IPM PLAN

for

PUBLIC WORKS VEGETATION MANAGEMENT PROGRAM

I. PROGRAM GOALS FOR PEST MANAGEMENT

The goal of this program is to maintain public safety through the reduction of hazards posed by fire, line of sight obstructions, flooding, and facility deterioration, and to minimize risks to the public and to staff from the use of pesticides.

II. LIST OF SITES AND FEATURES CURRENTLY UNDER MANAGEMENT

A. ROADSIDES

1. **Characterization of Sites**
    a. 2-10 foot strip along either side of approximately 600 miles of road (varies based on road conditions.
    b. Manage mostly roads without curbs and gutters, i.e., rural, less developed roads
    c. Manage some roads with curbs and gutters—herbicides are used at the joint of the curb and gutter to kill weeds because they break up the asphalt, which allows water to penetrate under the asphalt eventually causing major road deterioration.

2. **Overall Management Objectives**
    a. To create a fire break between the road and adjacent land (prevent cigarettes, hot catalytic converters coming into contact with dry grass when a car pulls off the road)
    b. To maintain road safety—sight lines for pedestrians and bicyclists (to see approaching vehicles), sight lines for drivers (to see signs, lane of travel, condition of shoulder, pedestrians, bicyclists), prevent drivers from moving closer to the center line
    c. To facilitate water conveyance in roadside ditches to prevent flooding
    d. To preserve pavement in good condition as long as possible. Root and shoot growth can cause cracking and heaving of pavement surfaces. Water running along plant roots can get under pavement and cause heaving. Vegetation management along roadsides extends the life of that pavement resulting in saving tax dollars, better road conditions, and the reduction of repaving necessary over time. This reduces the amount of paving material used each year and reduces the disposal of old paving material.
    e. To prevent the establishment and spread of exotic weeds on County property in order to protect wildlife habitat and recreation
    f. To maintain a certain aesthetic—this is complaint-driven (for example, as soon as weeds show up in the median on Olympic Blvd. near Rossmoor, the Public Works Dept. receives numerous phone calls)
    g. To control poison oak adjacent to road and drainage facilities to prevent employee exposure/injuries while performing their maintenance activities.

3. **Factors influencing management**
    a. Safety of employees while performing weed abatement and other maintenance operations: Management strategies must minimize worker injuries related to performing weed abatement, and road conditions, including vegetation on either side, must allow good sight lines to prevent accidents with vehicles.
    b. Safety of employees while performing other maintenance operations on roads: Employees must be able to see and be seen while working.
    c. Window of opportunity for suppressing particular weeds: The optimum time for suppression is not the same for every weed.
    d. Weed biology and ecology: These influence available and effective management strategies.
    e. Weather and season: Wind, rain and the prediction of rain must be considered when herbicides are being used in order to prevent drift and runoff. Pre-emergent herbicides require rain to perform effectively. High heat and low humidity increase fire danger from mowing and also increase the chances of heat prostration among workers.

f. Budget: Vegetation management is part of the total road maintenance budget. Increasing vegetation management costs results in less funding for other road maintenance activities. Almost all funding for road maintenance is Gas Tax revenue and in recent years this funding has been decreasing due to improving gas mileage. These funds are also subject to raids by the state.

g. Fire Department Regulations[1]: Weeds can be no higher than 3 inches. Road rights-of-way: "shall be cleared to a minimum of 10 feet horizontally from the edge of the blacktop and 13'6" vertically." Parcels 5 acres or less in size: "Maintain all weeds at a height of no more than 3 inches."

h. Terrain: These influence which vegetation management tools or strategies can be employed, e.g., a rocky shoulder makes weed whacking and mowing dangerous; large numbers of obstacles (trees, signs, culverts, fire hydrants, guard rails) make mowing difficult thus weeds around those obstacles must be cut by hand; very steep slopes endanger personnel using brush cutters; access to the area needing abatement may be extremely limited.

i. Endangered species habitat: There are legal restrictions on the kinds of pesticides and other management techniques that can be used in these areas.

j. Physical Site Characteristics: Proximity to hydrologic features such as streams, ponds, storm drains, high water tables; and other characteristics such as high speed traffic

k. Greenhouse gas emissions

l. Politics

m. Complaints from citizens both about weeds and about pesticide use

4. **Maintenance standards for roadsides (action levels for pests on/near roadsides): This depends on the individual pest.**

   a. See 3.c. above for Fire District regulations on weeds.

   b. The Department suppresses ground squirrel populations that threaten to undermine roads. Work performed under contract with the Contra Costa County Agriculture Department.

   c. The Department tries to eradicate or control invasive weeds along County roads to reduce their spread to other properties and into sensitive habitats.

   d. The Department tries to maintain a vegetation free zone along the pavement.

   e. The Department tries to keep grass under 3 inches in height.

[1] Contra Costa Fire Protection District Minimum Weed Abatement Standards, April 2009

5. **Monitoring procedures and frequency for site**: Road related facilities are inspected at least monthly. Depending on the specific nature of the site, it could be inspected more frequently. For example, roads not treated with residual herbicides require more frequent inspection.
    a. The Vegetation Management Supervisor and his employees inspect and monitor vegetation along roads throughout the year.
    b. Road Maintenance Supervisors and their employees also monitor vegetation and report related issues to the Vegetation Management Supervisor.

B. FLOOD CONTROL CHANNELS

1. **Characterizations of Sites**
    a. 50 to 90 miles of concrete lined channels or natural creeks with engineered slopes or more or less natural slopes

2. **Overall Management Objectives**
    a. To facilitate water conveyance for flood protection
    b. To reduce fire danger to surrounding homes, structures, and habitat
    c. To prevent the establishment and spread of exotic weeds on flood control property and downstream in order to protect wildlife habitat and recreation
    d. To prevent vegetation from breaking pavement and from damaging flood control structures
    e. To facilitate inspection of facilities to detect erosion and other dangers
    f. To preserve aesthetics, e.g. some creeks have trails along them, some members of the public want the creeks to look like parks
    g. To preserve the safety of the public and of employees who work on the facilities—dense vegetation can encourage homeless encampments; rodent and ground squirrel burrows can destroy the structure (and flood control capacity) of a levee or earthen dam

3. **Factors influencing management**
    a. "Roughness": Roughness value limits are determined through engineering calculations made by the entity that built the channel, typically the Army Core of Engineers. Roughness cannot exceed a certain value in order to facilitate water conveyance at a particular facility. Concrete, rip-rap, grass, trees that are trimmed up, thick shrubs/trees all have different roughness values.
    b. Safety of employees while performing weed abatement: Management strategies must minimize worker injuries related to performing weed abatement.
    c. Window of opportunity for suppressing particular weeds: The optimum time for suppression is not the same for every weed.

d. Weed biology and ecology: These influence available and effective management strategies.
e. Weather and season: Wind, rain and the prediction of rain must be considered when herbicides are being used to prevent drift and runoff. Pre-emergent herbicides require rain to perform effectively. High heat and low humidity increase fire danger from mowing and also increase the chances of heat prostration among workers
f. Budget
g. Terrain, climate and location: These factors influence which vegetation management tools or strategies can be employed, e.g. the kind of access available to the channel, whether the slope is composed of soil or rock, the grade of the slope, whether the slope was re-vegetated, soil moisture, temperature.
h. Endangered species habitat: There are legal restrictions on the kinds of pesticides and techniques that can be used in these areas.
i. Greenhouse gas emissions: emission rates differ for each control method.

4. **Maintenance standards for site**: Most Flood Control Facilities have Operation and Maintenance Manuals developed by the entity that built the facility that spell out standards and procedures.

5. **Monitoring procedures and frequency for site:**
   a. Facilities are regularly inspected by the Vegetation Management Supervisor and the Flood Control Supervisor.
   b. Additional inspections are performed by engineering staff.
   c. Army Corp of Engineer facilities are inspected once a year by Corps staff.
   d. An in-depth inspection is conducted every 5 years.
   e. Dams are inspected once a year by the State Division of Dams.

C. AIRPORTS

1. **Characterization of Sites**
   a. Along runways and taxi ways—the width of strip varies (the airports require bare earth along the runways and taxi ways, called a Safety Zone)
   b. Around light poles and signs
   c. Along fence lines to prevent people from hiding in weeds, possibly cutting the fence

2. **Overall Management Objectives**
   a. To maintain airport safety by keeping grass and other vegetation at the right height (around 6-8 inches) to eliminate nesting habitat (too long encourages some creatures, too short encourages others). These creatures can run across runways or fly into planes.

b. To maintain good visibility and to keep weeds below lights and signs
c. To lower the risk of fire by keeping the fuel load to a minimum

3. **Factors influencing management**
   a. The airports have Wildlife Hazard Management Plans that are required by the FAA and that must be adhered to.
   b. Certain kinds of vegetation, e.g., yellow starthistle, along the edges of the runways and taxi ways can capsize small planes that sometimes drive off the pavement.
   c. The FAA mandates an asphalt maintenance program that requires cracks to be free of weeds.
   d. The control tower at Buchanan Air Field is hard to close down to perform maintenance activities.
   e. Buchanan tries to maintain a balance between vertebrate predators and prey on the field. They encourage foxes because a number of pairs can den on the property, and they keep the small vertebrates in check. They discourage coyotes because they chase away the foxes and because the one or two coyotes that would claim the area as their territory don't seem to be able to control the small vertebrates as well as the foxes.
   f. Buchanan borders a creek and creatures are naturally attracted to the area.
   g. Budget

4. **Monitoring procedures and frequency for site**: Airport personnel monitor constantly, and Vegetation Management Staff inspect the airports periodically and whenever requested by airport personnel.

III. DECISION MAKING IN THE MANAGEMENT PROCESS

A. Limitations/Factors in Decision Making Process
   1. Equipment—Inventory, condition/age, availability must be factored into management decisions.
   2. Labor-Decisions must consider the total availably of labor, seasonal availability, and availability of properly trained labor.
   3. Window of Opportunity—The effective management of a pest with a particular management technique may not extend throughout the year. The consequences of delayed treatment (e.g. problem becomes worse over time) must be considered as well.
   4. Effectiveness—This can be measured as initial control, long-term control, degree of control, etc. and is an important consideration when resources are scarce.

5. Presence of Endangered Species or their Habitat—This can limit some or all activities at a location. Some limitations are for a specific season. Some activities require special permitting and presence of a certified biologist.
6. Terrain—Steep slopes preclude the use of heavy equipment for mowing or spraying. Steep slopes are also difficult for crews with hand-held tools, and may be better suited to animal grazing for vegetation management.
7. Weather—Weather is monitored daily and its impacts on management practices are considered. Wind, rain and the prediction of rain must be considered when herbicides are being used to prevent drift and runoff. Pre-emergent herbicides require rain to perform effectively. High heat and low humidity increase fire danger from mowing and also increase the chances of heat prostration among workers.
8. Proximity of hydrologic features—Only herbicides approved for aquatic use can be applied in or very near surface water. Many laws and regulations govern the use of terrestrial herbicides near water and set the distance of buffer zones.
9. Funds—Funding available to manage the pest will limit the options for management.

B. Environmental Consequences from Management Activities
   1. Airborne particulate matter
   2. Greenhouse gas emissions
   3. Water turbidity
   4. Soil compaction in wet areas
   5. Decreased oxygen concentration in water
   6. Sediment and/or organic matter clouding water
   7. Animal feces in water or soil
   8. Oil or fuel in water or on soil
   9. Presence of pesticides in water or soil

C. Work Process—See the **Pest Management Decision Tree** (Attachment A) for a graphic representation of this process.
   1. Gather information on work locations
      a. Initial survey or inspection: what vegetation, if any, needs to be removed?
      b. Re-inspect when alterations are made to the site or facility
   2. Understand the maintenance standards for the location
      a. Standards for a particular location are based on Streets and Highway Code of California (Section 1480 to 1485), Contra Costa Ordinance Code (Section 82-18.002 to 82-18.012), California Department of Transportation *Standard Plans*, *Standard Specifications*, American

Public Works Association *Street and Highway Maintenance Manual*, Army Corps of Engineers *Operation and Maintenance Manual* (specific for each facility), and CCC Fire Protection District Abatement Standards. These standards can be found online and in the Public Works Maintenance office at 2475 Water Bird Way.

   b. Prioritize activities when funding is insufficient to meet all needs—based on hazard level (immediate hazard, short/long-term damage, consequences of inaction), regulatory requirements, etc…
   c. Be aware of and respond to public and political expectations of maintenance

3. Understand environmental regulations and restrictions for the location (see Section IV. Environmental Stewardship, for details)
4. Identify problematic species
   a. Notification from CDFA, CCC Ag Department, Alameda-Contra Costa Weed Management Area, periodicals, reference books, etc
   b. Make note of new species which spread quickly into a facility
5. Identify successful strategies for controlling or eliminating problematic species
   a. Seek advice from Weed Extension Specialists, including UC Davis
   b. Search periodicals for information
   c. Seek advice from weed managers in surrounding jurisdictions
   d. Experiment with existing control methods used on other weeds
6. Maintain strong working knowledge of available equipment, labor, and funding for the specific location and time.
   a. Compare prior year expenditures against funding for each account during the budget year
   b. Track maintenance and condition of existing equipment
   c. Request purchase of equipment when additional equipment or replacement is warranted
   d. Take into account employee vacations, sick leave, and injuries when planning activities
   e. Review historical trends for each of these areas
7. Inspect each location maintained by the Department on a regular basis to facilitate early pest detection.
   a. Yearly inspection of flood control facilities with facility sponsor (Army Corps of Engineers, National Resource Conservations Service, etc.)
   b. Daily moniroting of roads and flood control facilities on a rotating basis by the Vegetation Management Supervisor followed by daily written reports
   c. Seasonal inspections prior to start of major seasonal activities
   d. Inspections in response to public request or concern within the Department

8. When a pest is detected and is found to require control, determine which control method is effective and available from the following methods:
    a. Do Nothing: An option only if pest control is not required.
    b. Controlled Burns: Only available with Bay Area Air Quality Management District and Fire District Approval. Requires significant resources at the burn location
    c. Mowing: This can be accomplished with tractors, walk-behind mowers, and weedeaters. This is a good option where the terrain and budget allow. This option is limited by the availability of personnel to perform this activity in a timely fashion (as determined by local fire agencies and the public). The risk of accidentally starting a fire is always present when mowing. Mower blades can strike stones or other objects and create sparks that under the right conditions can ignite vegetation. The use of hand-held and walk-behind equipment significantly increases the likelihood of employee injury.
    d. Biological Control: This involves the release of an organism(s) (disease or insect) to control a weed. Biocontrols are available only for a few weed species. The County Agriculture Department has released insects in the county for the control of puncture vine and yellow starthistle with some success, but this is not a general weed control method at this time.
    e. Disking: This method is usually not suitable along roads or near flood control facilities. Disking can weaken engineered soils (levees and road shoulders) and increase silt runoff. This method may be illegal where the Alameda Whipsnake and other threatened/endangered species are found.
    f. Exclusion: This involves preventing a pest from entering a facility. It pertains, for the most part, to species new to the area.
    g. Mulching: This method uses organic mulch or special weed fabric to prevent weeds from growing.
    h. Habitat Modification: This alters the physical area to prevent a pest or eliminate the need to control a pest. This is limited by budget and by regulations depending on location and type of facility. This can involve the planting of trees or shrubs or the application of mulch to reduce light or fuel in an area, or planting selected grass or other species to reduce or eliminate the need for abatement. The Department has been using the last technique at a number of sites along roads and flood control channels with marginal success.
    i. Herbicides: This is a cost-effective method where allowed. A variety of limitations exist based on the type and location of the site or facility.

9. When more than one method is available, and more than one site requires pest control at the same time, use the more labor-intensive method where the overall cost difference is smallest.

IV. ENVIRONMENTAL STEWARDSHIP

Work within a riparian corridor, which is the jurisdiction of the California Department of Fish and Game (DFG), requires a Streambed Alteration Agreement. A Routine Maintenance Agreement (RMA) was approved in April 2011 which allows maintenance work to occur in County maintained riparian corridors but has certain restrictions and requirements. Use the **Pest Management Decision Tree Insert** (See Attachment A, sheet 2) to determine what needs to be done prior to starting work.

V. SHORT- AND LONG-RANGE PLANS FOR MANAGEMENT – Not complete yet

A. ROADSIDES

B. FLOOD CONTROL CHANNELS

C. AIRPORTS AND REAL PROPERTY

VI. RECORDS

Training: Training records are kept at 2475 Waterbird Way, Martinez.

Pesticide Use: Records by site are kept at 2475 Waterbird Way.

Pesticide Labels and MSDS Sheets: Labels are located in each vehicle and at 2475 Waterbird Way. MSDSs for those products currently used are located at each office.

VII. LICENSING REQUIREMENTS

A. Vegetation Management Supervisor: Job description requires possession of an Agricultural Pest Control Advisors License (PCA) and a Qualified Applicator Certificate (QAC). Both are issued by the Department of Pesticide Regulation. Both require successful completion of testing and ongoing continuing education in order to maintain the licenses.

B. Senior Vegetation Management Technician: This lead position has the same licensing requirements as the supervisor position.

C. Vegetation Management Technician: This position requires possession of a Qualified Applicator Certificate (QAC).

VIII. TRAINING

A. Each employee must receive a minimum of 40 hours of approved continuing education (C.E. hours) every two years to maintain their PCA license, and 20 C.E. hours to maintain their QAC license.

B. Typical training opportunities include: UC Davis Weed Day, UC Davis Weed School, the Aquatic Weed School, the annual California Weed Science Conference, and training opportunities specifically targeted toward non-crop weed control.

C. Employees receive a yearly training on pesticide safety geared specifically toward the products we use and the sites we maintain.

D. Employees receive training on the safe use of power equipment- chain saws, pole pruners, brush cutters, push mowers, and tractor-mounted mowers.

E. Employees receive environmental awareness training that includes BMPs to prevent spread of noxious weeds

IX. EMERGENCIES

Definition of an Emergency: An emergency could be a fire, flooding, or high liability vehicle accident/personal injury.

A weed emergency would be the discovery of a high priority invasive weed new to our county or a facility.

Protocol for Handling an Emergency: We notify the CCC Agriculture Department (to confirm species and to alert them and the State) and then work in coordination with the Ag Department. When we first found purple loosestrife, the Board of Supervisors was alerted, and we had personnel go door-to-door passing out pamphlets describing the weed. Back yards along the creek were inspected/searched for the "mother plant", which was never located. We inspected the creek frequently for more plants. All plants that were located were removed or treated, and we continue to monitor for loosestrife, and any other invasive weeds.

X. PUBLIC EDUCATION AND OUTREACH

The Department performs outreach and education primarily through the County Clean Water Program. Vegetation Management staff also answer questions from the public regarding vegetation management issues.

XI. MANAGEMENT PROCEDURES

A. MANAGEMENT PROCEDURES FOR ROADSIDES

1. Trimming trees, shrubs, and other vegetation

   These operations generally take place in late fall through early spring, but can occur at any time in order to maintain public safety. Crews remove vegetation that obscures regulatory and warning

signs along roads and remove any line of sight or overhead hazards that make it difficult to see other vehicles as well as pedestrians and cyclists.

2. Mowing weeds using tractor mowers, push mowers, and weed wackers,
   These operations generally take place after the rainy season usually starting in May or June with the goal of finishing before July 4th. The weeds are cut to reduce fire hazard and maintain safe sight distances.
3. Application of pre-emergent herbicides on non-paved roadside shoulders
   The majority of these non-paved shoulders are treated beginning in late fall or early winter to prevent the growth of annual weeds that will pose a fire hazard. This operation usually reduces the total herbicide used in a year by decreasing the number of contact herbicide applications that would otherwise be required.
4. Spot-spraying of contact herbicides as needed
   These application can be made at any time of year but are generally made in early spring through early fall, depending on the species of weed present. The Vegetation Management Supervisor determines herbicide selection and timing of application.
5. Good stewardship of pesticides and adherence to laws and regulations
   Herbicides are rotated according to their mode of action to help prevent the selection of resistant biotypes. The Department regularly monitors for any signs of resistance. Special care is taken to identify endangered species habitat and abide by all restrictions. The Department has also identified other sensitive areas, such as near reservoirs, where residual herbicides are not used. All herbicide applications are made based on a written recommendation, and all state and federal laws and regulations are followed.
6. Investigation of and experimentation with new techniques and technologies
   Through research, workshops and networking, the Vegetation Management Supervisor continually investigates new and innovative weed and vertebrate management techniques, alternate herbicides, and new technologies, such as those that can increase the precision of herbicide application or data collection. These are screened for practicality, efficacy, and cost, and where feasible, are field tested.

List of pesticides appropriate to the site (Note: list is under development)

B. MANAGEMENT PROCEDURES FOR FLOOD CONTROL CHANNELS

1. Trimming trees, shrubs, and other vegetation.

Crews use hand held brush cutters, chain saws, pole pruners and other power equipment to remove vegetation that might impede the flow of water.

2. Mowing weeds using tractor mowers, push mowers, and weed wackers.
3. These operations generally take place after the rainy season usually starting in May or June with the goal of finishing before July 4th. The weeds are cut to reduce fire hazard. Manual ditch cleaning to remove cattails and other growth at the bottom of channels.
4. Herbicide spraying for cattails growing in channels.
5. Application of pre-emergent herbicides to flood control access roads.
   Applications begin in late fall or early winter to prevent the growth of annual weeds that will pose a fire hazard. This operation usually reduces the total herbicide used in a year by decreasing the number of contact herbicide applications that would otherwise be required.
6. Spot-spraying of contact herbicides as needed on access roads in summer to control persistent weeds.
7. Spraying stream-banks with herbicides to limit weed growth.
   This is done to retard the height of stream-bank vegetation and inhibit growth of broadleaf vegetation. Through experimentation and experience our crews have discovered that applying a highly diluted herbicide mixture can limit the growth of certain vegetation. This "chemical mowing" allows for desirable grasses to grow along the stream banks to prevent erosion and prevents the growth of undesirable vegetation. Stream-banks are typically treated from December to early April.
8. Good stewardship of pesticides and adherence to laws and regulations.
   Herbicides are rotated according to their mode of action to help prevent the selection of resistant biotypes. The Department regularly monitors for any signs of resistance. Special care is taken to identify endangered species habitat and abide by all restrictions. All herbicide applications are made based on a written recommendation, and all state and federal laws and regulations are followed.
9. Investigation of and experimentation with new techniques and technologies.
   Through research, workshops and networking, the Vegetation Management Supervisor continually investigates new and innovative weed and vertebrate management techniques, alternate herbicides, and new technologies, such as those that can increase the precision of herbicide application or data collection. These are screened for practicality, efficacy, and cost, and where feasible, are field tested.

   The Department is currently conducting a three-year grazing study on flood control facilities (2011 through 2014). Data will be collected to assess the costs and effectiveness of goats and

sheep and potential impacts associated with using grazing flood control channels. Informal grazing trials are being conducted at other sites around the County to determine costs and effectiveness at a variety of locations.

List of pesticides appropriate to the site (Note: list is under development)

C. MANAGEMENT PROCEDURES FOR AIRPORTS

1. Mowing and hand abating weeds
   Airport personnel mow their property twice a year to keep vegetation between 6" and 8".
2. Crack sealing
   This is contracted out and is part of the FAA mandated Asphalt Maintenance Program
3. Spot spraying with pre- and post-emergent herbicides, as needed
   The Department provides this service as needed to the airports
4. Good stewardship of pesticides and adherence to laws and regulations
   Herbicides are rotated according to their mode of action to help prevent the selection of resistant biotypes. The Department regularly monitors for any signs of resistance. Special care is taken to identify endangered species habitat and abide by all restrictions. All herbicide applications are made based on a written recommendation, and all state and federal laws and regulations are followed.
5. Investigation of and experimentation with new techniques and technologies
   Through research, workshops and networking, the Vegetation Management Supervisor continually investigates new and innovative weed and vertebrate management techniques, alternate herbicides, and new technologies, such as those that can increase the precision of herbicide application or data collection. These are screened for practicality, efficacy, and cost, and where feasible, are field tested.

List of pesticides appropriate to the site (Note: list is under development)

XII. CHARACTERIZATION OF KEY PESTS AND MANAGEMENT METHODS (not complete)

A. KEY PESTS OF ROADSIDES

***Brassica* spp. (mustards)**

1. Ecology: Broadleaf, winter or summer annuals, sometimes biennials; 1 to 3 feet tall; grow profusely and produce allelopathic chemicals that prevent germination of other plants. California

Invasive Plant Council (Cal-IPC) rates *Brassica nigra* (black mustard) as "moderate" for invasiveness.

2. Related management factors: Dry stands of mustard are a fire hazard.
3. List of potential management strategies:
    a. Mowing
    b. Application of selective herbicides
    c. Doing nothing
4. Current control methods: Application of selective herbicide
5. What has been tried: Mowing, herbicide
6. What alternatives have been rejected and why:
    a. Mowing does not kill the plant; it re-grows.
    b. In areas where this weed constitutes a problem, it is not feasible to do nothing.

***Conyza canadensis* (horseweed, marestail)**

1. Ecology: Broadleaf, summer annual or biennial; blooms from June through September; 6 ½ to 10 feet tall; reproduction by seed; native of North American grasslands and is common in ditch banks, canal banks, along roadsides and in waste areas. It establishes in areas where the natural vegetation has been disturbed. During wet years it may be found on hillsides of coastal sage scrub. It is a strong competitor for water and grows rapidly.
2. Related management factors: Invasive weed; grows along pavement edge damaging asphalt
3. List of potential management strategies:
    a. Mowing
    b. Disking or cultivating
    c. Application of selective herbicides
    d. Doing nothing
4. Current control methods: Application of selective herbicide
5. What has been tried: Mowing, herbicide
6. What alternatives have been rejected and why:
    a. Mowing does not kill the plant and can actually stimulate growth.
    b. Cultivating and disking have been rejected due to the high expense and difficulty of performing such an operation along roads and other structures.

c. In areas where this weed constitutes a problem, it is not feasible to do nothing.

***Salsola tragus (=S. iberica)* (Russian thistle, tumble weed)**

1. Ecology: Broadleaf, summer annual, 1 to 3 feet tall, very branched and round in shape, can be up to 5 feet wide. Plant is soft and succulent at first, but it becomes rigid and spiny with maturity. It flowers July to October and reproduces from seed. When it is mature, it pulls free of the soil and blows away, hence the name "tumbleweed." This is how the seed is spread.

   Russian thistle is found in fields, overgrazed pastures, roadsides, waste places, and disturbed sites. It does best on high, dry land if other plants are not crowding it. Russian thistle is quite drought resistant, and is found on nearly all soil types. It is salt resistant, so it does grow well on alkali soils. California Invasive Plant Council (Cal-IPC) rates it as “limited” for invasiveness.

   Russian thistle is sometimes harvested for hay and silage. Russian thistle hay is credited with saving the beef cattle industry in Canada and the United States during the Dust Bowl era, when conventional hay crops failed and no other feed was available for starving animals.

2. Related management factors: Russian-thistle can impede traffic, create fire hazards, and is a host of the beet leaf-hopper, an agricultural insect pest.

3. List of potential management strategies:

   a. Do nothing

4. Current control methods: Application of selective herbicide

5. What has been tried:

6. What alternatives have been rejected and why:

***Rubus armeniacus* (blackberry, Himalayan blackberry)**

1. Ecology: This perennial shrubby vine forms mounds up to10 feet tall, with arching or trailing, thorny stems that become woody and reach up to 40 feet long. These areas are often impenetrable. It is common in riparian woodlands, disturbed open areas, and along streams. It can spread vegetatively by rooting from the cane tips or from nodes along the canes, from rhizomes or root fragments, and from the root crown. Seeds are viable and tend to be dispersed by mammals or birds whose digestive tracts scarify the hard seed coating and promote germination.

Seeds germinate in the spring and fall, but can remain viable for several years. An individual plant can live 25 years.

Once established, the plant's dense mounds displace native vegetation by shading out light. Himalayan blackberry reduces access to water for wildlife, degrades pasture, and can impede recreation in natural areas. California Invasive Plant Council (Cal-IPC) rates it as "high" for invasiveness.

2. Related management factors: The build-up of dead canes and abundant leaf litter gradually increases the risk of fire.
3. List of potential management strategies:
4. Current control methods: Application of selective herbicide
5. What has been tried:
6. What alternatives have been rejected and why:

Bermuda Grass

Fleabane

Wild Oats

Ripgut Brome

French Broom

Scotch Broom

Italian Thistle

Milk Thistle

Pampas Grass

Tobacco Tree

Yellow Starthistle

***Toxicodendron diversilobum* (poison oak)**

B. KEY PESTS OF FLOOD CONTROL CHANNELS

***Brassica* spp. (mustards)**

1. Ecology: Broadleaf, winter or summer annuals, sometimes biennials; 1 to 3 feet tall; grow profusely and produce allelopathic chemicals that prevent germination of other plants. California Invasive Plant Council (Cal-IPC) rates *Brassica nigra* (black mustard) as "moderate" for invasiveness.
2. Related management factors: Dry stands of mustard are a fire hazard. Tall mustard increases the roughness coefficient of flood control channels and can impede flow.
3. List of potential management strategies:
    a. Mowing
    b. Application of selective herbicides
    c. Doing nothing
4. Current control methods: Application of selective herbicide
5. What has been tried: Mowing, herbicide
6. What alternatives have been rejected and why:
    a. Mowing does not kill the plant; it re-grows.

In areas where this weed constitutes a problem, it is not feasible to do nothing.

***Tamarisk ramosissima* (salt cedar)**

***Toxicodendron diversilobum* (poison oak)**

***Hedera helix* (English Ivy)**

***Typha latifolia* (Common Cattail)**

***Arundo donax* (giant reed, reed bamboo)**

***Ludwigia peploides* (creeping waterprimrose)**

***Lythrum salicaria* (Purple loosestrife)**

***Iris pseudacorus* (yellowflag iris)**

***Sesbania punicea* (red sesbania, rattlebush)**

***Lepidium latifolium* (perennial pepperweed)**

Unwanted Trees (Willows, Poplars, Olives, Palms,)

Cocklebur