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Study 249 Appendix

Monitoring Sites and Sample Collection Schedule for Urban Areas in Northern California

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1 INTRODUCTION

The California Department of Pesticide Regulation (CDPR) has recently initiated a statewide urban monitoring program, Study 249 (He, 2008a). The Study 249 protocol serves as a general guideline for the monitoring project, in which details about specific monitoring sites were not provided. Thus, the protocol provides information on the need for urban sampling, goals and objectives of the study, total number of sampling sites, and laboratory analysis but gives no details on site selection, site description, or when samples would be collected. Therefore, it is the purpose of this document is to:

- Provide information about the sampling sites;
- Give rationale for sampling dates (both stormwater and baseflow sampling);

This document will only discuss the Northern California (NCA) portion of CDPR Study 249.

2 SITE SELECTION

2.1 Criteria for site selection

The criteria listed in the study protocol were used as the basis for selecting sites in NCA. Foremost, selected sites had to fit the model described in the protocol: two or three stormdrain outfalls that drain into a receiving water. Receiving water is defined as any waterbody that receives runoff discharges from stormdrains. Safety and accessibility were critical; other important criteria were:

- Minimal agricultural inputs of target pesticide[1] inputs in the catchment area;
- Stormdrain catchment area with greater than 200 residences or light businesses;
- Likely to have flow during the dry season;
- Historical water quality data available;
- Ecological importance of receiving waters.

By collaborating with local agencies (Table 1) and site reconnaissance, numerous potential sites in the Sacramento and San Francisco Bay areas were investigated. Three receiving waters with

[1]pesticides to be analyzed in Study 249

associated stormdrains were selected as they fit the stormdrain/receiving water model. In addition, the three areas had large residential coverage and minimal agricultural inputs, as well as other important factors (Table 2). The selected monitoring areas are:

1. Pleasant Grove Creek (Roseville);
2. Grayson Creek (Martinez);
3. Martin Canyon/Koopman Canyon Creek (Dublin).

Maps of the monitoring sites can be found in Appendix I.

Table 1. Agencies contacted to assist with site selection in NCA.

Agency	Contact Person
California Stormwater Quality Association (CASQA)	Pesticide Subcommittee
Urban Pesticides Pollution Prevention Project (UP3 Project)	Kelly Moran
Central Valley Regional Water Quality Control Board	Robert Holmes[1]
Alameda County Public Works Agency, Clean Water Division	Arleen Feng, Jim Scanlin
Sacramento County Department of Water Resouces	David Tamayo
Contra Costa County Public Works - Contra Costa Clean Water Program	Jamison Crosby
San Francisco Regional Water Quality Control Board	Janet O'Hara
City of Palo Alto	Brad Eggleston
Zone 7 Water Agency	David Lunn, Gerald Gates

[1]Current agency: California Department of Fish and Game, Water Branch, Instream Flow Progam

Table 2. Details of sampling sites selected for Study 249 NCA. See Appendixes II and III for further details.

Site ID*	Waterbody Type	Agricul-tural Inputs**	Number of Residences (approximate)	Dry Season Flow	Historical Data Available	Ecological Importance
Pleasant Grove Creek, Roseville (Placer County)						
PGC010	Stormdrain	None	250 homes	Likely	No	Drains into the Sacramento River
PGC020	Stormdrain	None	450 homes	Likely	No	
PGC030	Stormdrain	None	300 homes	Likely	Yes	
PGC040	Receiving Water	None		Yes	Yes	
Grayson Creek, Martinez (Contra Costa County)						
GRY010	Stormdrain	None	600 homes	Yes	No	Drains into Grayson Creek and Suisun Bay
GRY020	Stormdrain	None	1200 homes	Yes	No	
GRY030	Receiving Water	None		Yes	Yes	Drains into Suisun Bay
Martin Canyon/Koopman Canyon Creek, Dublin (Alameda County)						
MCC010	Stormdrain	None	1300 homes	Likely	No	Drains into the Martin Canyon Creek and San Francisco Bay
MCC020	Stormdrain	None	650 homes	Yes	No	
MCC030	Stormdrain	None	450 homes, (and 50% light business)	Yes	No	
MCC040	Receiving Water	None		Yes	No	Drains into the San Francisco Bay

* See Appendix II for further details

** See Appendix III for further details

2.2 Agricultural Inputs

In Study 249, water samples will be analyzed for 22 insecticides, 19 herbicides, and 11 pesticide degradates. In addition, sediment samples will be analyzed for 11 pyrethroid insecticides. Many of these pesticides have agricultural uses. Of all the criteria to select urban sampling sites, minimal agricultural pesticide inputs in the urban area is probably most important. To determine if these pesticides, when detected, are solely from urban inputs and not from agricultural use, it is critical to determine if any agricultural inputs contribute to the selected urban watersheds. The CDPR Pesticide Use Report (PUR) database (CDPR, 2008) reports non-residential pesticide uses in the state of California. Agricultural uses are reported within a one mile squared area.

The PUR database was accessed to determine if any agricultural inputs were made into the watersheds of Pleasant Grove, Grayson, and Martin Canyon Creeks. After analyzing the data, no target pesticides were reported for agricultural use in the catchment areas of these creeks in 2006 or 2007 (Appendix III). Detected pesticides from the water and sediment samples collected for Study 249 in NCA are apt to be from urban applications.

3 SAMPLE TIMING

Study 249 protocol states that there will be three storm events and three non-storm baseflow events. Sample collection will be targeted to maximize pesticide detections. Presuming that high urban pesticide use will likely lead to high pesticide concentrations in irrigation or stormwater runoff, the PUR database was analyzed to predict peak urban pesticide use based on historical data.

Urban pesticide use includes structural pest control, landscape maintenance, rights of way, public health protection, and residential home and garden use (He, 2008a). All, except for residential home and garden use, are reported in the CDPR PUR database. Residential home users are not required to report their pesticide use. Pesticides used in landscape maintenance and rights of way may have higher potential for ending up in urban creeks and streams, and landscape maintenance applications most likely mimic residential home and garden use, a primary target of Study 249. Therefore, landscape maintenance applications were mainly used to predict when sampling should take place in NCA. The PUR data were reviewed for Alameda, Contra Costa, Sacramento, and Placer Counties (areas of monitoring) for years 2005 - 2007. Both Sacramento and Placer Counties were included as being in the “Sacramento Area” because of Roseville’s proximity to Sacramento County.

When analyzing the PUR data for best targeted sample timings, three other factors were considered:

1. All three creeks will be sampled on two consecutive days (sample collection for the three creeks will take two days). Therefore, the PUR data from all four counties were totaled and averaged for the three years.
2. Herbicide applications were reviewed separately from insecticides. Insecticides were separated into pyrethroids (for collecting sediment samples) and to all other insecticides (organophosphates, carbamates, fipronil [for collecting water samples]).
3. We will attempt to collect water samples for both herbicide and insecticide analysis at the same time if the data indicates high previous monthly use for both. However, if the data indicates otherwise, samples may be collected at different sampling times.

Using the PUR data for landscape maintenance, the sample timings have been determined and are discussed in sections 3.1, 3.2, and 3.3 for storm event sampling, baseflow water sampling, and baseflow sediment sampling, respectively (see Appendix IV)

3.1 Storm event water sampling

Stormwater sampling will occur in the 2009 water year as no stormwater samples were collected in the 2008 water year. Ideally, stormwater sampling should match storm events after high herbicide and insecticide use. Decisions about the optimal times for stormwater sampling were based on the PUR data. These decisions were driven by herbicide use data, which were applied in the thousands of pounds per acre compared to insecticides that were applied in the hundreds of pounds per acre (see Appendix IV). The PUR data for pyrethroids were reviewed separately from the other insecticide data and not used to determine sample timings. Pyrethroids will be analyzed for sediment samples only, which will not be collected during storm events.

Perusing the PUR data, stormwater sampling would take place from November through March. The optimal stormwater sampling would likely occur at the following timings (also see Table 3):

1) First storm in mid to late November or early December;
2) Late January or early February; and
3) Late February or early March.

Study 249 protocol indicates that stormwater samples will be taken during the first major storm of the 2009 water year (with QPF's[2] equal to or greater than 0.3 inch and a 15-day antecedent dry period; He, 2008a; He, 2008b). From the PUR data, the best predicted first storm timing would be in late November or early December. If the first major storm of the 2009 water year strikes earlier, we may need to adjust the timings for stormwater sampling.

[2]QPF is the National Weather Service's Quantitative Precipitation Forecasts; see http://www.hpc.ncep.noaa.gov/qpf/qpf2.shtml

Table 3. Projected stormwater sample timings. Timings were selected to best accommodate sampling for herbicides and insecticides at the same sampling date, if possible. See Figures 7 and 8 (Appendix IV) for more information. Only three storm events will be collected.

Storm season, highest herbicide use month*	Projected sampling months (based on storm events)	Storm season, highest insecticide use month**	Projected sampling months
February	Late February or early March storm	February	March storm (early)
March	Late March storm	March	March storm (late)
November	Late November or December storm	January	February
January	Late January or February storm		

*Average 2005 – 2007, in order of highest use to lower use.

**Does not include pyrethroid insecticides.

3.2 Baseflow water sampling

To optimize the detections of target pesticides, baseflow sampling should consider the following two factors: 1) herbicide and insecticide (not pyrethroids) use, and 2) irrigation patterns (high pesticides use with no irrigation will not likely allow for pesticide runoff). In a dry year, irrigation can begin as soon as winter storms ebb. In 2008, irrigation started in March due to lack of spring storms. For this study, high irrigation use is expected from April through September and baseflow sample timings are selected during this period. Baseflow sampling will occur in April, May, June, and August (Table 4). Based on the PUR data, water samples for herbicide analysis will be collected in May whereas water samples for insecticide analysis will be collected in August (Figure 7 and 8, Appendix IV). Water samples for both herbicide and insecticide analysis will be collected in April and June.

3.3 Baseflow sediment sampling

Sediments will only be sampled once in Study 249. In urban environments, pyrethroids tend to be applied in the warmer months of the year, with applications peaking between June through August (Figure 9 in Appendix IV). Ideally, sediment would be collected between late August to early September as a target date, with sample collection occurring prior to creeks drying up in late summer. Sediment sampling will be targeted for August; for logistics, they will be collected with the August insecticide water samples.

Table 4. Baseflow sample timings. Timings were selected to best accommodate sampling for herbicides and insecticides at the same sampling date, if possible. See Figures 4 and 5 (Appendix IV) for more information.

Baseflow, highest herbicide use month*	Projected sampling months**	Baseflow, highest insecticide use month***	Projected sampling months
April	May (collected May 27, 28 2008)	June	Late June or early July (collected June 23, 24 2008)
March	April (collected April 21, 22 2008)	April	April (collected April 21, 22 2008)
May	June (collected June 23, 24 2008)	July	August
		May	June (collected June 23, 24 2008)

*Average 2005 – 2007, in order of highest use to lowest use.

**Some sampling occurred prior to the completion of this document.

***Does not include pyrethroid insecticides.

4 REFERENCES

CDPR 2008. California Department of Pesticide Regulation's Pesticide Information Portal, Pesticide Use Report (PUR) data. Accessed at http://calpip.cdpr.ca.gov/cfdocs/calpip/prod/main.cfm on May 9, 2008.

Contra Costa Watershed Forum, 2008. Contra Costa Watershed Atlas. Accessed at http://cocowaterweb.org/resources/ccwf-publications/watershed-atlas on June 3, 2008.

He, Li-Ming. 2008a. Study 249. Statewide Urban Pesticide Use and Water Quality Monitoring. Accessed at http://www.cdpr.ca.gov/docs/emon/pubs/protocol.htm on March 19, 2008.

He, Li-Ming. 2008b. Statewide Urban Pesticide Use and Water Quality Monitoring. Sampling and Analysis Plan, in preparation.

Placer County, 2006. Community Development Resource Agency. Assessed at http://www.placer.ca.gov/departments/communitydevelopment/planning/placerlegacy/pgcc.aspx and at http://www.placer.ca.gov/upload/cdr/planning/pgcc/section6.pdf on June 3, 2008.

Appendix I. Monitoring Site Locations in NCA

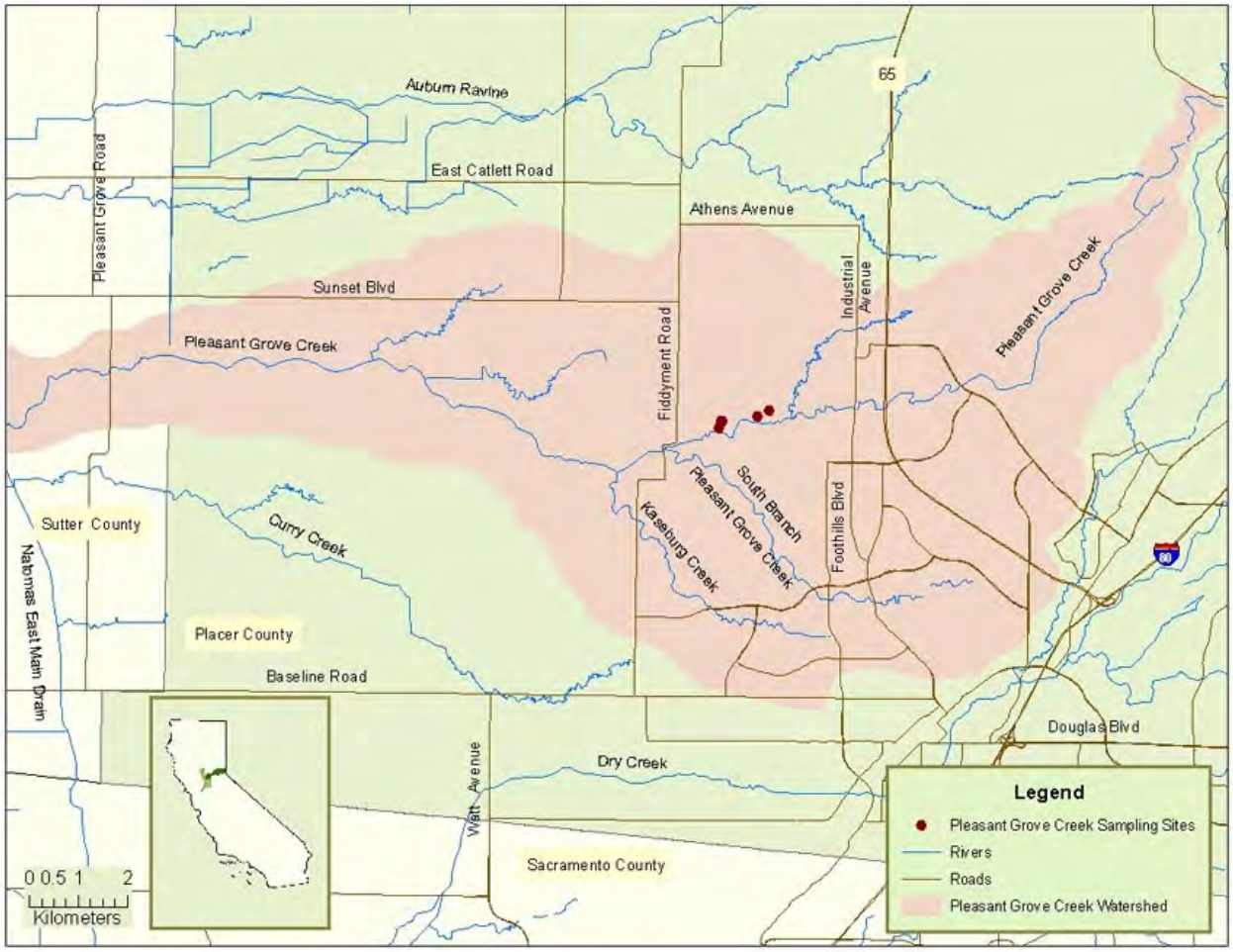

Figure 1. Monitoring sites and watershed of Pleasant Grove Creek in Roseville, CA. Watershed area is approximate. (Placer County, 2006).

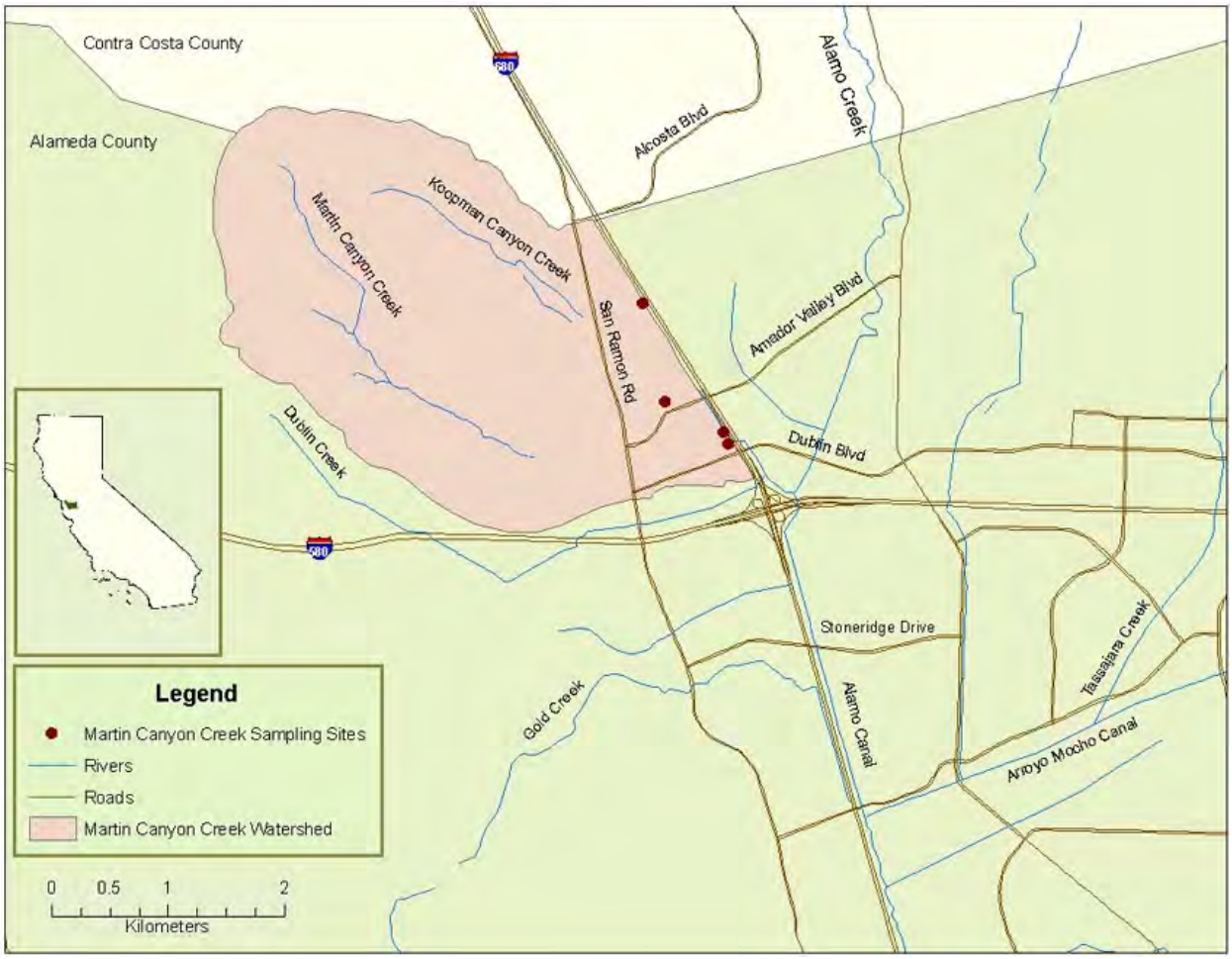

Figure 2. Monitoring sites and watershed of Martin Canyon/Koopman Canyon Creek in Dublin, CA. Watershed area is approximate.

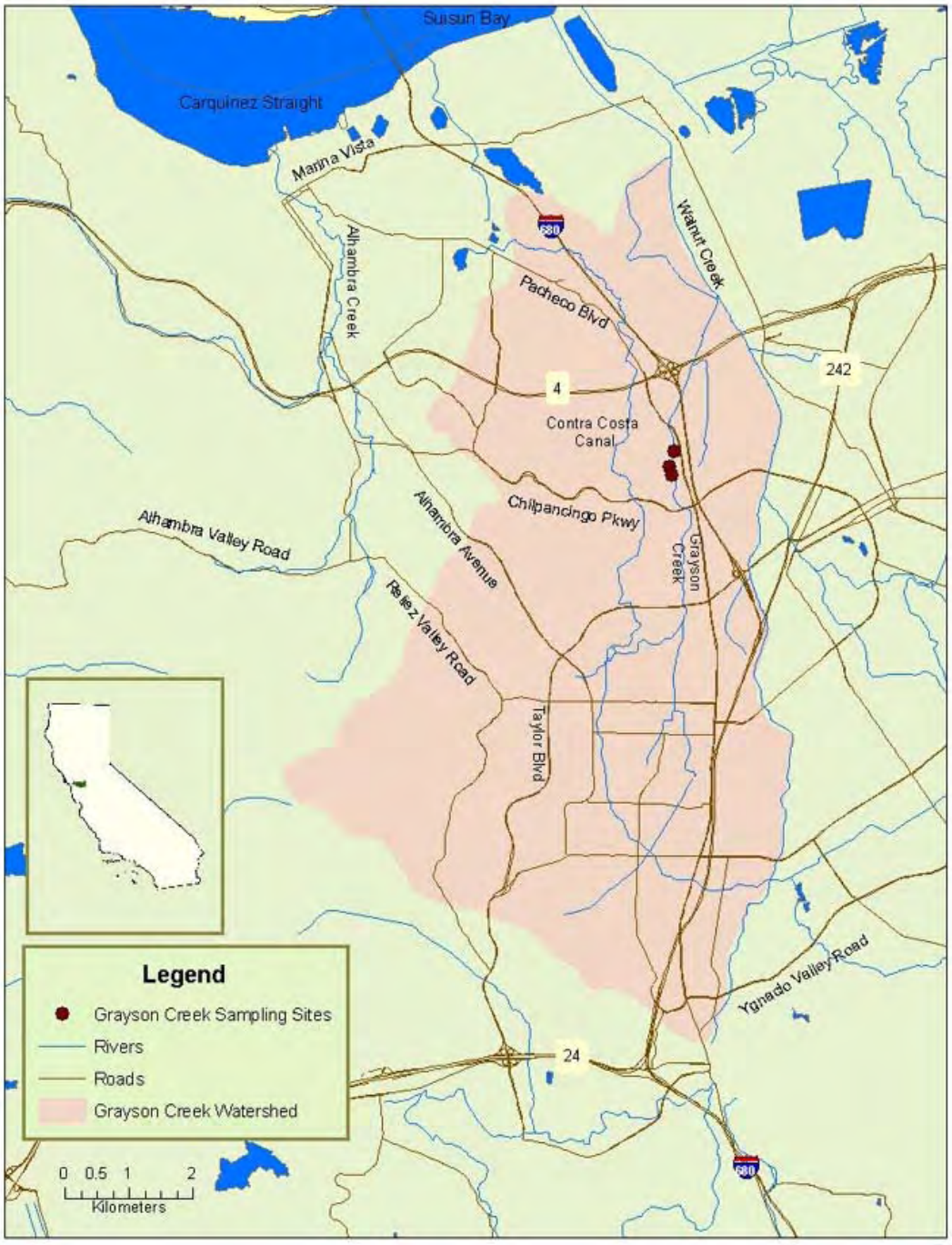

Figure 3. Monitoring sites and watershed of Grayson Creek in Martinez, CA. Watershed area is approximate (Contra Costa Watershed Forum, 2008).

Appendix II. Characteristics of the Sampling Sites in NCA

Pleasant Grove Creek, Roseville (Placer County)

Site ID	Site Address/Location	GPS Coordinates (NAD83)	Site type	Stormdrain Area (approximate)*
PGC010	1432 Diamond Woods Circle at Dr. Paul J. Dugan Park	38.80477 -121.32733	Stormdrain	50 acres
PGC020	Intersection of Opal Drive and Northpark Drive	38.80232 -121.33855	Stormdrain	150 acres
PGC030	Pleasant Grove Creek at Crocker Ranch Road	38.79908 -121.34698	Stormdrain	85 acres
PGC040	Pleasant Grove Creek at Veterans Memorial Park	38.79857 -121.34802	Receiving Water	

Martin Canyon/Koopman Canyon Creek, Dublin (Alameda County)

Site ID	Site Address/Location	GPS Coordinates (NAD83)	Site type	Stormdrain Area (approximate)*
MCC010	7494 Donohue Drive by Fire Station	37.70922 -121.93335	Stormdrain	500 acres
MCC020	7612 Millbrook Ave at end of cul-de-sac	37.71668 -121.93524	Stormdrain	225 acres
MCC030	I-680 between Dublin Boulevard and Amador Valley Road	37.70686 -121.92711	Stormdrain	290 acres
MCC040		37.70593 -121.92658	Receiving Water	

Grayson Creek, Martinez (Contra Costa County)

Site ID	Site Address/Location	GPS Coordinates (NAD83)	Site type	Stormdrain Area (approximate)*
GRY010	Shadowood Park between Chilpancingo Parkway and 2nd Avenue South	37.97967 -122.06878	Stormdrain	320 acres
GRY020	2nd Avenue South and Blackwood Drive	37.98097 -122.06929	Stormdrain	670 acres
GRY030	Center Avenue between Pacheco Boulevard and Aspen Drive	37.98330 -122.06835	Receiving Water	

*The following people were of great help by supplying stormdrain maps or information of their respective areas:

Contact Person	Contact Agency
Mark Boucher, Jamison Crosby	Contra Costa County
Mark Queipo	City of Roseville
Rusty Wynn	City of Pleasanton
Erin Lamberger	City of Dublin
Eric Ramos	City of San Ramon Engineering

Appendix III. CDPR PUR Data for the Sampling Sites

The figures below show agriculture pesticide inputs for Pleasant Grove, Grayson, and Martin Canyon Creeks. All pesticides were grouped together to obtain a view of the total pesticide inputs in the respective creeks. Data is shown for 2006 and 2007. Sampling areas in all figures are indicated by the symbol ● .

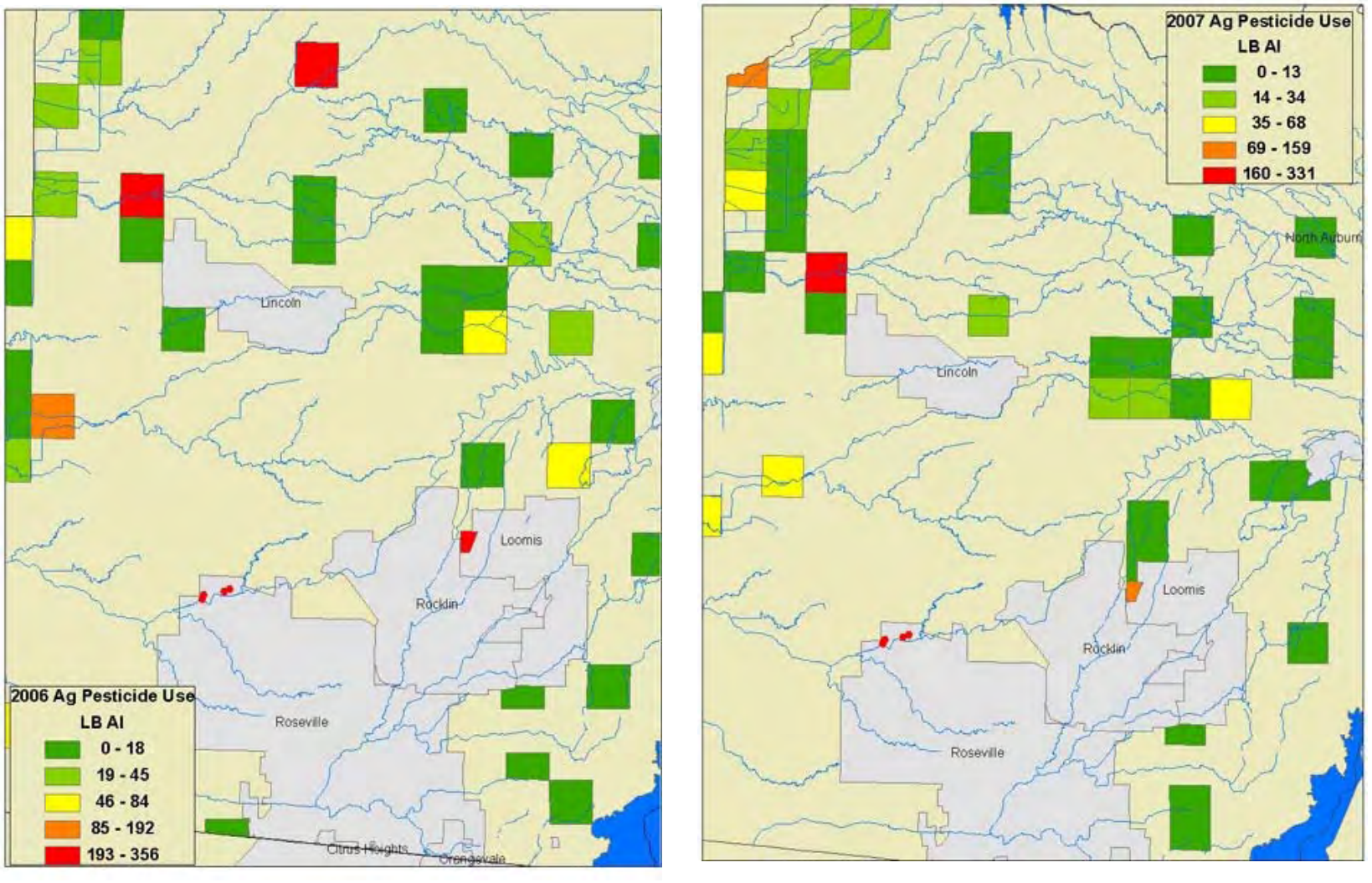

Figure 4. Reported agricultural pesticide use in 2006 and 2007 for the Roseville sampling area (Pleasant Grove Creek). Sampling sites are indicated by the symbol ● .

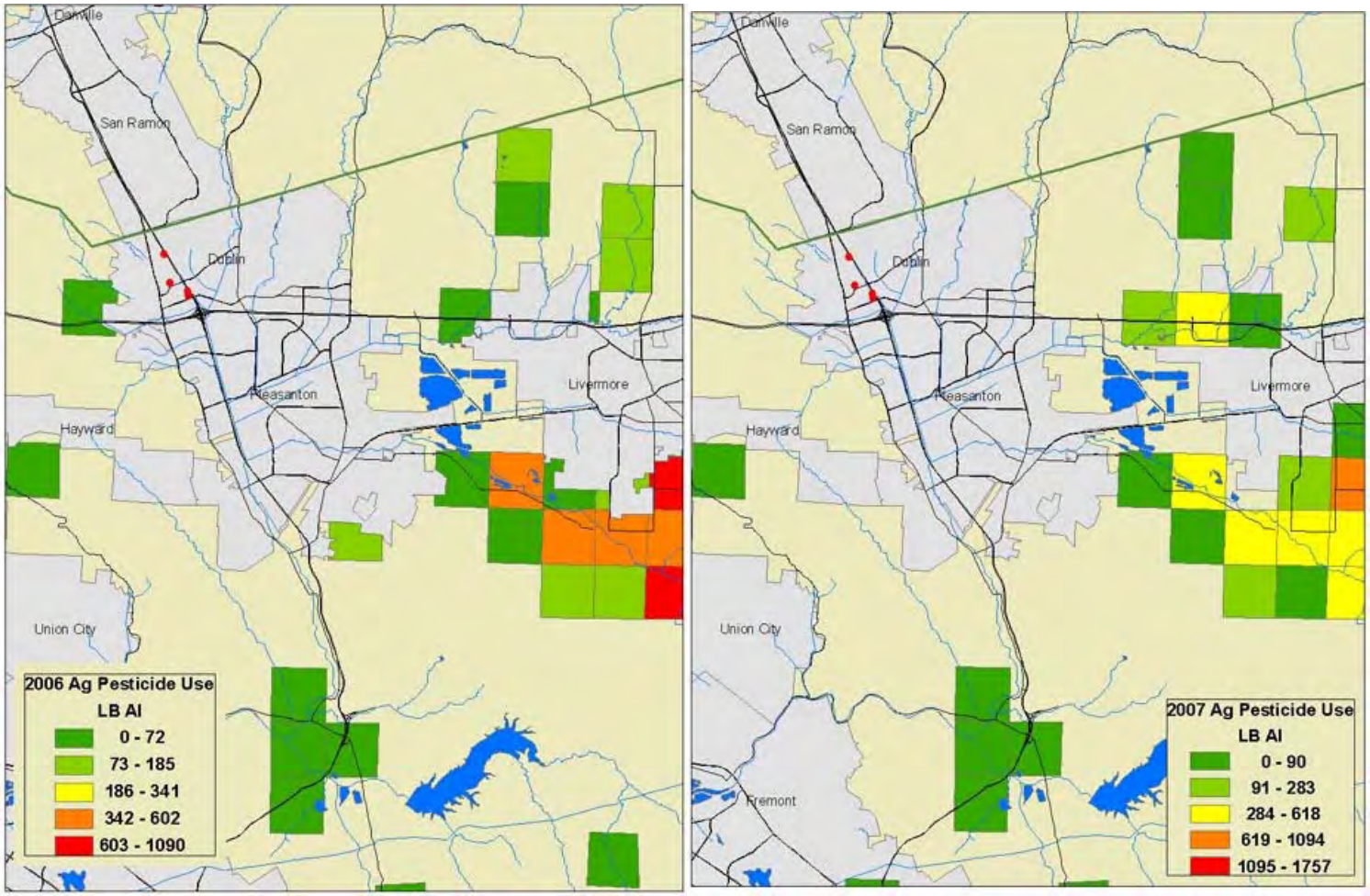

Figure 5. Reported agricultural pesticide use in 2006 and 2007 for the Dublin sampling area (Martin Canyon Creek). Sampling sites are indicated by the symbol ● .

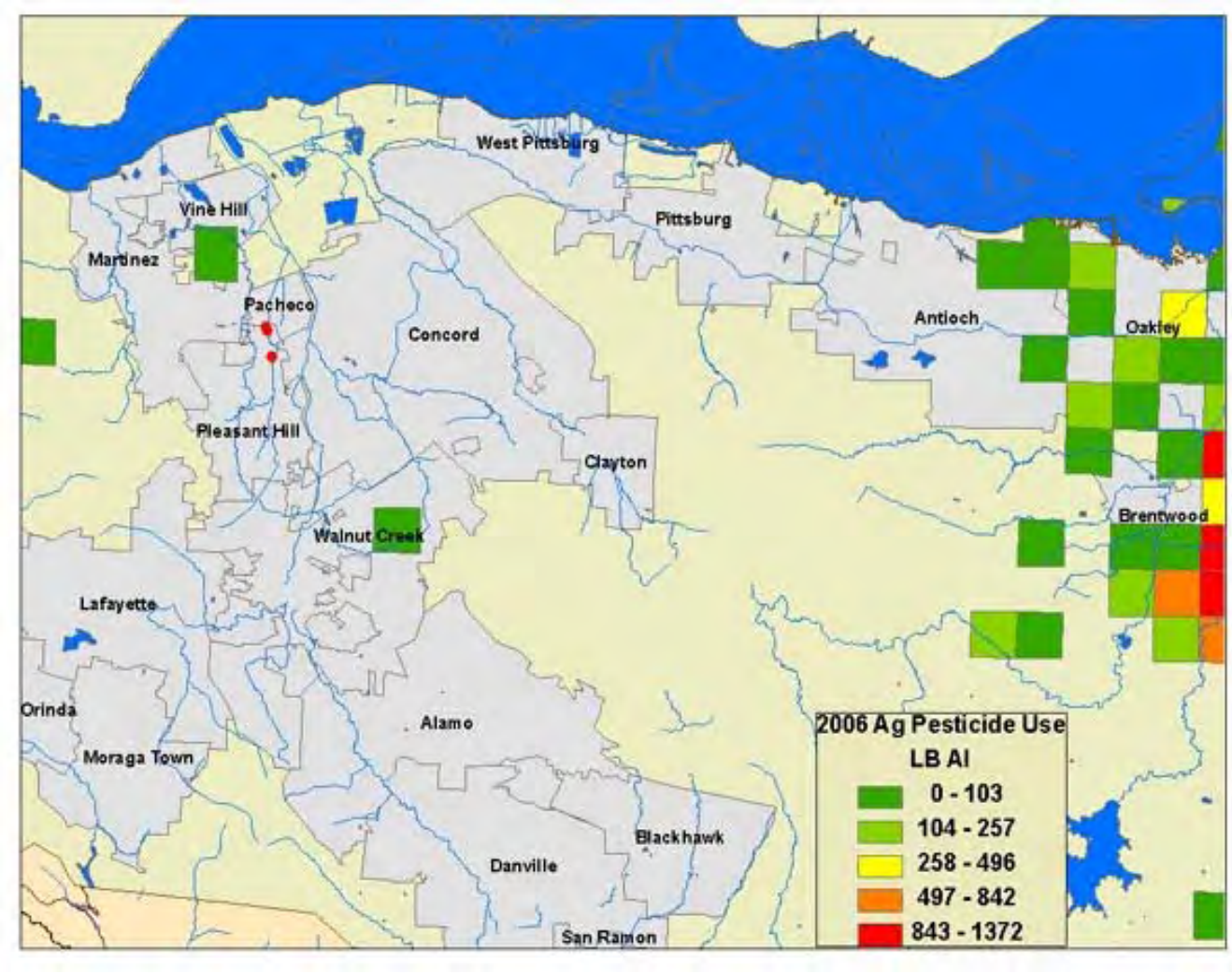

Figure 6a. Reported agricultural pesticide use in 2006 for the Martinez sampling area (Grayson Creek). Sampling sites are indicated by the symbol ●.

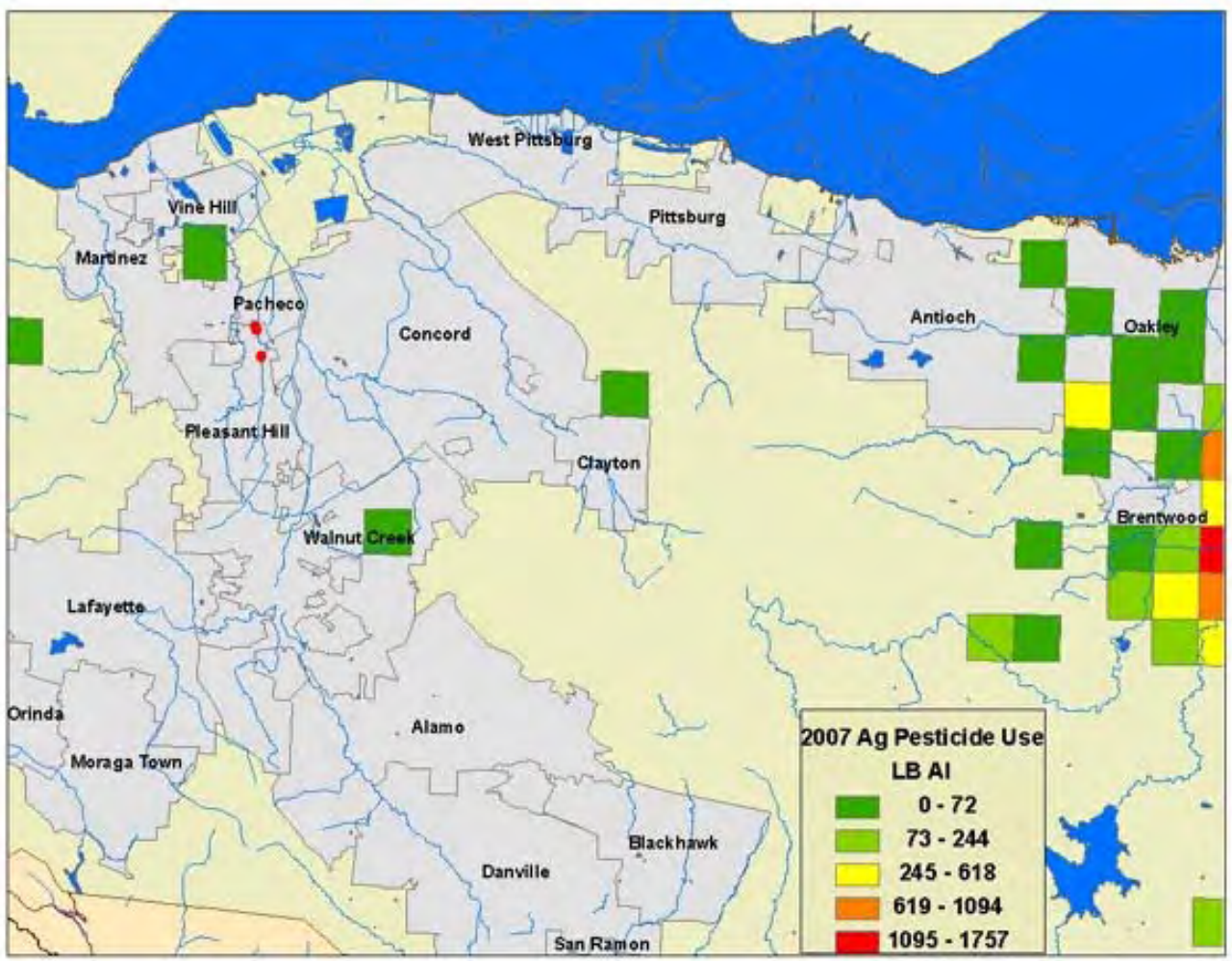

Figure 6b. Reported agricultural pesticide use in 2007 for the Martinez sampling area (Grayson Creek). Sampling sites are indicated by the symbol ● .

Appendix IV. PUR Data Used to Determine Sampling Schedules for NCA

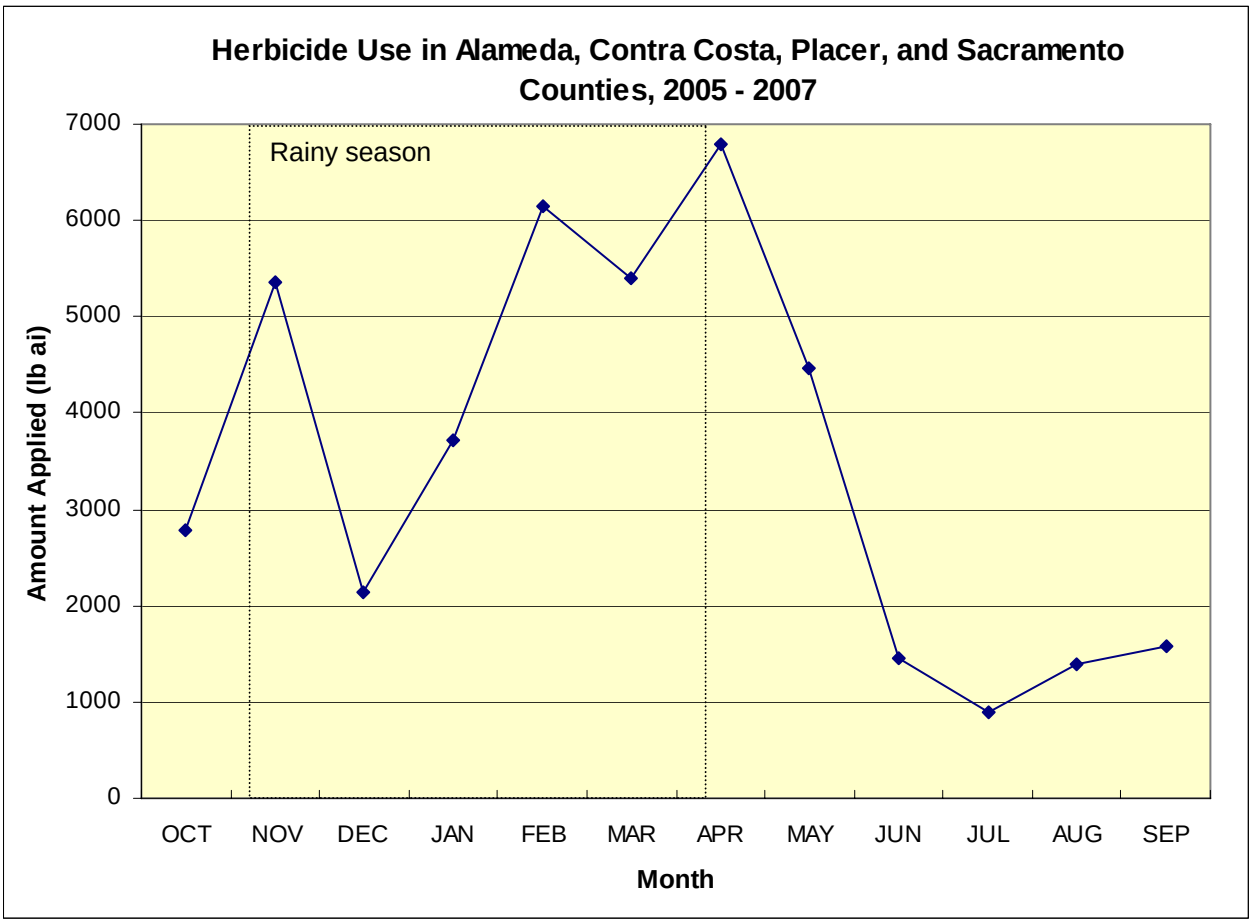

Figure 7. Average monthly herbicide use (lb a.i. per acre) in landscape maintenance for Alameda, Contra Costa, Placer, and Sacramento Counties. Data is an average of the years 2005, 2006, and 2007. Data is presented for the water year (October – September).

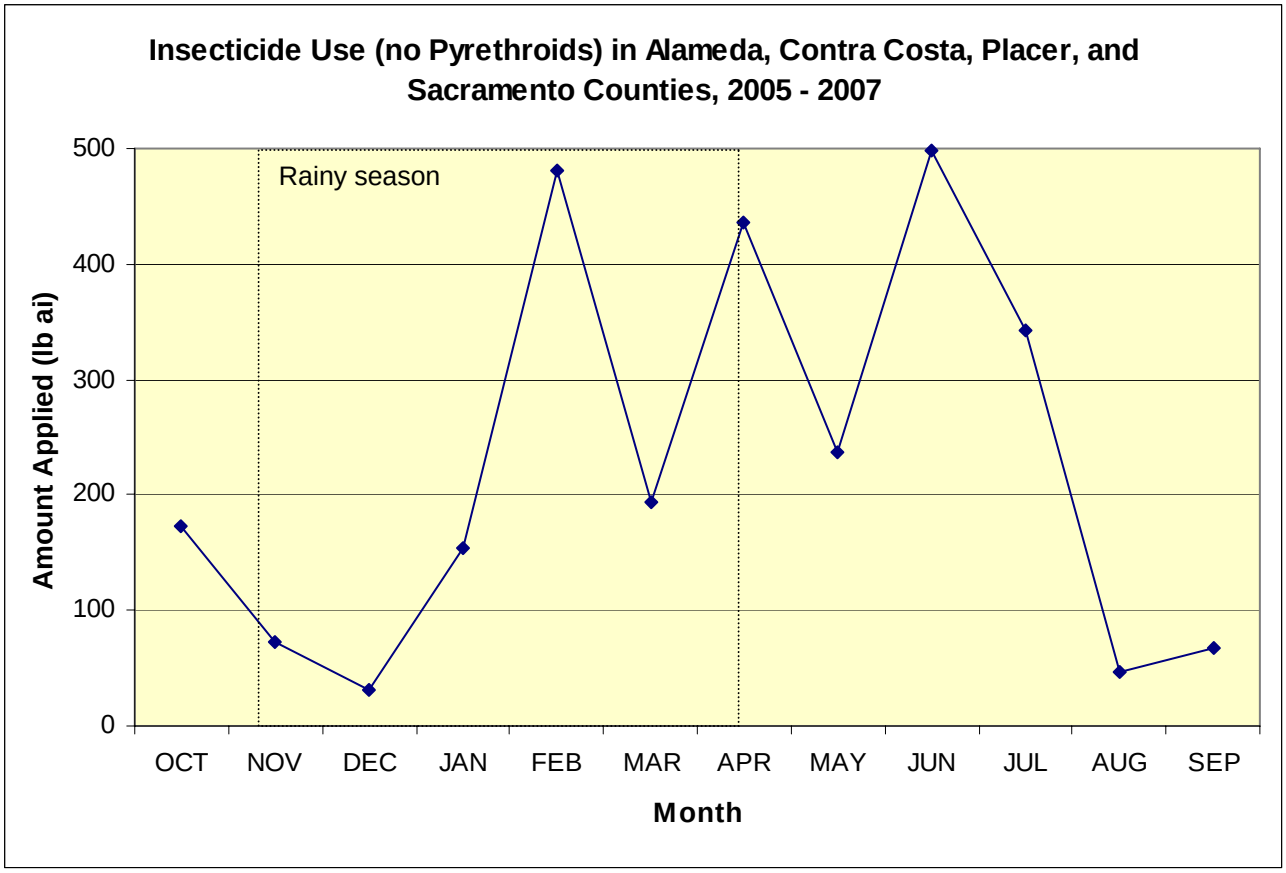

Figure 8. Average monthly insecticide (carbamates, fipronil, organophosphates; no pyrethroids) use (lb a.i. per acre) in landscape maintenance for Alameda, Contra Costa, Placer, and Sacramento Counties. Data is presented for the water year (October - September).

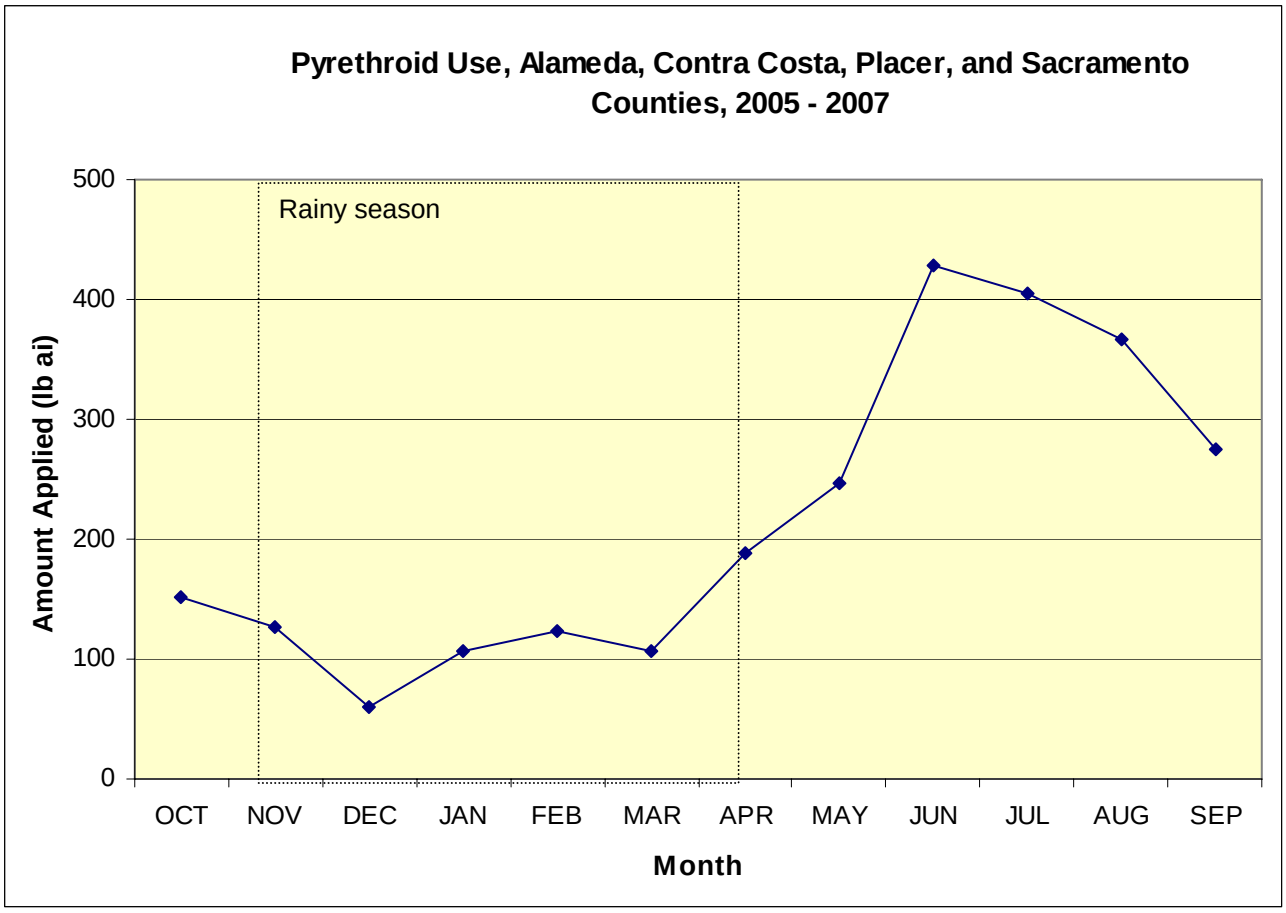

Figure 9. Average monthly pyrethroid use (lb a.i. per acre) in landscape maintenance for Alameda, Contra Costa, Placer, and Sacramento Counties. Data is an average of the years 2005, 2006, and 2007. Data is presented for the water year (October - September).