked, distinctively marked, tamper-resistant container designed specifically for holding baits and constructed of metal or heavy duty plastic and securely attached to the ground, fences, floors, walls or weighted bases, etc. such that the container cannot be easily moved/removed; and iii.) baits are secured (e.g., on a rod) in the baffle-protected feeding chamber of the bait container and not in the station's runway; and iv.) in loose pellet formulation or loose meal formulation (i.e., not within packets) placed deep into burrows (i.e., at least two feet into the burrow from the burrow's main entrance) to reduce potential for rejection or access by non-target animals. Neither bait blocks nor baits still enclosed within packets are to be used for direct burrow baiting.
Which application methods are available for this rodenticide?	Applications around buildings must be made in tamper-resistant bait stations situated along walls or other external parts of buildings (e.g., doorways, ramps and loading docks) where rats or mice might seek to gain entrance. Indoors, rodenticides must be used in tamper-resistant bait stations. **CONCLUSIONS: Rodenticide would first be deployed in tamper-resistant bait stations that would be anchored to the substrate.** **Tamper-resistant bait stations are of durable fabrication and meet the following criteria:** **1. resistant to weather** **2. strong enough to prohibit entry by large non-target species** **3. equipped with a locking lid and/or secured rebaiting hatches** **4. equipped with entrances that readily allow target animals access to baits while denying access to larger non-target species** **5. capable of being anchored easily and securely to resist efforts to move the container or to displace its contents** **6. equipped with an internal structure for securely containing baits**

	7. made in such a way as not to be an attractive nuisance **8. capable of displaying proper precautionary statements in a prominent location.** **In an emergency, if control of burrowing rats is not achieved with mechanical means or repellents, then burrow baiting to the Green Shield IPM Certification specifications (see above) will be employed.**
What factors were considered in choosing the pesticide application method?	Safety to the applicator, the environment, and nontarget species; endangered species considerations, the effectiveness of the method, and the cost to the Division.
What weather concerns must be checked prior to application?	Since the rodenticide would be protected inside a bait station, weather would not be a concern.

Pesticide Profile for**: Warfarin**

Active Ingredient	Warfarin (.025%)
Injunction Restrictions	This chemical is enjoined in particular locations for the following endangered species: Alameda whipsnake.
Signal Word	Caution (the lowest hazard level in EPA's labeling system)
Federally, State, or Locally Restricted Use Material	No
Cancer	Not listed
Prop 65	Listed as a developmental toxicant
DPR Groundwater Protection List	Not listed
Mammalian Hazard	Highly toxic by ingestion with oral LD_{50} values for technical sodium warfarin of 323 mg/kg in male rats and 58 mg/kg in female rats; 60 mg/kg in mice; and 200-300 mg/kg in dogs. [EXTOXNET Warfarin Pesticide Information Profile, 1995]
Bird Hazard	"The acute avian toxicity of warfarin indicates that it is practically nono-toxic to game birds. In subacute studies, warfarin ranged from moderately toxic to practically non-toxic to upland game birds and waterfowl." [EXTOXNET Warfarin Pesticide Information Profile, 1995]
Secondary Poisoning	"One study exists on a 50/50 percent formulation of warfarin-sulfaquinoxaline technical. The warfarin-sulfaquinoxaline caused secondary poisoning in mammalian carnivores such as mink and dogs when ingesting prey killed after they were provided with treated bait (carrots containing 0.025% by weight of the test materials). The first death occurred after 8 days of continuous exposure to treated nutria." [EXTOXNET Warfarin Pesticide Information Profile, 1995]
Aquatic Organism Hazard	"The toxicity of warfarin to aquatic organisms is felt to be of low potential due to the fact that warfarin is insoluble in water. A long field experience shows no potential hazards to aquatic organisms." [EXTOXNET Warfarin Pesticide Information Profile, 1995]
Bee Hazard	"Warfarin used as a prepared bait (0.13%) is considered non-toxic to bees when used as prescribed." [EXTOXNET Warfarin Pesticide Information Profile, 1995]
Persistence	No data found.
Soil Mobility	No data found.
Use in County by the Department	Warfarin is not used by Contra Costa County operations. This profile has been prepared because warfarin might be used as a rodenticide bait for rats and mice in the event of a public health emergency.
Method of Application	If it were used, it would be inside of tamper-resistant bait stations anchored to the substrate.
Special Cautions	Keep away from humans, domestic animals and pets. Harmful if swallowed or absorbed through the skin because this material may reduce the clotting ability of blood and cause bleeding. Do not get in eyes, on skin or clothing. Wash arms, hands and face with soap and water after applying and before eating or smoking.
Rate Used in Co.	To be determined.
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), EXTOXNET (a coalition of a number of Cooperative Extension offices across the country); Thurston Co., WA Terrestrial Pesticide Reviews; European Union; University of Hertfordshire, U.K. Pesticide Properties Database

Contra Costa County

DECISION DOCUMENTATION TREE for WEED MANAGEMENT

Date: 8/14/13

Department: Grounds Division

Location: Camino Tassajara medians in Danville between Conejo and Shadow Creek (~1 mi.)

Situation: Weed management on Special District medians ranging in width from 2 to 10 ft.; planted with sycamores, 10 different kinds of shrubs, some of them hedges, including roses, *Cotoneaster*, and *Rhaphiolepis,* but no grass; some medians are mulched, some are not; watered by drip irrigation; traffic on the road averages 55 to 60 mph; staff cannot block lanes to work because it causes major traffic problems, but they use traffic cones to block turnouts.

Note that Special Districts vary widely in the funding available for their maintenance. In newer housing developments there is more money while in most of the older developments, the assessments are far below what it costs to maintain the landscaping. In San Pablo and Richmond funding can vary greatly from one side of the street to the other.

What are the management goals for the site or weed?	For medians in Danville, where citizens expect aesthetically pleasing landscaping, the goals are • to maintain the medians "weed-free"—this means that weed growth 1" to 2" tall is OK. • to maintain the medians at an aesthetic that is just at or below the complaint level • to concentrate management efforts on the areas near stoplights and stop signs because people notice the condition of the medians when they slow down and/or stop	
How often is the site monitored?	The site is monitored weekly.	
Weeds have been identified as the following:	Various grasses, including wild oats, and various broadleaf weed including, vetch, bristly oxtongue, prickly lettuce, spurge, filaree, willow herb, dandelion, clover,	
Are populations high enough to require control?	The Division manages weeds as necessary to meet the goals stated above.	
Is this a sensitive site?	**Is this a "highly sensitive site" as defined by PWD Environmental staff?**	No
	Is this under the RMA with Fish and Game?	N.A.
	Is this part of any of the court-ordered injunction? From Conejo to approximately 96 yds to the east is included in the San Joaquin kit fox injunction area. See attached map. However, none of the pesticides used by grounds in this area is part of the injunction.	Yes
	Is this a known or potential habitat for any endangered or threatened species? San Joaquin kit fox	Yes
	Is it on or near an area where people walk or children play?	No

	Is it near a drinking water reservoir?	No
	Is it near a creek or flood control channel? The eastern end of this area of medians is near the Shadow Creek Detention Basin.	Yes
	Is it near crops?	No
	Is it near desirable trees or landscaping?	Yes
	Is the soil highly permeable, sandy, or gravelly? Lots of clay in the soil there, but for most sites, the soil is an artificial soil mix.	No
	Is the ground water near the surface? Drilling logs from the vicinity indicate ground water could be from 10 to 22 ft. from the surface.	Unknown
Which cultural controls were considered?	**Mulching**: This is used in some areas. Grounds can mulch periodically when there is enough money in this particular Special District budget. An extensive mulching project would depend on whether or not the Special District Zone considered it a priority and wanted to pay for it. Mulching is very expensive, especially if the mulch must be purchased. The cost of the mulch plus labor can cost from $5K to $10K for ¼ mile at an average of 8 to 12 ft wide. Mulching is easiest where the median is flat, rather than mounded. In areas where the median is built up into a little hill, the mulch falls or blows off. If mulch were to be used on those areas, the median would have to be completely redesigned to remove the hill and enough soil below the curb to allow space for the mulch and keep it from moving into the roadway. Grounds can recommend changes such as this, but the Division does not have control over design or planting, only maintenance. Grounds must also consider the aesthetic of mulching. In an area where mulching is possible for a 10 foot stretch and then not for 50 more feet before another 10 foot stretch, the look would not be uniform, and people would complain. **Weed barrier/sheet mulching**: This is very labor intensive and expensive. The plants are established so it would be very difficult to do and would be less effective. **Restricting irrigation to reduce weed growth**: The medians are irrigated with spaghetti tubing with drip emitters or bubblers, which reduces weed growth (as opposed to overhead sprinklers). **Planting Desirable Species**: Grounds is only in charge of maintenance and not design or planting. Special Districts is alerted when there are plant problems, but there may or may not be funds for changes and it may or may not be a priority. When Special Districts does a re-landscaping project they do consult the Grounds Manager about maintenance issues. **Dense plantings to shade out weeds**: In some areas the plantings are dense, but Grounds has no control over planting. **Hardscaped medians**: The medians on the eastern end of Camino Tassajara are paved and have evenly spaced openings for a tree and some herbaceous plants. These are ideal for ease of maintenance. The few weeds that come up in the pavers can be handpulled. This design also reduces water use and planting costs. **CONCLUSIONS**: **The kind of cultural control that can be used on these medians is driven by the funds available in the Special District budget and the priorities in the Zone. Mulching is preferred where it can be employed and where there is money available for the installation. Drip irrigation is being used to reduce weed growth. Dense plantings in some areas also suppress weed growth. Hardscaped medians greatly reduce the amount of maintenance and weed control needed. The use of other cultural controls is not practical or not possible at this time. Note that Grounds does not have control over planting or design for these medians.**	
Which physical controls were considered?	**Pruning for the health of the plant**: Every 3 or 4 years when enough money has been saved in this Special District budget, Grounds hires a contractor to prune the sycamores. Currently, it is better to contract this work out because necessary tree cutting vehicles are not yet back in the Grounds' budget. Staff prunes shrubs when there is time and when pruning is needed. **Handpulling weeds:** This is done whenever there is a low enough density of weeds. Staff handpull, rather than weed whack plants that are going to seed to avoid scattering seed everywhere. **Mowing by hand**: Weed whacking is used wherever and whenever possible.	

	Mowing by machine: This is not appropriate or possible on these medians. **Grazing**: Grazing is not appropriate on a median. **CONCLUSIONS: Pruning is used for the health of the trees and bushes, and weed whacking is used as much as possible within the budget. Handpulling is used whenever the weed density is low and especially for weeds with seed heads.**
Which biological controls were considered?	**CONCLUSIONS**: **Biological controls are not applicable in this situation.**
Which chemical controls were considered?	Pre-emergent (residual) herbicide? Yes Post emergent (contact) herbicide? Yes Possible herbicide choices: **<u>Pre-Emergent Herbicides</u>** **Prodiamine (Barricade®)**: This is a selective pre-emergent to control susceptible broadleaves and grasses.This herbicide has not been used for many years, but may be used again as part of a rotation to prevent weed resistance. **Dithiopyr (Dithiopyr 40 WSB®)**: This is a selective, systemic, pre-emergent and early post-emergent. Will control or suppress more than 40 different annual grass and small-seeded broadleaf weeds including, wild oats, annual bluegrass, oxalis, chickweed, geranium, marestail pigweed, purslane, and spurge. It will not harm nearby flowers, shrubs, or trees, but direct applications to ornamental plants should be avoided. Dithiopyr 40 WSB requires at least ½" of rain or irrigation to activate it. Rate: 10 oz./100 gal. of water Timing: Pre-emergence to early seedling; applied before 1st rains in fall to prevent germination of winter weeds and in spring around April to prevent germination of spring weeds Material cost: $80/acre **Isoxaben (Gallery®)**: Gallery is a selective pre-emergent herbicide that prevents the growth of 95 species of broadleaf weeds for up to eight months. It must be activated by light cultivation or at least 1/2 inch of rainfall or sprinkler water within 3 wks. of application to set up a solid control area around weed seedlings. As the weed seeds germinate, Gallery disrupts and halts root and stem development of the weeds, so seedlings gradually die before they ever break the soil surface. Control includes prickly lettuce, bristly oxtongue, clover, filaree, willow herb, dandelion. Rate: 0.9 lb./acre. Timing: Pre-emergence to early seedling; applied before 1st rains in fall to prevent germination of winter weeds and in spring around April to prevent germination of spring weeds Material cost: $350/acre **<u>Post-Emergent Herbicides</u>** **Glyphosate (Roundup®):** This is a systemic herbicide that will kill almost any type of vegetation—grass, broadleaf, vines, brush, etc. Rate: 9 oz./ 3 gallon backpack sprayer (used to spot treat weeds) Timing: Seedling to mature plant, ideally before seed set; the smaller the weed, the less herbicide required Material cost: $13.60/acre **Fluazifop-P-butyl** (**Fusillade 2000®):** This is a systemic herbicide for the control of annual and perennial grasses. This herbicide is not used because there is not a large enough volume of grass weeds on these medians. **Triclopyr:** Grounds uses triclopyr only for hard to control weeds (mostly woody plants such as ivy), stumps, and invasive weeds, so it would not be appropriate for the weeds on medians. **<u>Herbicides with both Pre- and Post-Emergent Action</u>** **Flumioxazin (Sureguard®):** Flumioxazxin is a preemergent and fast postemergent for the control of broadleaf and grassy weeds in landscape settings. It is taken up by roots and foliage of plants (it is primarily absorbed by

	the roots of treated plants following soil applications). Pre-emergence: Flumioxazin is applied to clean, weed-free soil, mulch, or gravel surfaces. Moisture at some time following the application is necessary to properly activate the herbicide. Post-emergence: Flumioxazin can be tank mixed with a postemergent herbicide, such as glyphosate when weeds are present. Tank mixtures of flumioxazin with glyphosate provide faster and more effective weed control than glyphosate alone. The flumioxazin provides long-lasting residual weed control with a single application. Flumioxazin should not be applied to the foliage of ornamental plants. Note: Grounds does not use flumioxazin alone as an herbicide Rate: 1/3 oz./3 gallon backpack sprayer Timing: Seedling to mature plant, ideally before seed set; the smaller the weed, the less herbicide required. It can provide residual control for 4 to 10 months. Cost: $154/acre (@ 11oz/acre) **CONCLUSIONS: Mulching is preferred wherever it can be used, but when an herbicide is needed, Grounds uses isoxaben and dithiopyr as pre-emergents to reduce the amount of post-emergent herbicide use and to reduce the amount of time that staff must work on these dangerous medians. These 2 herbicides are usually applied both in fall and spring because different weeds germinate at different times. Both pre-emergents are used because they each target somewhat different weed species.** **Grounds uses glyphosate alone and glyphosate mixed with flumioxazin to control weeds that escape the pre-emergent treatments. Post emergent treatments are mostly spot treatments done with a backpack sprayer.** **Glyphosate + flumioxazin is applied in areas where there is a dense enough stand of weeds to not waste the glyphosate and an extensive enough area that the 3 gallons of spray mix in the backpack can be used up. After flumioxazin is mixed with water, it must be applied within 12 hours. Currently only Lead Gardeners are allowed to use glyphosate mixed with flumioxazin. Grounds is seeing a large decrease in the weed populations on these medians now that they have been using flumioxiazin. This is presumably because of the synergistic effect that flumioxazin has on glyphosate and because of the pre-emergent quality of flumioxazin.**
Which herbicide application methods are available for this chemical?	Methods available: Broadcast from a truck with a boom; spot-sprayed pulling hose from a truck; spot-sprayed with a backpack sprayer **CONCLUSIONS: The pre-emergents are applied by pulling hose from a truck wherever a truck can get in to the areas needing treatment. In other areas a backpack sprayer is used.** **Glyphosate or glyphosate plus flumioxazin are spot-applied using a backpack sprayer.** **Broadcast application with a boom from a truck is not used because it wastes large amounts of herbicide.**
What factors were considered in choosing the pesticide application method?	Staff safety is the first consideration. Other considerations are the effectiveness and precision of the method, the extent of the area needing treatment and its location, the time of year, the size and kind of weeds, the possibility of pesticide runoff, risks to non-target species, endangered species issues, and the cost to the Division.
What weather concerns must be checked prior to application?	For any herbicide, a primary concern is wind since it can carry herbicides off-site, onto non-target plants or to sensitive areas. For glyphosate, heavy rain soon after application may wash the herbicide off the plant necessitating an additional application. Glyphosate should not be applied during a temperature inversion because drift potential is high. For isoxaben, rain must occur within 21 day in order to activate the herbicide. The soil should be slightly moist and not bone dry in order to ensure that the herbicide clings to the soil. Flumioxazin requires moisture to activate the herbicide, but it is not time-sensitive. Dithiopyr 40 WSB requires activation by at least ½" of rain or irrigation.

DRAFT Pesticide Profile for: Gallery®

Active Ingredient	Isoxaben (75% in formulated product, Gallery)
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Possible carcinogen for isoxaben. Known or probable carcinogen for the crystalline silica in the formulation. Crystalline silica has been shown to cause lung cancer with chronic occupational exposure.
Prop 65	Not listed
Known groundwater contaminant	No
Mammalian Hazard	Acute oral LD_{50} >10,000 mg/kg in rats and mice (practically non-toxic)
Bird Hazard	Acute oral LD_{50} >2,000 mg/kg (practically non-toxic)
Aquatic Organism Hazard	Fish: LC_{50} >1.1 mg/L (moderately toxic) Crustacean: LC_{50} >1 mg/L (moderately toxic) Mollusk: LC_{50} >0.96 mg/L (highly toxic) Moderately toxic to aquatic organisms.
Bee Hazard	LD_{50} >101.7 ug/bee (practically non-toxic)
Persistence	The photolysis half-life in water is 6 days. The photolysis half-life in soil is 100 to 248 days.
Soil Mobility	Koc = 1400 (moderately adsorbed onto soils)
Use in County by Grounds Division	To prevent weed germination on high profile medians along Camino Tassajara where traffic is 55 to 60 mph. Use of isoxaben twice a year reduces the amount of post-emergent herbicides that must be used. To maintain bare ground on the Marsh Creek Firing Range in order to prevent fires.
Method of Application	Pulling a hose attached to a truck is the main method. Occasionally a backpack sprayer is used
Cautions	Normal applicator precautions include wearing gloves, long sleeved shirt, long pants, shoes and socks, and avoiding ingestion, breathing dust or spray mist, and contact with skin, eyes, or clothing. Isoxaben must be applied within 21 days of at least ½ inch of rain or irrigation in order to activate the herbicide.
Rate Used in Co.	0.9 lb/acre (approx. 0.675 lb a.i./acre)
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

DRAFT Pesticide Profile for: Dithiopyr 40 WSB®

Active Ingredient	Dithiopyr (40% in formulated product, Dithiopyr 40 WSB)
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Evidence of non-carcinogenicity for 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} >2,250 mg/kg (practically non-toxic)
Aquatic Organism Hazard	Fish: LC_{50} 0.46 mg/L (highly toxic) Crustacean: LC_{50} 5.2 mg/L (moderately toxic) Mollusk: not found Warning on label: Highly toxic to aquatic organisms.
Bee Hazard	LD_{50} 81 ug/bee (practically non-toxic)
Persistence	Biotic or aerobic half life is 39 days. Abiotic half life is 69 days. Liquid products of dithiopyr are likely to have some of it volatilize after application, and the remainder of the chemical will be degraded by sunlight and soil microbes. Dithiopyr is expected to degrade to half of the applied concentration in less than 60 days.
Soil Mobility	Koc = 1175 - 2482 (moderately adsorbed onto soils with organic matter and poorly onto soils without organic matter)
Use in County by Grounds Division	To prevent weed germination on high profile medians along Camino Tassajara where traffic is 55 to 60 mph. Use of dithiopyr twice a year reduces the amount of post-emergent herbicides that must be used. To maintain bare ground on the Marsh Creek Firing Range in order to prevent fires.
Method of Application	Pulling a hose attached to a truck is the main method. Occasionally a backpack sprayer is used
Cautions	Normal applicator precautions include wearing a long-sleeved shirt and long pants, chemical-resistant gloves made of any water proof material, and shoes plus socks. Requires ½ inch of irrigation or precipitation to activate the herbicide.
Rate Used in Co.	10 oz./100 gal water (approx. 0.5 lb. a.i./acre)
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

DRAFT Pesticide Profile for: SureGuard®

Active Ingredient	Flumioxazin (51% in formulated product, SureGuard)
Injunction Restrictions	None
Signal Word	Caution
Federally, State, or Locally Restricted Use Material	No
Cancer	Not likely to be carcinogenic to 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} >2,250 to 5,620 mg/kg (practically non-toxic)
Aquatic Organism Hazard	Fish: LC_{50} 2.3 to 21 mg/L (moderately to slightly toxic) Crustacean: LC_{50} 0.23 mg/L (highly toxic) Warning on label: Toxic to aquatic invertebrates.
Bee Hazard	LD_{50} 105 ug/bee (practically non-toxic)
Persistence	Aerobic half life is 12 to 27 days. Abiotic half life is 69 days.
Soil Mobility	Koc = 1412 (potential to leach into groundwater is low)
Use in County by Grounds Division	For spot treatment on high profile medians along Camino Tassajara where traffic is 55 to 60 mph.
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, and shoes plus socks. SureGuard must be applied within 12 hours of mixing.
Rate Used in Co.	11 oz./acre (approx. 5.6 oz. a.i./acre)
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

DRAFT Pesticide Profile for: Roundup Pro Concentrate®

Active Ingredient	Glyphosate (50.2% in formulated product, Roudup Pro Concentrate
Injunction Restrictions	60 ft. buffer around California red-legged frog habitat
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	Koc = 21,699 (potential to leach into groundwater is low)
Use in County by Grounds Division	For spot treatment on high profile medians along Camino Tassajara where traffic is 55 to 60 mph. For spot treatment of weeds in numerous locations in the county.
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, and shoes plus socks.
Rate Used in Co.	63 oz./acre (approx. 2 lbs. a.i./acre)
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

Contra Costa County

DECISION DOCUMENTATION TREE for WEED MANAGEMENT

Date: October 20, 2013

Department: Public Works Roadside and Flood Control Channel Vegetation Management Div.

Location: Flood Control Channels

Situation: Vegetation management along flood control channels and creek banks

Note that management decisions are site specific for flood control channels. Not every management technique will work equally well at all sites and the costs of each technique will vary depending on the site.

What are the management goals for the site?	To maintain vegetation along flood control channels and creek banks so that • erosion of the banks does not occur • vegetation does not impede the flow of water in a flood • vegetation does not collect silt and debris that could obstruct the passage of water • vegetation does not hide problems on banks such as ground squirrel burrows, erosion, beaver activity, etc. • homeless encampments cannot flourish unnoticed • waterways do not become a conduit for the spread of noxious weeds throughout the county • waterways provide habitat for wildlife • maintenance is performed in accordance with the Routine Maintenance Agreement (RMA) with the state Department of Fish and Wildlife Vegetation is also managed along flood control access roads to maintain the integrity of the roads and the ease of access for equipment.	
How often is the site monitored?	All sites in the county are monitored every few days. The Vegetation Manager spends part of every day inspecting waterways on a rotating basis. The road crews, the flood control supervisors, and the vegetation management crew are all trained to recognize vegetation issues on flood control channels and creeks and to report them to the Vegetation Manager.	
Weeds have been identified as the following:	Various grasses, including Harding grass, Johnson grass, reed canarygrass, wildoats, quack grass; various broadleaf weeds including mustard, cocklebur, poison hemlock, wild carrot, stinging nettle, blackberries; and noxious weeds such as perennial pepperweed, purple loosestrife, red sesbania	
Are populations high enough to require control?	The Vegetation Management crew manages vegetation as necessary to meet the goals above.	
Is this a sensitive site?	**Is this a "highly sensitive site" as defined by PWD Environmental staff?** Some sites fit in this category.	Yes
	Is this under the RMA with Fish and Game? All creeks are covered under the RMA**.**	Yes
	Is this part of any of the court-ordered injunction? Some areas are included in one or more injunctions.	Yes
	Is this a known or potential habitat for any endangered or threatened species? Yes, some sites contain habitat for various sensitive species including salmonids,	Yes

	red legged frog, various nesting birds, dusky footed woodrat, salt marsh harvest mouse.	
	Is it on or near an area where people walk or children play? The walking trails on Walnut Creek, Marsh Creek, and Wildcat Creek are above the creek slopes, and the Division does not use pesticides on or near the trails. The public is not allowed on the slopes or in the water.	No
	Is it near a drinking water reservoir? No flood control channels that the Division maintains are near reservoirs.	No
	Is it near crops? There are areas of Marsh Creek, Sand Creek, and Dry Creek that are near crops.	Yes
	Is it near desirable trees or landscaping? There are some flood control access roads that are near residences.	Yes
	Is the soil highly permeable, sandy, or gravelly? Yes, in some areas.	Yes
	Is the ground water near the surface?	Unknown, but near the creeks, groundwater may be at creek level
Which cultural controls were considered?	**Mulching:** Woodchips are used on flood control access roads where appropriate to prevent and suppress weeds. Creek banks cannot be mulched **Weed Barrier/Sheet Mulching:** This cannot be used on the creek banks, and for the access roads, it would be an added and unnecessary expense since a deep cover of woodchips serves the same purpose. **Planting Desirable Species:** The Vegetation Manager is experimenting with planting Bermuda grass on some areas of the slopes of Walnut Creek to see if it can choke out other weeds. Although the areas were seeded with the grass 2 years ago, it is very slow growing and the results of the experiment will not be apparent for some time yet. One of the drawbacks of using Bermuda grass is that it will grow over riprap and hide the rocks. Staff that are working in those areas may not see the rocks and thus risk injuries, such as twisted ankles. The County Flood Control District will be partnering with Restoration Trust, an Oakland-based non-profit organization, in a native planting experiment along Clayton Valley Drain (near Hwy 4 adjacent to Walnut Creek). The study will involve three 20' x 20' test plots and one control plot that will compare the survival of three different California natives: Santa Barbara sedge, (C*arex barbarae*), field sedge (*Carex praegracilis*), and creeping wild rye (*Leymus triticoides*) planted by seed and by plugs. Planting will begin in December 2013. These species spread from underground rhizomes and will anchor the soil to provide erosion control. They are all perennial species that stay green year around and 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. Native grasses and sedges can potentially out-compete non-native broadleaf weeds and annual grasses, but they may require maintenance assistance from herbicides. Restoration Trust will monitor these plots for 5 years after the plantings to assess native plant survival, their degree of competition with the non-native annual species, and the relative success of seeding versus planting plugs. **CONCLUSIONS**: **Mulching can be and is used along flood control access roads where the mulch will not drift into the creek. The Public Works Department is experimenting with planting desirable species to out-compete weedy species. This is an IPM technique the Public Works Department is interested in exploring further.**	
Which physical controls were considered?	**Pruning:** Trees are pruned for equipment clearance and for line of sight along access roads. Feral trees that sprout on the slopes or in creek channels are cut down. **Mowing by machine:** Many creek slopes are mowed by tractor for fire prevention, as required by the Fire District. The channels are mowed along the top of the slope and about 6 ft. down the side of the slope. Mowing works best on open spaces without a lot of trees.	

	Mowing by hand: Where it is not possible to get a tractor in, the Department uses a crew with weed whackers. **Grazing:** Grazing is used where the presence of endangered species, such as the red legged frog, make it impossible to mow, for example, on Pine Creek Dam. Grazing is also used in areas such as Pine Creek and Ygnacio Valley Drain where the creek sides are steep and dangerous for human workers. Goats are more expensive than hand mowing, but less expensive than an injured employee. The Department's grazing study is being conducted on Walnut Creek. **Burning:** This technique was used in the past but is no longer because the Air Quality Control Board allows burning only in very limited circumstances. **CONCLUSIONS: Each of these techniques, except burning, is used by the Department where they are appropriate.**
Which biological controls were considered?	**Biological controls are not applicable in this situation unless a particular invasive weed is the target, and it has a biological control available.**
Which chemical controls were considered?	Possible herbicide choices **Pre-emergent Herbicides** **Indaziflam (Esplanade®)**: This pre-emergent herbicide controls a broad spectrum of weeds if applied before germination. It does not generally control weeds after they have emerged. For maximum weed control, the herbicide needs to reach the soil surface and be activated by rainfall or adequate soil moisture. It is applied in the fall to control winter germinating weeds and in the spring to control spring germinating weeds. Rate: 5 oz./acre Timing: Before weeds sprout in either fall or spring near the time rain is expected. Material cost: $40/acre Herbicide Resistance Management Group: 29 **Sulfometuron methyl (Oust XP®)**: This pre-emergent and early post-emergent herbicide controls many annual and perennial grasses and broadleaf weeds. The Department uses it to control grasses on flood control access roads. Rate: 3.6 to 4.8 oz/acre Timing: Before or just after weeds germinate in the fall or spring. Material cost: $41.80 to $55.73/acre Herbicide Resistance Management Group: 2 **Prodiamine (ProClipse® 65 WDG):** The pre-emergent herbicide controls grass and broadleaf weeds by preventing the growth and development of newly germinated weed seeds. Weed control is most effective when the product is activated by at least ½" of rainfall or irrigation, or shallow (1" to 2") incorporation before weed seeds germinate and within 14 days following application. Rate: 1 to 2 lbs/acre Timing: Before fall weeds or spring weeds germinate, and close to the time rain is expected. Material cost: ~$33 to $66/acre Herbicide Resistance Management Group: 3 **Post emergent (contact) herbicides** **Glyphosate (Roundup® Pro Concentrate & Aquamaster®):** Glyphosate is a systemic herbicide (is absorbed into the plant and circulates to kill the entire plant) that will kill almost any type of vegetation—grass, broadleaf, vines, brush, etc. Roundup is used on creek slopes for many different weeds. Aquamaster is used at a much reduced rate for chemical "mowing" on creek slopes to stunt vegetation but not kill it. Aquamaster is registered for use in water so the Department uses that form of glyphosate if applications are going to be very near water. Rate for use on access roads using a boom mounted on a truck: 2 pts in 20 gal of water/acre Rate for use pulling hose with a handgun attached: 6 pts in 100 gal of water/acre Rate for chemical mowing: 1/5 pt in 10 gal of water/acre Timing: Varies depending on the location, the weather, the weed growth, the work load

Material cost::

- $9.00/acre for Roundup application from a boom mounted on a truck
- $27.00/acre for Roundup application from a hose with a handgun
- $1.20/acre for Aquamaster used for chemical mowing

Herbicide Resistance Management Group: 9

Enjoined for red legged frog

Triclopyr TEA (Garlon® 3A and Renovate®): Triclopyr controls woody plants and broadleaf weeds, but not grasses. Renovate is registered for use within or adjacent to aquatic sites.

Rate for use of Garlon 3A or Renovate on access roads using a boom mounted on a truck: 2 pts in 20 gal of water/acre

Rate for use of Garlon 3A or Renovate pulling hose with a handgun attached: 4 pts in 100 gal of water/acre

Rate for cut stump treratment: Undiluted material

Timing: Varies depending on the location, the weather, the weed growth, the work load

Material cost:

- $20.26/acre for Garlon 3A application from a boom mounted on a truck
- $40.52/acre for Garlon 3A application from a hose with a handgun
- $28.62/acre for Renovate application from a boom mounted on a truck
- $57.24/acre for Renovate application from a hose with a handgun

Herbicide Resistance Management Group: 4

Enjoined for red legged frog

Herbicides with both Pre- and Post-Emergent Activity

Chlorsulfuron (Telar® XP): Telar XP is both a pre-emergent and post-emergent herbicide for the control of many invasive and noxious broadleaf weeds. Warm, moist conditions following application enhance the effectiveness of Telar XP since moisture carries the herbicide into weed roots and prevents them from developing. Weeds hardened off by drought stress are less susceptible to this herbicide. This herbicide is used by the Department mainly for control of perennial pepperweed.

Rate: 1.6 oz./acre

Timing: Before fall weeds or spring weeds germinate and close to the time rain is expected.

Material cost: $34.40/acre

Herbicide Resistance Management Group: 2

Imazapyr (Habitat®): Habitat is registered for the control of undesirable vegetation in and around standing or flowing water, and can be used for wetland, riparian, and terrestrial vegetation growing in or around surface water when treatment might inadvertently result in application to surface water. Habitat has both pre- and post-emergent activity and is a systemic herbicide (is absorbed into the plant and circulates to kill the entire plant) that controls grass and broadleaf weeds, brush, vines, etc. It will not control vegetation submerged in water.

Rate: 8 oz./3 gal of water in a backpack for spot treatments and for cut stumps

Timing: Timing: Varies depending on the location, the weather, the weed growth, the work load

Material cost: $34.40/acre

Herbicide Resistance Management Group: 2

Enjoined for red legged frog

CONCLUSIONS: Esplanade, Oust XP, and ProClipse 65 WDG are pre-emergent herbicides that are used only on flood control access roads to prevent weed emergence. They each belong to a different resistance management group and are used in rotation to prevent creating herbicide-resistant weeds. The Department uses pre-emergent herbicides to reduce the amount of post-emergent herbicides that are needed. In some areas, it is very difficult to mow either by hand or by machine, and grazing would be too costly. Those areas are treated with herbicide.

	Glyphosate, which is not a selective herbicide, is used at a regular rate in areas where it is not necessary to maintain a cover of grasses. Glyphosate, at a much reduced rate, is used to chemically "mow", or stunt, vegetation on creek banks. **Garlon 3A and Renovate are specific for broadleaf weeds and are used where the Department wants to keep a grassy cover on the creek slopes. Either might be used as a cut stump treatment.** **Telar is used primarily for control of perennial pepperweed.** **Habitat is used only as a spot treatment for *Arundo*, pampas grass, ivy growing on fences and in creeks, and as a cut stump treatment for feral trees (the tree is cut down and the herbicide is immediately applied to the cut stump).**
Which herbicide application methods are available for this chemical?	Methods available: There are 4 methods available: application from a boom attached to a truck, application from a handgun attached to a hose connected to a truck-mounted tank, spot treatment with a backpack, and spot treatment with a squirt bottle. The truck with a boom is used wherever it is possible to get the truck in since it is so much faster. A handgun is used where the truck can't get in, the backpack sprayer is used for small spot treatments, and the squirt bottle is used for cut stump treatments. **CONCLUSIONS: The terrain, the proximity to the water, the kind of weed, and the goal of the treatment dictate the application method.**
What weather concerns must be checked prior to application?	Each day, the Vegetation Manager checks the weather when he arrives at work at 6:00 AM. Rain can prevent application of some herbicides because of the danger of runoff. For most pre-emergent herbicides, rain is needed after application in order for the herbicide to be effective. He must also consider wind speed to avoid herbicide drift. Excessive heat or cold makes plants shut down, and herbicide applications at that time would be ineffective.
Costs of various management techniques	See the chart below.

Fiscal Year 2012-2013					
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	1819	69.0%	$257,599	$142	38.7%
Right of Way Mowing	255	9.7%	$189,891	$745	28.6%
Weed Spray - Flood Control Access Roads	228	8.7%	$28,257	$124	4.2%
Weed Spray - Creeks	172	6.5%	$28,324	$165	4.3%
Grazing	96	3.6%	$106,335	$1,108	16.0%
Weed Spray - Aquatic Applications	59	2.2%	$42,831	$726	6.4%
Mulching	5.7	0.2%	$11,637	$2,042	1.8%
Totals	2634.7		$664,874		

ATTACHMENT B.

IPM Priority Assessment Tool

Date:	IPM Best Management Practices Department:	Percentage Implementation	Dept. 2012 Priority **L** = low **M**= med **H=** high	IPM Comm. 2012 Priority **L** = low **M=** med **H=** high	Can this be improved with existing resources?
Pest Mgmt. Data/Info	Inventory pesticide stock annually				
	Record location of chemical use				
	Record size of area treated with chemicals				
	Track chemical use by cost (labor + materials)				
	Record location of non-chemical mgmt				
	Record size of area treated non-chemically				
	Track non-chemical mgmt by cost (labor & equipment)				
	Note target species				
	Make information available to public upon request				
	Make information available to public on the Web				
IPM Plan	Have written IPM Plan that is periodically reviewed and updated.				
	Develop and maintain pest and/or site specific IPM Plans				
	Record explicit mgmt goals for each pest/site/kind of site				
	Develop metrics to evaluate the extent to which goals are met				
	Record the extent to which goals are met				
	List explicit tolerance levels for pest/site/kind of sites (can be set at 0)				
	Describe pest management decision-making process				
Monitoring	Monitor areas under management regularly for pest/damage detection, identification, and population estimates				
	Monitor areas under management regularly for evaluation of mgmt efforts				
	Document monitoring activities				
IPM Decision-making Process	Document preventive measures considered and reason(s) for use or rejection				
	Document non-chemical strategies considered and reason(s) for use or rejection				
	Document chemical strategies considered and reason(s) for use or rejection				
	Document potential impacts of the pest on human health and/or the environment				
	Document potential impacts of management actions on human health and/or the environment, including "no impact"				
	Note costs and ability of staff to implement				

	Schedule mgmt activities for optimal effect				
IPM Research	Research new, alternative options for pest mgmt				
	Budget or seek other funds for design and implementation of field trials for evaluating new, alternative treatment strategies				
	Conduct field trials of new strategies				
	Document potential program improvements that could be implemented if there were resources, and document resource needs (tools, equip, training, staff, budget, etc)				
Training	Conduct annual IPM safety training				
	Conduct training in BMPs for pests and sites				
	Provide all staff involved in pest management with at least yearly professional development training				
	Provide training/educational presentations for other entities				
Program Administration	Adopt and implement County IPM Posting Policy				
	Report annually on IPM program				
	Track pest management budget				
Environmental Compliance	Conduct environmental assessment & monitoring to comply with Public Wrks RMA				
	Conduct environmental training for staff (relating to pest mgmt activities)				
	Comply with Municipal Regional Permit for Stormwater Discharge				
	Follow court-mandated pesticide injunctions				
Regulatory Compliance	Report pesticide use monthly to Ag Dept.				
	Comply with state and federal permit requirements				
	Comply with fire regulations for vegetation				
	Comply with flood control certification requirements				
	Comply with water conservation laws				
	Comply with Health Department regulations				
	Comply with pesticide safety regulations				
	Comply with OSHA worker safety regulations				
Safety	Provide employees with written policies on worker safety in regard to pest management activities, pesticide emergencies, and pesticide clean-up				
	Conduct regular worker safety trainings				
	Track incidents related to safety in pest management (both for chemicals and alternatives)				

ATTACHMENT C.

Department of Agriculture Noxious Weed Program Summary

(See PDF)

ATTACHMENT D.

Contra Costa County Operations Pesticide Use Data Spreadsheet

(See PDF for 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 12-13, Contra Costa County operations used a total of 7,494 lbs. of pesticide active ingredient, which included 2,719 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