Appendix A. Action Area Derivation for Azinphos Methyl

Use List

The following use list (Table 1) is derived from label use information. It is used as a basis for terrestrial and aquatic pesticide use area determination.

Table 1 Use list from labels

Category	Use
Orchards and vineyards	almonds, pistachios, walnuts, apples, cherries, pears
Cultivated Crops	Brussels sprouts, nursery stock

Terrestrial Use Determination

Sources and Methods

Base mapping layers for the terrestrial analysis component were obtained from the National Land-cover Dataset (NLCD 2001) for the majority of land use types and the California GAP data (6/98) for the orchards and vineyard uses. The NLCD is a recently released national land use dataset and the GAP is from the Biogeography Lab from UCLA-Santa Barbara. These raster files were converted to vector and used in the analysis. Table 2 shows the land-cover sources used.

Table 2 Land-cover data sources

Land-cover Data Sources			
Layer name	**Base source**	**Description**	**non-NASS**
Cultivated Crops	NLCD	82: Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.	No
Developed, High Intensity	NLCD	24: Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to100 percent of the total cover.	Yes
Developed, Low Intensity	NLCD	22: Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.	Yes
Developed, Medium Intensity	NLCD	23: Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.	Yes
Developed, Open Space	NLCD	21: Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing	Yes

Land-cover Data Sources			
Layer name	**Base source**	**Description**	**non-NASS**
		units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.	
Forest	NLCD	Union of 41,42,43: Deciduous, evergreen and mixed. Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover.	Yes
Open Water	NLCD	11: All areas of open water, generally with less than 25% cover of vegetation or soil.	Yes
Orchards and vineyards	CA GAP	A union of 11210, 11211 and 11212. This is the only CA GAP reference.	No
Pasture/Hay	NLCD	81: Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.	No
Wetlands	NLCD	Union of 90, 95: Woody wetlands and emergent herbaceous.	Yes

U.S. Department of Agriculture's National Agriculture Statistics Service (NASS) census dataset, 2002 was used to determine whether a crop was grown in a particular county. This census dataset provides survey information over five years on agricultural practices and is used mainly for cultivated or agriculture crops. Chemical labeled uses were matched to NASS uses; an agriculture use match would result in a mapped area for one or more counties. For uses that are not agricultural, the use is assumed to occur in every county where that particular land-cover occurs within California (*i.e.* a 'forestry' labeled use is assumed to potentially occur in all California counties where NLCD indicates there is forest land-cover).

The 'Initial Area of Concern' represents the use type and its occurrence in the NASS or NLCD datasets. These are the areas where the pesticide has potential to be applied. The 'Action Area' represents the 'Initial Area of Concern' plus a buffer distance. There may not always be a buffer distance in which case the 'Action Area' is the same as the 'Initial Area of Concern'. The overlap of the 'Action Area' with CRLF habitat areas is named 'Overlapping Area' and is the target of spatial analysis. The ratio of Overlapping Area to CRLF habitat area is reported for each of eight Recovery Units (RU1 to RU8).

There are three types of CRLF habitat areas considered in this assessment: Critical Habitat (CH); Core Areas; and California Natural Diversity Database (CNDDB) occurrence sections (EPA Region 9). Critical habitat areas were obtained from the U.S. Fish and Wildlife Service's (USFWS) final designation of critical habitat for the CRLF (USFWS 2006). Core areas were obtained from USFWS's Recovery Plan for the CRLF (USFWS 2002). The occurrence sections represent an EPA-derived subset of occurrences noted in the CNDDB. They are generalized by the Meridian Range and Township Section (MTRS) one square mile units so that individual habitat areas are obfuscated. As such, only occurrence section counts are provided and not the area potentially affected.

Tables 3 and 4 summarize the overlapping area for azinphos methyl use and CRLF species range with and without a terrestrial buffer of 3707 feet.

Table 3 Terrestrial spatial summary results for AZM agriculture and orchard uses with a 3707 ft buffer.

Measure	RU1	RU2	RU3	RU4	RU5	RU6	RU7	RU8	Total
Initial Area of Concern (no buffer)									34,449 sq km
Action Area – Initial area of concern + buffer									? sq km
Established species range area (sq km)	3654	2742	1323	3279	3650	5306	4917	3326	28,197
Overlapping area (sq km)	143	181	117	576	1101	1098	1511	516	5423
Percent area affected	*4%*	*7%*	*9%*	*18%*	*30%*	*21%*	*31%*	*16%*	*19%*
# Occurrence Sections (959 total)	2	0	19	124	205	66	71	15	502

Table 4 Terrestrial spatial summary results for AZM agriculture and orchard uses with no buffer.

Measure	RU1	RU2	RU3	RU4	RU5	RU6	RU7	RU8	Total
Initial Area of Concern (no buffer)									34,449 sq km
Action Area – Initial area of concern + buffer									sq km
Established species range area (sq km)	3654	2742	1323	3279	3650	5306	4917	3326	28,197
Overlapping area (sq km)	1.8	43.6	16.1	29.9	126.6	320.6	347.3	246.8	1132.7
Percent area affected	*<1%*	*2%*	*1%*	*1%*	*3%*	*6%*	*7%*	*7%*	*4%*

Aquatic Action Area Delineation

The aquatic analysis uses a downstream dilution model to determine the downstream extent of exposure in streams and rivers. The downstream component, combined with the initial area of concern, define the aquatic action area. The downstream extent includes the area where the EEC could potentially be above levels that would exceed the most sensitive LOC. The model calculates two values, the dilution factor (DF) and the threshold Percent Cropped Area (PCA). The dilution factor (DF) is the maximum RQ/LOC, and the threshold PCA is the inverse value represented as a percent.

The dilution model uses the NHDPlus data set (http://www.horizon-systems.com/nhdplus/) as the framework for the downstream analysis. The NHDPlus includes several pieces of information that can be used to analyze downstream effects. For each stream reach in the hydrography network, the data provide a tally of the total area in each NLCD land cover class for the upstream cumulative area contributing to the given stream reach. Using the cumulative land cover data provided by the NHDPlus, an aggregated use class is created based on the classes listed in Table 4. A cumulative PCA

is calculated for each stream reach based on the aggregate use class (divided by the total upstream contribution area).

The dilution model traverses downstream from each stream segment within the initial area of concern. At each downstream node, the threshold PCA is compared to the aggregate cumulative PCA. If the cumulative PCA exceeds the threshold then the stream segment is included in the downstream extent. The model continues traversing downstream until the cumulative PCA no longer exceeds the threshold. The additional stream length by the downstream analysis is presented in Table 5

Table 5 Aquatic spatial quantitative results for AZM uses (agriculture and orchard) areas.

| Measure	Total
Total California stream kilometers	332,962
Total stream kilometers in initial area of concern	30,419
Total stream kilometers added downstream	194
Total stream kilometers in final action area	30,613

Limitations and Constraints of Tabular and Geospatial Sources

The geographic data sets used in this analysis are limited with respect to their accuracy and timeliness. The NASS Census of Agriculture (NASS 2002) contains adjusted survey data collected prior to 2002. Small use sites, and minor uses (e.g., specialty crops) tend to be underrepresented in this dataset. The National Land Cover Dataset (NLCD 2001) represents the best comprehensive collection of national land use and land cover information for the United States representing a range of years from 1994 – 1998. Because the NLCD does not explicitly include a class to represent orchard and vineyard landcover, California Gap Analysis Project data (CaGAP 1998) were overlaid with the NCLD and used to identify these areas.

Hydrographic data are from the NHDPlus dataset (http://www.horizon-systems.com/nhdplus/). NHDPlus contains the most current and accurate nationwide representation of hydrologic data. In some isolated instances, there are, however, errors in the data including missing or disconnected stream segments and incorrect assignment of flow direction. Spatial data describing the recovery zones and core areas are from the US Fish and Wildlife Service. The data depicting survey sections in which the species has been found in past surveys is from the California Natural Diversity Database (http://www.dfg.ca.gov/bdb/html/cnddb.html).

The relatively coarse spatial scale of these datasets precludes use of the data for highly localized studies, therefore, tabular information presented here is limited to the scale of individual Recovery Units. Additionally, some labeled uses are not possible to map precisely due to the lack of appropriate spatial data in NLCD on the location of these areas. To account for these uncertainties, the spatial analysis presented here is conservative, and may overestimate the areal extent of actual pesticide use in California.
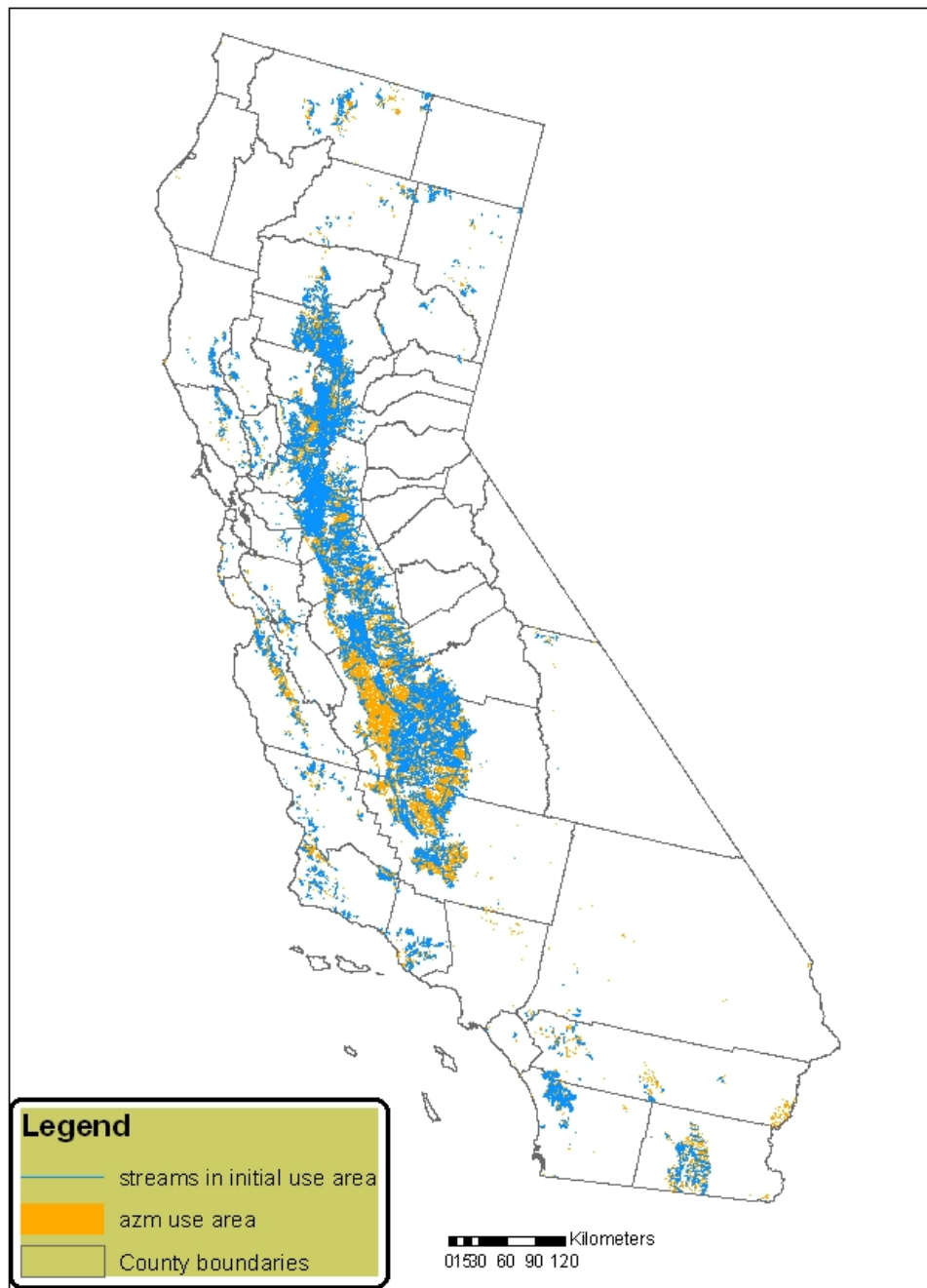
4

Azinphos-methyl Use Map
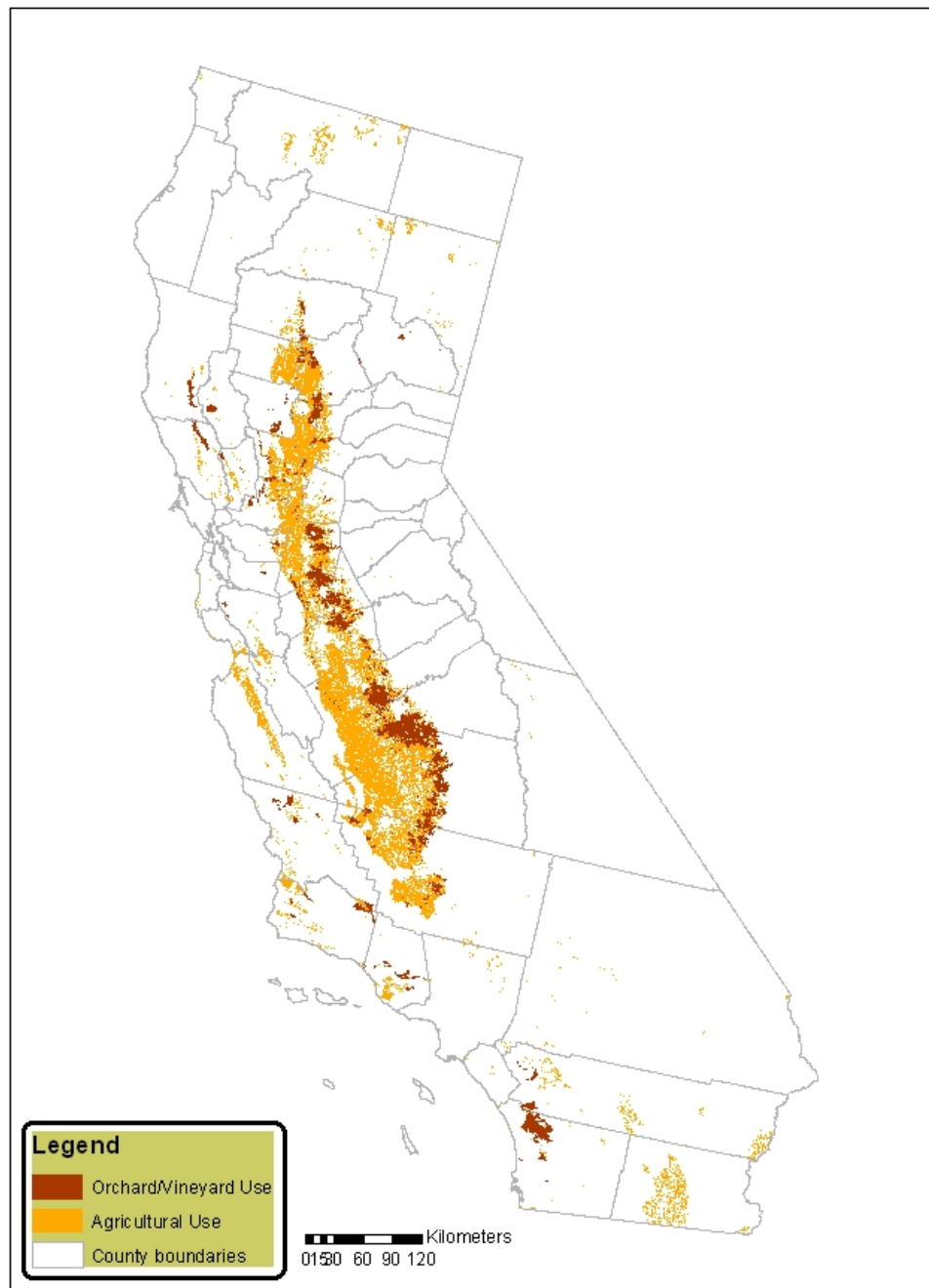
Legend
- Orchard/Vineyard Use
- Agricultural Use
- County boundaries

Kilometers
0 15 30   60   90 120

Compiled from California County boundaries (ESRI, 2002),
USDA National Agriculture Statistical Service (NASS, 2002)
Gap Analysis Program Orchard/ Vineyard Landcover (GAP)
National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office
of Pesticides Programs, Environmental Fate and Effects Division.
June 18, 2007. Projection: Albers Equal Area Conic USGS, North
American Datum of 1983 (NAD 1983)

Azinphos-methyl Initial Area of Concern

Legend

— streams in initial use area

▮ azm use area

▯ County boundaries

Kilometers
0 15 30 60 90 120

Compiled from California County boundaries (ESRI, 2002),
USDA National Agriculture Statistical Service (NASS, 2002)
Gap Analysis Program Orchard/ Vineyard Landcover (GAP)
National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office
of Pesticides Programs, Environmental Fate and Effects Division.
June 18, 2007. Projection: Albers Equal Area Conic USGS, North
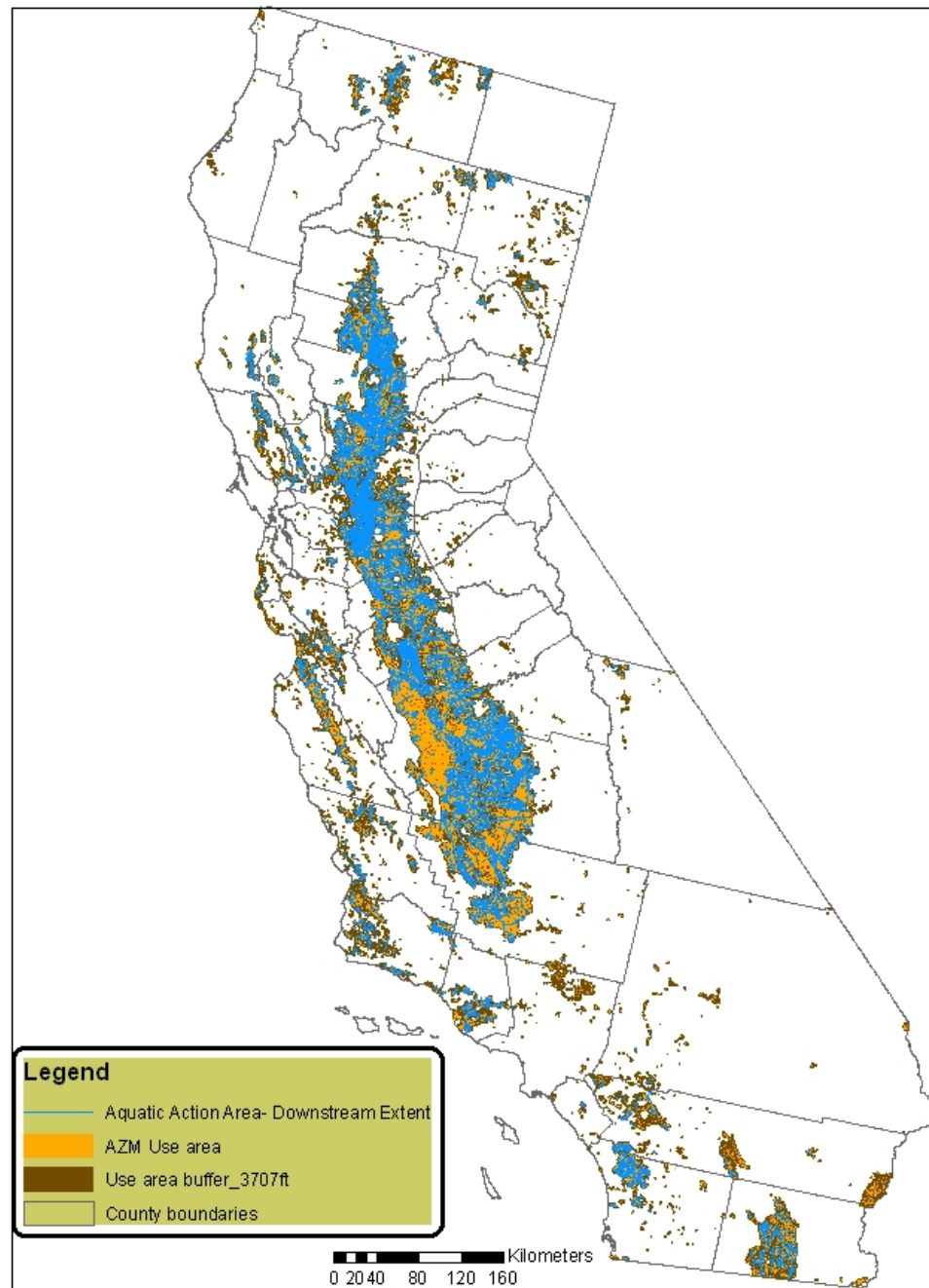American Datum of 1983 (NAD 1983)

Azinphos-methyl Action Area

Legend

— Aquatic Action Area- Downstream Extent

AZM Use area

Use area buffer_3707ft

County boundaries

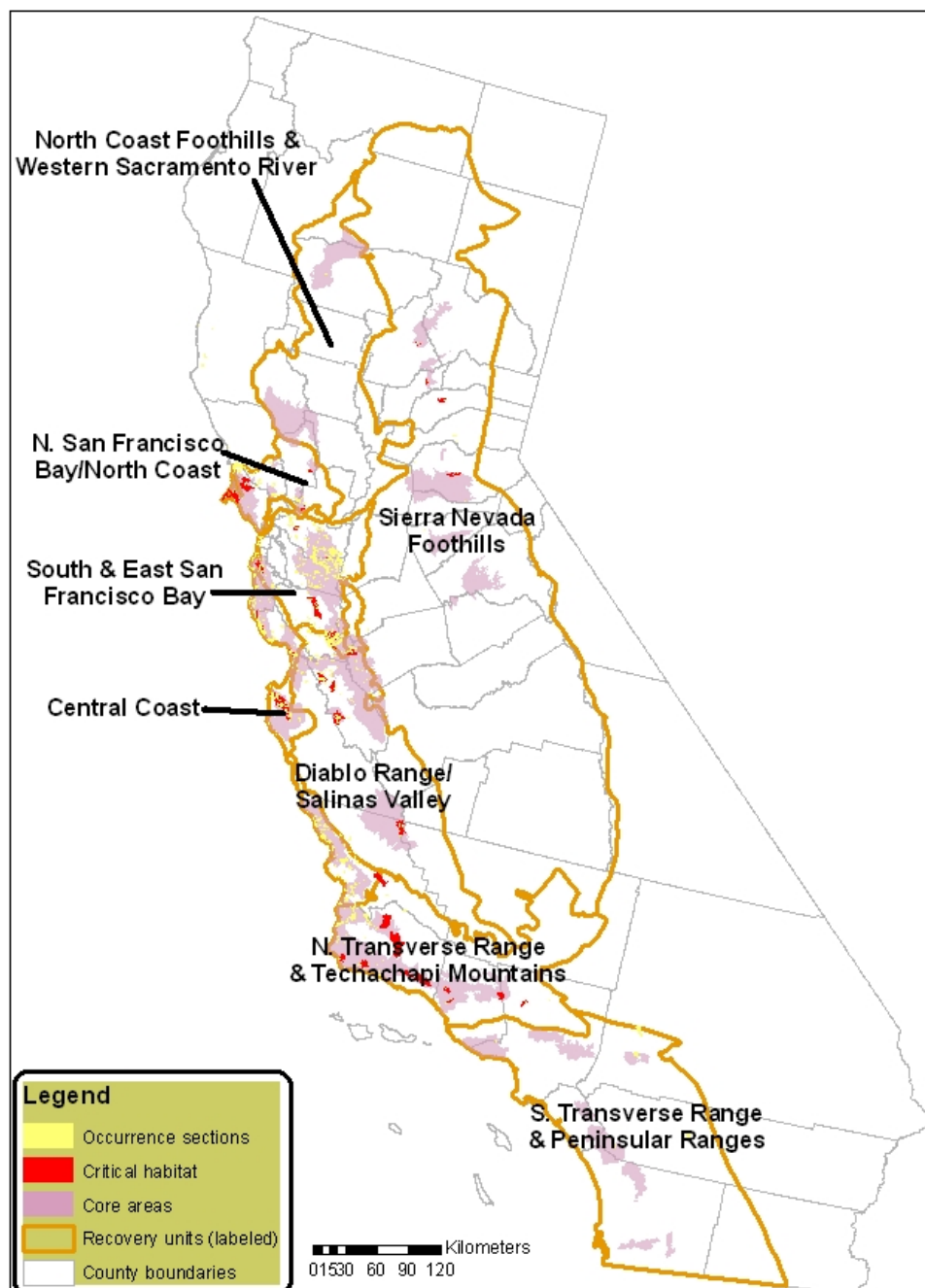Kilometers

0 20 40   80   120 160

Compiled from California County boundaries (ESRI, 2002),
USDA National Agriculture Statistical Service (NASS, 2002)
Gap Analysis Program Orchard/ Vineyard Landcover (GAP)
National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office
of Pesticides Programs, Environmental Fate and Effects Division.
June 18, 2007. Projection: Albers Equal Area Conic USGS, North
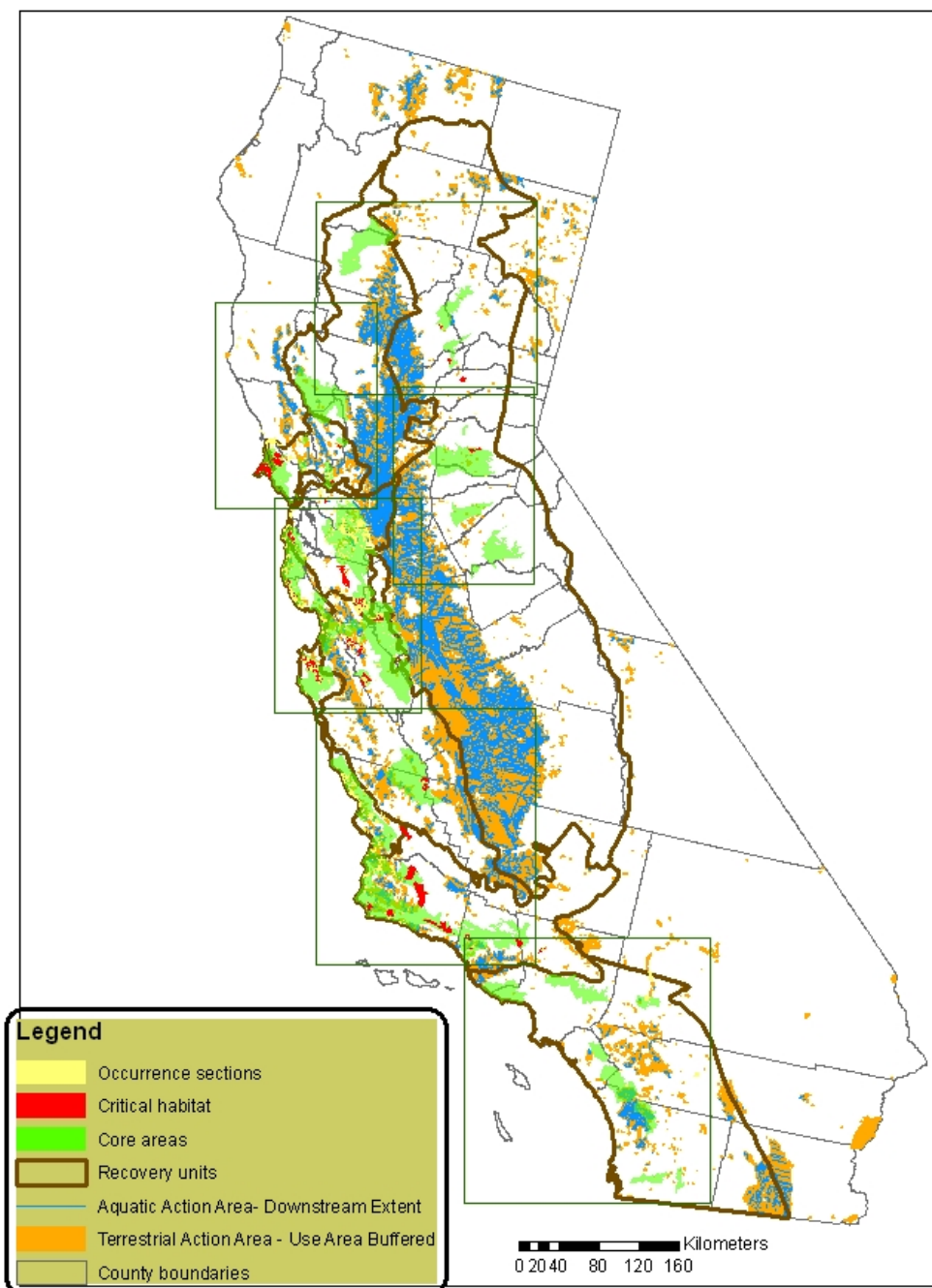American Datum of 1983 (NAD 1983)

CRLF Habitat Areas

North Coast Foothills &
Western Sacramento River

N. San Francisco
Bay/North Coast

Sierra Nevada
Foothills

South & East San
Francisco Bay

Central Coast

Diablo Range/
Salinas Valley

N. Transverse Range
& Techachapi Mountains

S. Transverse Range
& Peninsular Ranges

Legend
Occurrence sections
Critical habitat
Core areas
Recovery units (labeled)
County boundaries

Kilometers
0 15 30   60   90   120

Compiled from California County boundaries (ESRI, 2002),
USDA National Agriculture Statistical Service (NASS, 2002)
Gap Analysis Program Orchard/ Vineyard Landcover (GAP)
National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office
of Pesticides Programs, Environmental Fate and Effects Division.
June 15, 2007. Projection: Albers Equal Area Conic USGS, North
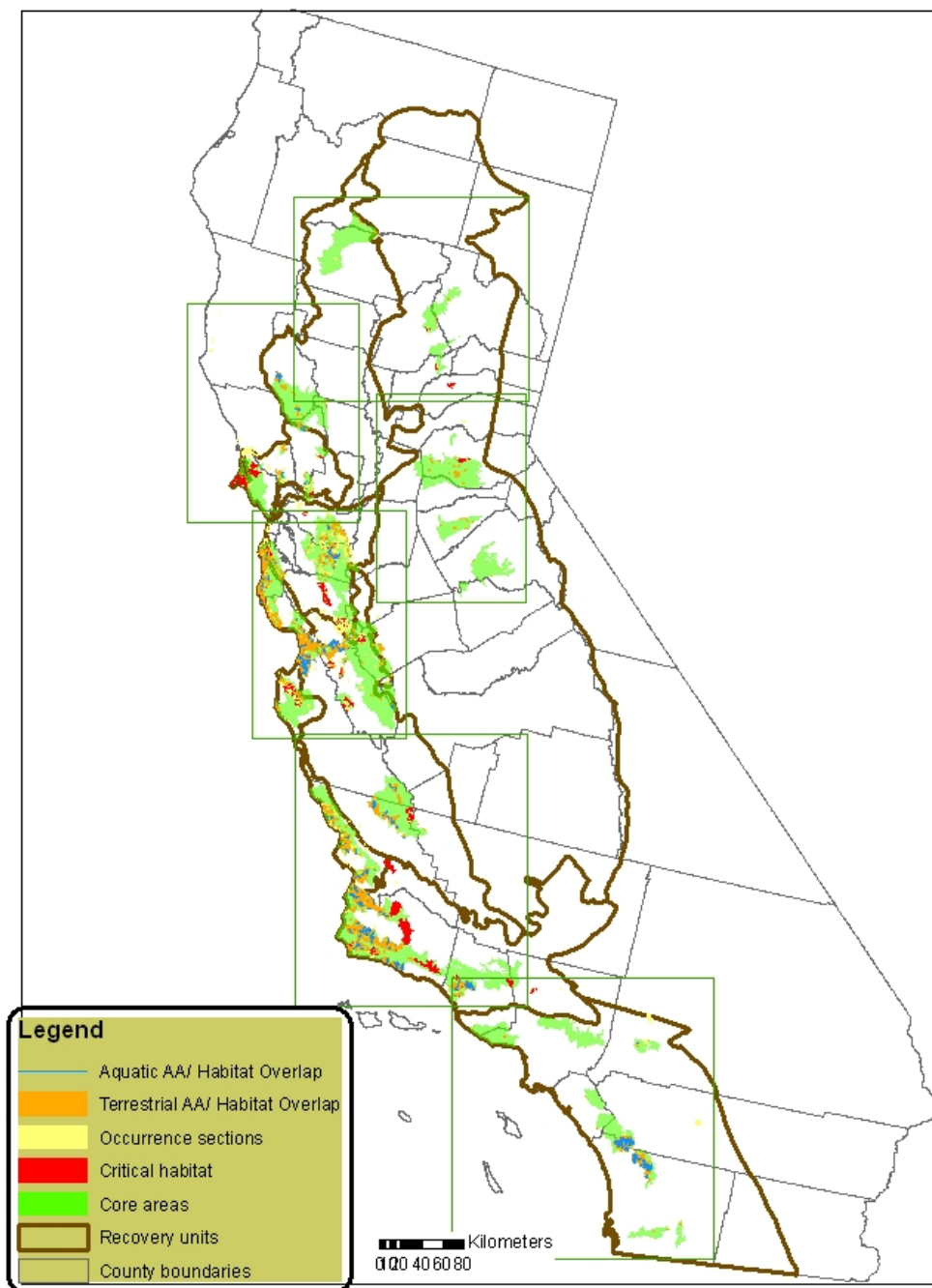American Datum of 1983 (NAD 1983)

Azinphos-methyl Action Area and CRLF Habitat

Legend

- Occurrence sections
- Critical habitat
- Core areas
- Recovery units
- Aquatic Action Area- Downstream Extent
- Terrestrial Action Area - Use Area Buffered
- County boundaries

Kilometers
0 20 40 80 120 160

Compiled from California County boundaries (ESRI, 2002), USDA National Agriculture Statistical Service (NASS, 2002) Gap Analysis Program Orchard/ Vineyard Landcover (GAP) National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. June 18, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)
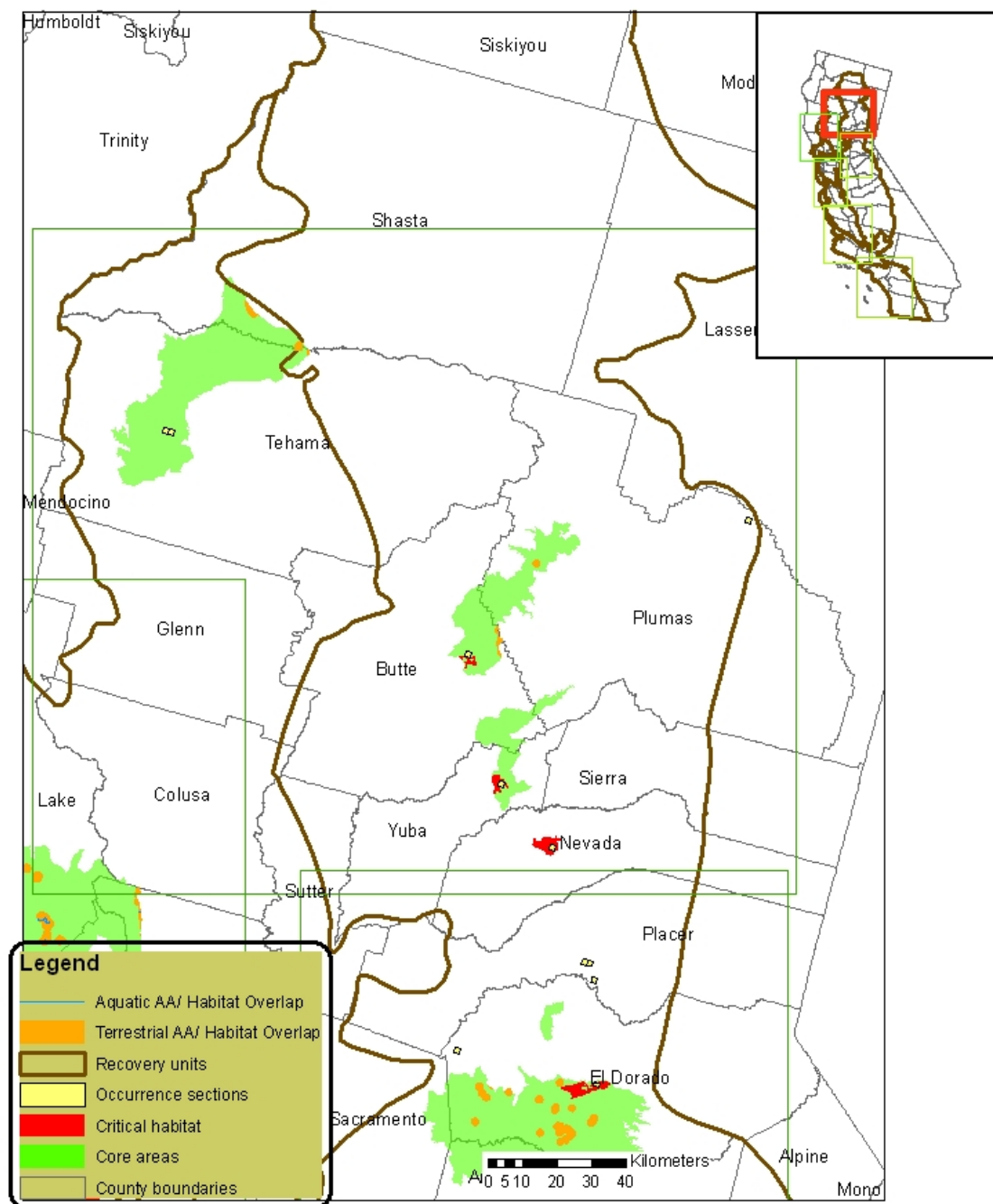
Azinphos-methyl AA and Habitat Overlap

Legend

- Aquatic AA/ Habitat Overlap
- Terrestrial AA/ Habitat Overlap
- Occurrence sections
- Critical habitat
- Core areas
- Recovery units
- County boundaries

Kilometers
0 10 20 40 60 80

Compiled from California County boundaries (ESRI, 2002),
USDA National Agriculture Statistical Service (NASS, 2002)
Gap Analysis Program Orchard/ Vineyard Landcover (GAP)
National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office
of Pesticides Programs, Environmental Fate and Effects Division.
June 18, 2007. Projection: Albers Equal Area Conic USGS, North
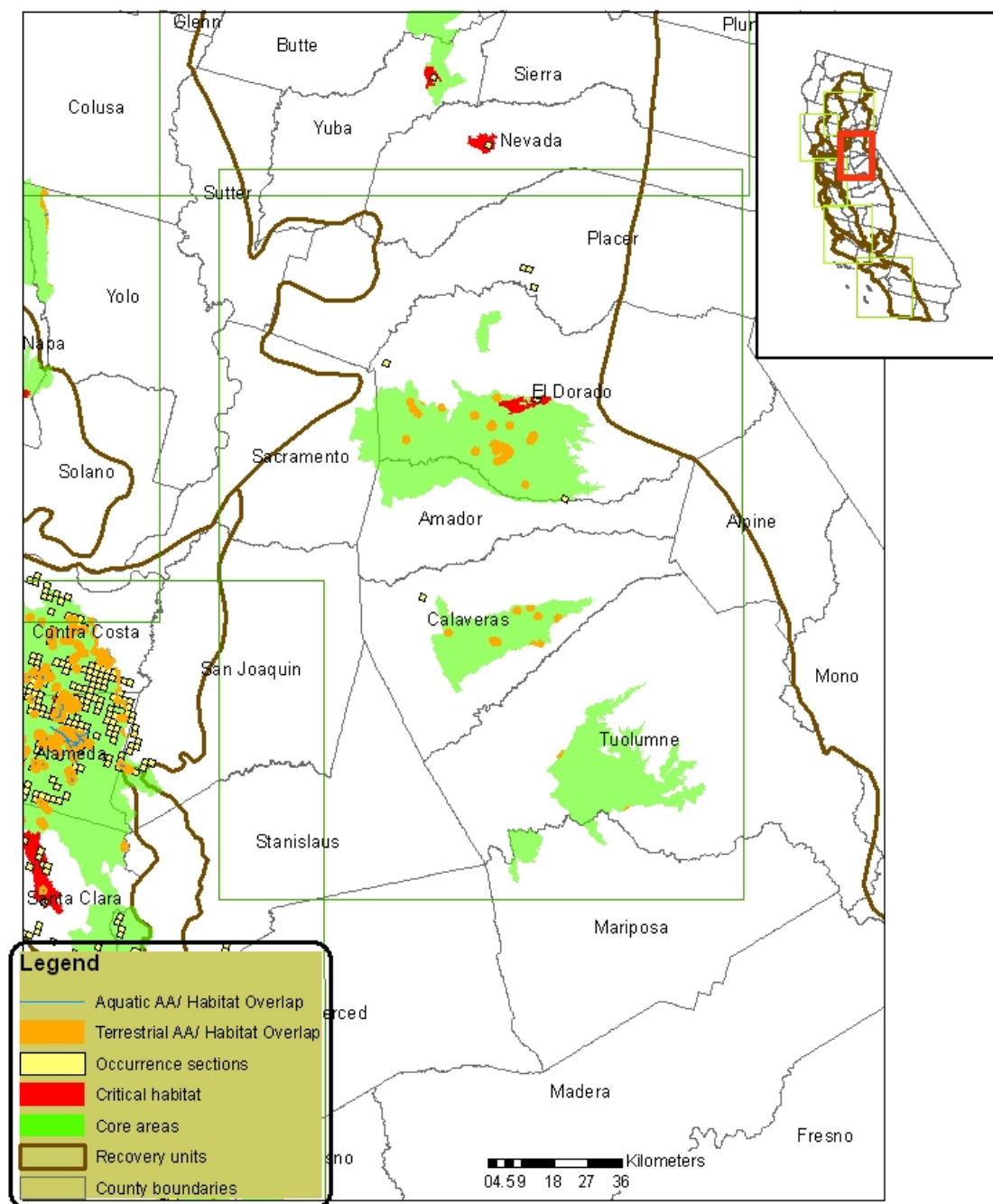American Datum of 1983 (NAD 1983)

Azinphos-methyl AA and Habitat Overlap- Detail Map #1

Legend

- Aquatic AA/ Habitat Overlap
- Terrestrial AA/ Habitat Overlap
- Recovery units
- Occurrence sections
- Critical habitat
- Core areas
- County boundaries

Compiled from California County boundaries (ESRI, 2002), USDA National Agriculture Statistical Service (NASS, 2002) Gap Analysis Program Orchard/ Vineyard Landcover (GAP) National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. June 18, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)
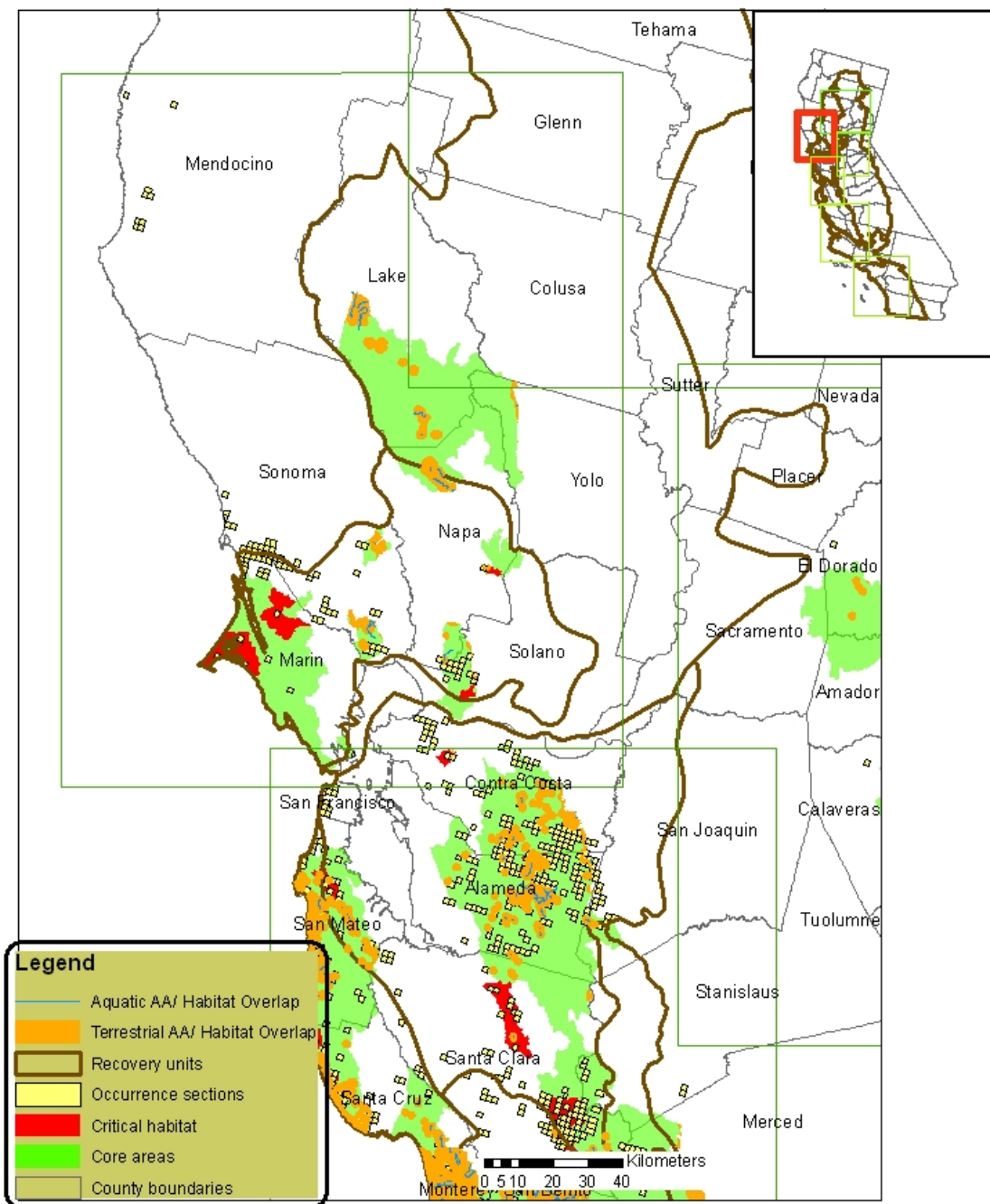
Azinphos-methyl AA and Habitat Overlap- Detail Map #2

Legend
- Aquatic AA/ Habitat Overlap
- Terrestrial AA/ Habitat Overlap
- Occurrence sections
- Critical habitat
- Core areas
- Recovery units
- County boundaries

Kilometers
0 4.5 9   18   27   36

Compiled from California County boundaries (ESRI, 2002),
USDA National Agriculture Statistical Service (NASS, 2002)
Gap Analysis Program Orchard/ Vineyard Landcover (GAP)
National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office
of Pesticides Programs, Environmental Fate and Effects Division.
June 18, 2007. Projection: Albers Equal Area Conic USGS, North
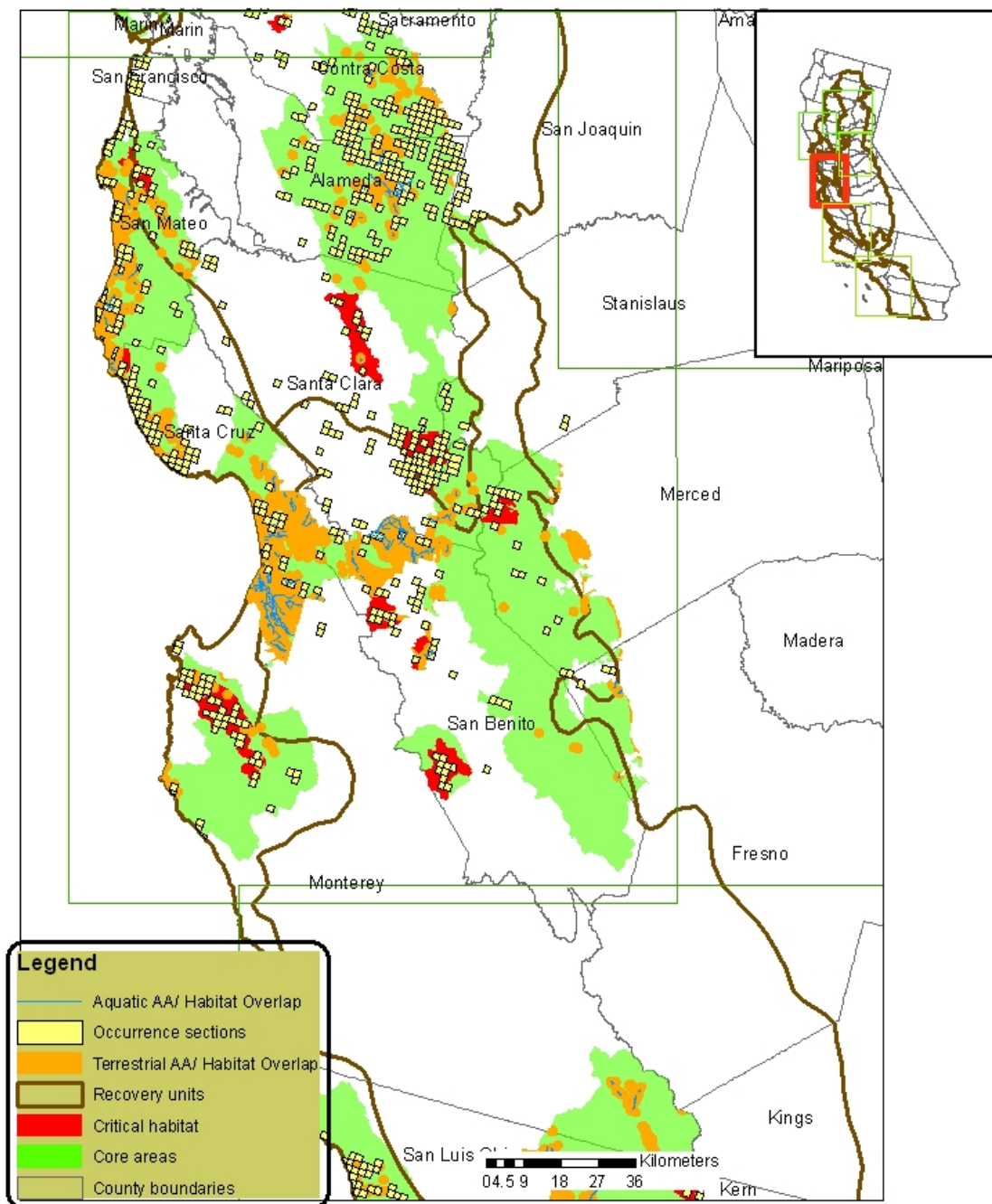American Datum of 1983 (NAD 1983)

Azinphos-methyl AA and Habitat Overlap- Detail Map #3

Legend

- Aquatic AA/ Habitat Overlap
- Terrestrial AA/ Habitat Overlap
- Recovery units
- Occurrence sections
- Critical habitat
- Core areas
- County boundaries

Compiled from California County boundaries (ESRI, 2002), USDA National Agriculture Statistical Service (NASS, 2002) Gap Analysis Program Orchard/ Vineyard Landcover (GAP) National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. June 18, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

Azinphos-methyl AA and Habitat Overlap- Detail Map #4

Legend

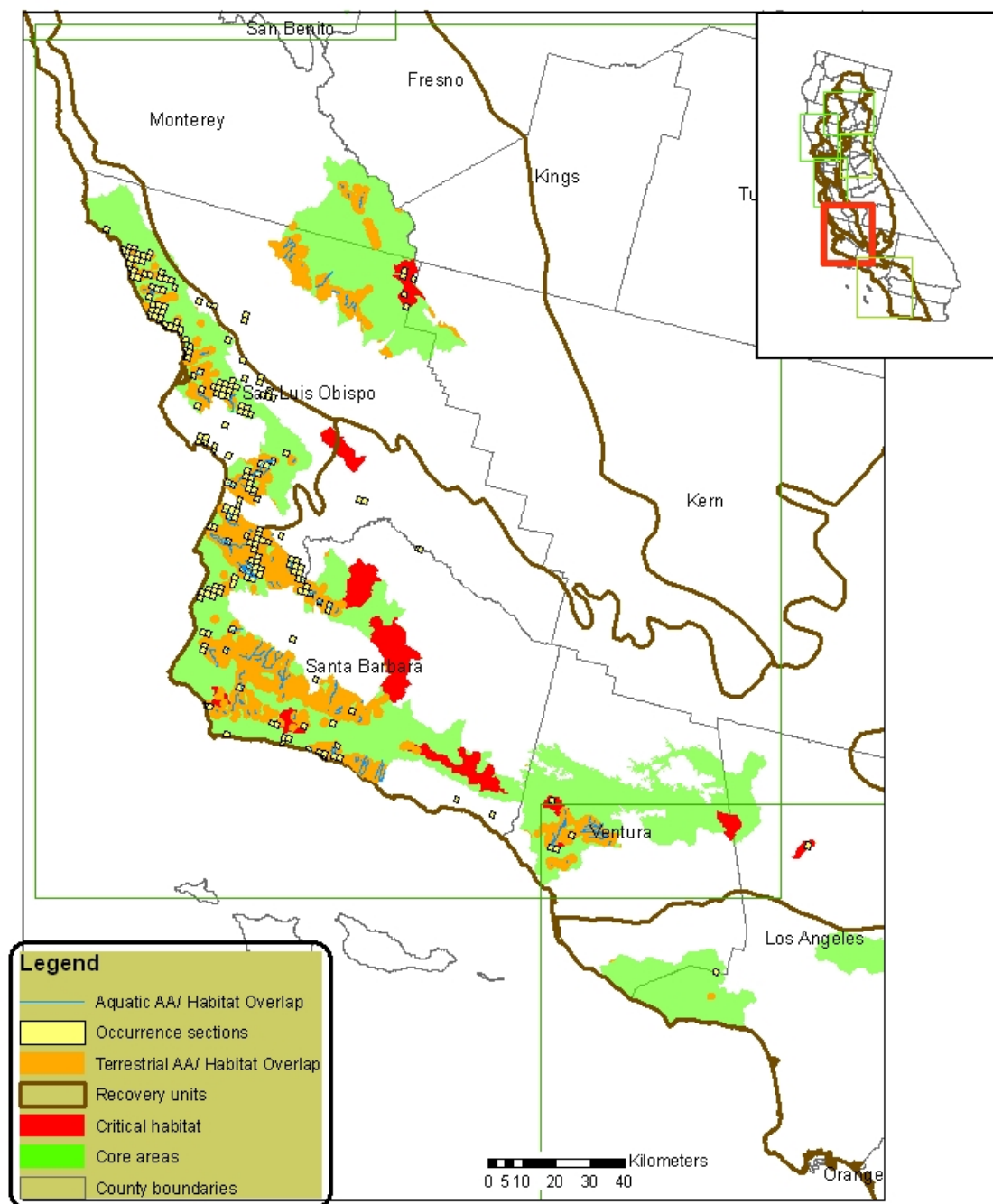|	
——	Aquatic AA/ Habitat Overlap
▨	Occurrence sections
▧	Terrestrial AA/ Habitat Overlap
▢	Recovery units
▢	Critical habitat
▢	Core areas
▢	County boundaries

Compiled from California County boundaries (ESRI, 2002), USDA National Agriculture Statistical Service (NASS, 2002) Gap Analysis Program Orchard/ Vineyard Landcover (GAP) National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. June 18, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

Azinphos-methyl AA and Habitat Overlap- Detail Map #5

Legend
- Aquatic AA/ Habitat Overlap
- Occurrence sections
- Terrestrial AA/ Habitat Overlap
- Recovery units
- Critical habitat
- Core areas
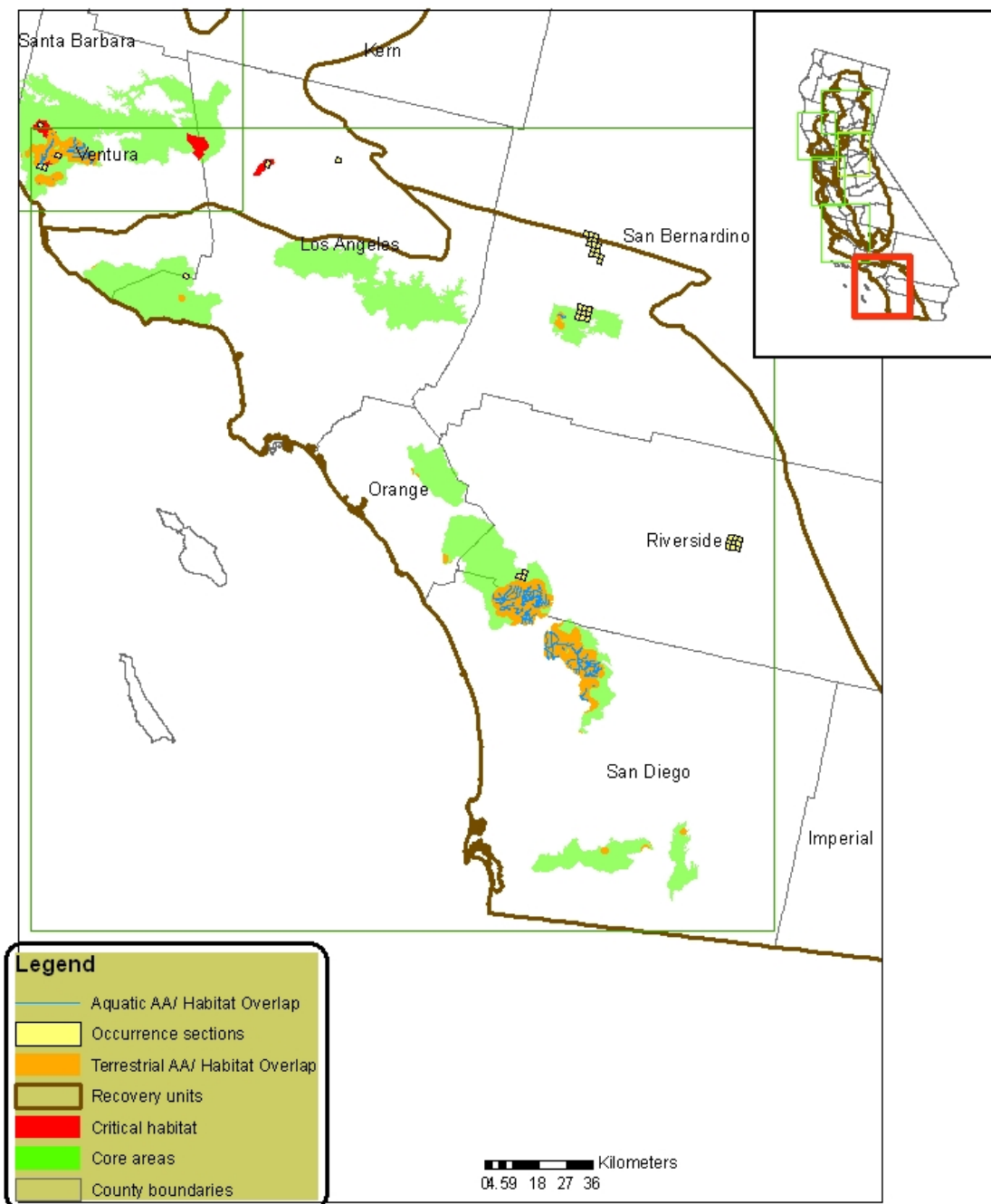- County boundaries

Kilometers
0 5 10 20 30 40

Compiled from California County boundaries (ESRI, 2002), USDA National Agriculture Statistical Service (NASS, 2002) Gap Analysis Program Orchard/ Vineyard Landcover (GAP) National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. June 18, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

Azinphos-methyl AA and Habitat Overlap- Detail Map #6

Legend

- Aquatic AA/ Habitat Overlap
- Occurrence sections
- Terrestrial AA/ Habitat Overlap
- Recovery units
- Critical habitat
- Core areas
- County boundaries

Kilometers
0 4.59 18 27 36

Compiled from California County boundaries (ESRI, 2002), USDA National Agriculture Statistical Service (NASS, 2002) Gap Analysis Program Orchard/ Vineyard Landcover (GAP) National Land Cover Database (NLCD) (MRLC, 2001)

Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. June 18, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)