Appendix C

Spatial Summary for Chlorothalonil Uses

Use List

The following use list is derived from label use information. It is used as a basis for the spatial analysis for chlorothalonil uses.

Table 1 Use list from labels

Category	Use
Cultivated Crops	Asparagus, beans, blueberries, Brussels sprouts, carrots, celery, cole crops, corn, cucurbits, garlic, leeks, grasses grown for seed, onions (dry bulb, green, shallots), ornamentals (field), pachysandra (field), peanuts, potatoes, roses (field), sod farm, tomatoes
Orchards/Vineyards	Filberts, mangoes, stone fruits, almonds, pistachios
Forestry	Conifers, established
Non-agricultural	Turf, including golf courses (also included residential areas)

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. The rights-of-way landuse layer was derived from TeleAtlas (2006) for roads and rail, and the U.S. Department of Transportation's National Pipeline Dataset (1999). 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	Grid code 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	Grid code 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	Grid code 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	Yes

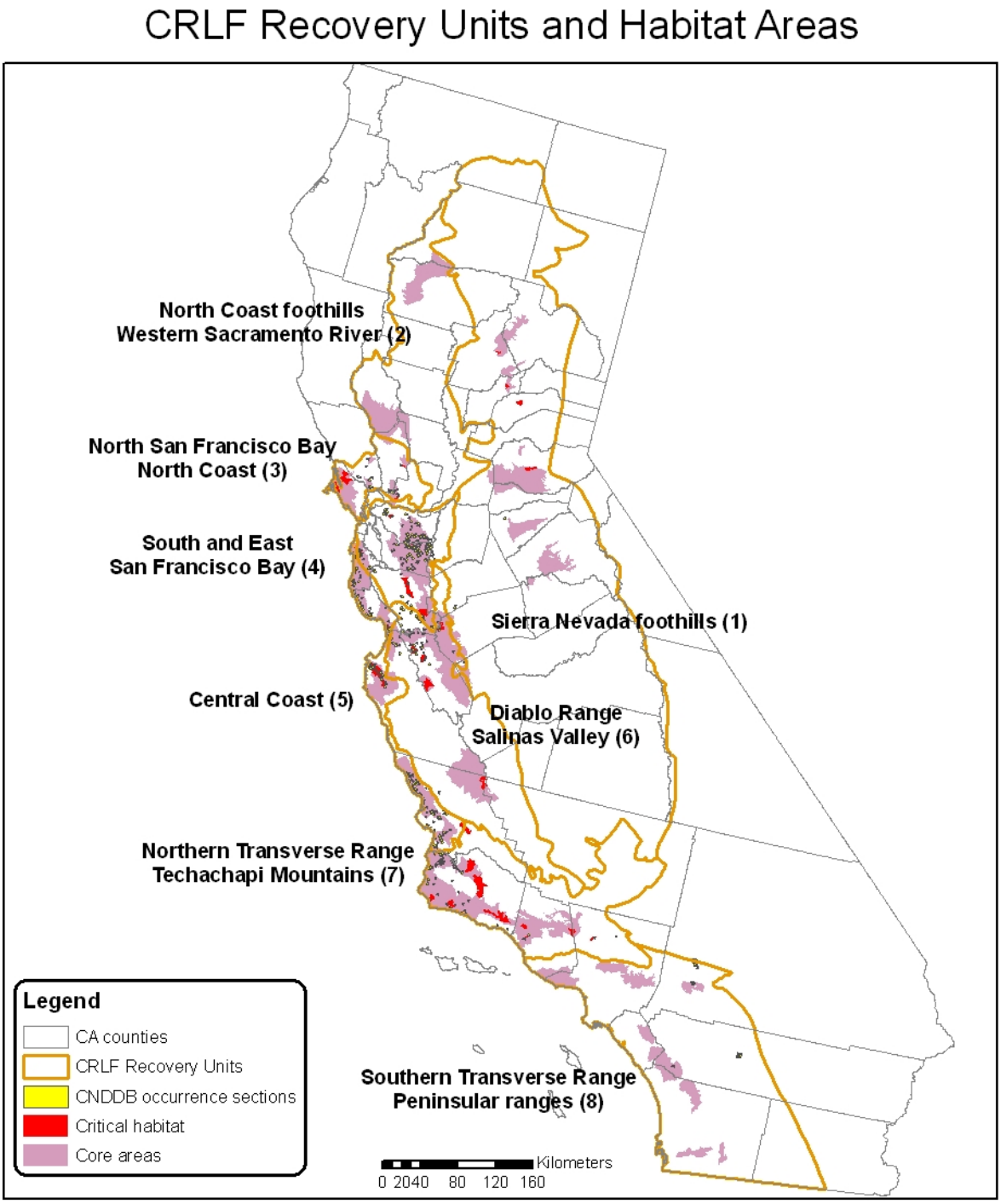
Land Cover Data Sources			
Layer name	**Base source**	**Description**	**non-NASS**
		units.	
Developed, Medium Intensity	NLCD	Grid code 23: Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.	Yes
Developed, Open Space	NLCD	Grid code 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 units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.	Yes
Forest	NLCD	Grid codes 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	Grid code 11: All areas of open water, generally with less than 25% cover of vegetation or soil.	Yes
Orchards and vineyards	CA GAP	Grid codes 11210, 11211 and 11212. This is the only CA GAP reference.	No
Pasture/Hay	NLCD	Grid codes 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	Grid codes 90, 95: Woody wetlands and emergent herbaceous.	Yes
Rights-of-Way	US DOT; TeleAtlas	A derived class, using road, rail, and pipeline coverages.	Yes
Turf	NLCD	A derived NLCD class based on developed classes and the impervious surface layer with corrections applied.	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.

Reference Map



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, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

Spatially Determined Analysis for Terrestrial Uses

Table 3 Terrestrial spatial summary results for cultivated crops, orchards, and turf buffered to 2100 ft.

Measure	**RU1**	**RU2**	**RU3**	**RU4**	**RU5**	**RU6**	**RU7**	**RU8**	**Total**
Action Area (Initial area of concern plus 2100ft buffer)	32061	9809	1880	4880	1722	7194	3874	15176	76596
Established species range area (CH plus core in sq km)	3654	2742	1323	3279	3650	5306	4917	3326	28,197
Overlapping area with Habitat (Action Area buffered, sq km)	224	247	178	899	983	941	1337	855	5664
Percent area affected	*6%*	*9%*	*14%*	*27%*	*27%*	*18%*	*27%*	*26%*	*20%*
Established occurrence sections (959 total; 30 outside recovery units)	13	3	70	324	276	120	90	33	929
# Occurrence sections affected	70	29	27	55	63	51	59	45	399

Table 4 Terrestrial spatial summary results for conifer forests buffered to 2100 ft.

Measure	**RU1**	**RU2**	**RU3**	**RU4**	**RU5**	**RU6**	**RU7**	**RU8**	**Total**
Action Area (Initial area of concern plus 2100ft buffer)	58524	7486	3290	4192	5854	11233	13608	9712	113899
Established species range area (CH plus core in sq km)	3654	2742	1323	3279	3650	5306	4917	3326	28,197
Overlapping area (sq km)	3338	1895	1113	2545	3321	2397	4186	1806	20601
Percent area affected	*91%*	*69%*	*84%*	*78%*	*91%*	*45%*	*85%*	*54%*	*73%*
Established occurrence sections (959 total; 30 outside recovery units)	13	3	70	324	276	120	90	33	929
# Occurrence sections affected	10	3	59	244	263	103	65	16	763

Habitat Area Overlap for Chlorothalonil Uses

Habitat Area includes Core and Critical Habitat areas. Sections are not included in the area calculations.

Cultivated, Orchard and Turf with a 640 meter buffer

Recovery Unit 1 — 3,654 Area (sq km)

	Habitat Area	Use Overlap %
Amador	51.7	1.4%
Butte	3.5	0.1%
Calaveras	22.6	0.6%
El Dorado	112.4	3.1%
Mariposa	0.6	0.0%
Plumas	19.6	0.5%
Sacramento	3.6	0.1%
Tuolumne	10.4	0.3%
Total area for RU 1:	224	6.1%

Recovery Unit 2 — 2,742 Area (sq km)

	Habitat Area	Use Overlap %
Lake	159.7	5.8%
Marin	8.3	0.3%
Napa	16.9	0.6%
Shasta	16.2	0.6%
Solano	35.6	1.3%
Tehama	4.5	0.2%
Yolo	5.8	0.2%
Total area for RU 2:	247	9.0%

Recovery Unit 3 — 1,320 Area (sq km)

	Habitat Area	Use Overlap %
Marin	51.8	3.9%
Napa	47.3	3.6%
Solano	32.0	2.4%
Sonoma	47.1	3.6%
Total area for RU 3:	178	13.5%

Recovery Unit 4 — 3,278 Area (sq km)

	Habitat Area	Use Overlap %
Alameda	425.5	13.0%
Contra Costa	221.8	6.8%
San Joaquin	5.9	0.2%
San Mateo	209.6	6.4%
Santa Clara	36.3	1.1%
Total area for RU 4:	899	27.4%

Recovery Unit 5 — 3,647 Area (sq km)

	Habitat Area	Use Overlap %
Monterey	160.0	4.4%
San Luis Obispo	356.4	9.8%
San Mateo	218.1	6.0%
Santa Cruz	248.6	6.8%
Total area for RU 5:	983	27.0%

Recovery Unit 6 — 5,307 Area (sq km)

	Habitat Area	Use Overlap %
Fresno	10.6	0.2%
Kern	6.4	0.1%
Merced	52.9	1.0%
Monterey	344.0	6.5%
San Benito	251.2	4.7%
San Luis Obispo	200.9	3.8%
Santa Clara	24.6	0.5%
Santa Cruz	50.1	0.9%
Total area for RU 6:	941	17.7%

Recovery Unit 7 — 4,916 Area (sq km)

	Habitat Area	Use Overlap %
Los Angeles	2.5	0.1%
San Luis Obispo	70.5	1.4%
Santa Barbara	1,095.5	22.3%
Ventura	168.6	3.4%
Total area for RU 7:	1,337	27.2%

Recovery Unit 8 — 3,326 Area (sq km)

	Habitat Area	Use Overlap %
Los Angeles	218.9	6.6%
Orange	41.3	1.2%
Riverside	144.6	4.3%
San Bernardino	13.9	0.4%
San Diego	387.1	11.6%
Ventura	49.5	1.5%
Total area for RU 8:	855	25.7%

Forest, Conifer with a 640 meter buffer

Recovery Unit 1 — 3,654 Area (sq km)

	Habitat Area	Use Overlap %
Amador	190.6	5.2%
Butte	367.2	10.0%
Calaveras	456.9	12.5%
El Dorado	1,080.5	29.6%
Mariposa	53.7	1.5%
Nevada	27.2	0.7%
Plumas	330.3	9.0%
Sacramento	8.9	0.2%
Tuolumne	720.5	19.7%
Yuba	102.1	2.8%
Total area for RU 1:	3,338	91.3%

Recovery Unit 2 — 2,742 Area (sq km)

	Habitat Area	Use Overlap %
Colusa	0.6	0.0%
Lake	869.3	31.7%
Marin	9.1	0.3%
Napa	226.7	8.3%
Shasta	73.8	2.7%
Solano	6.5	0.2%
Tehama	510.4	18.6%
Yolo	198.8	7.2%
Total area for RU 2:	1,895	69.1%

Recovery Unit 3 — 1,320 Area (sq km)

	Habitat Area	Use Overlap %
Marin	755.4	57.2%
Napa	201.9	15.3%
Solano	77.8	5.9%
Sonoma	78.2	5.9%
Total area for RU 3:	1,113	84.3%

Recovery Unit 4 — 3,278 Area (sq km)

	Habitat Area	Use Overlap %
Alameda	825.8	25.2%
Contra Costa	443.7	13.5%
San Joaquin	67.8	2.1%
San Mateo	257.1	7.8%
Santa Clara	837.9	25.6%
Stanislaus	113.0	3.4%
Total area for RU 4:	2,545	77.6%

Recovery Unit 5 — 3,647 Area (sq km)

	Habitat Area	Use Overlap %
Monterey	914.7	25.1%
San Luis Obispo	1,205.6	33.1%
San Mateo	635.3	17.4%
Santa Clara	3.0	0.1%
Santa Cruz	562.2	15.4%
Total area for RU 5:	3,321	91.0%

Recovery Unit 6 — 5,307 Area (sq km)

	Habitat Area	Use Overlap %
Fresno	39.0	0.7%
Kern	3.7	0.1%
Merced	451.0	8.5%
Monterey	552.0	10.4%
San Benito	985.9	18.6%
San Luis Obispo	93.2	1.8%
Santa Clara	193.4	3.6%
Santa Cruz	22.7	0.4%
Stanislaus	56.0	1.1%
Total area for RU 6:	2,397	45.2%

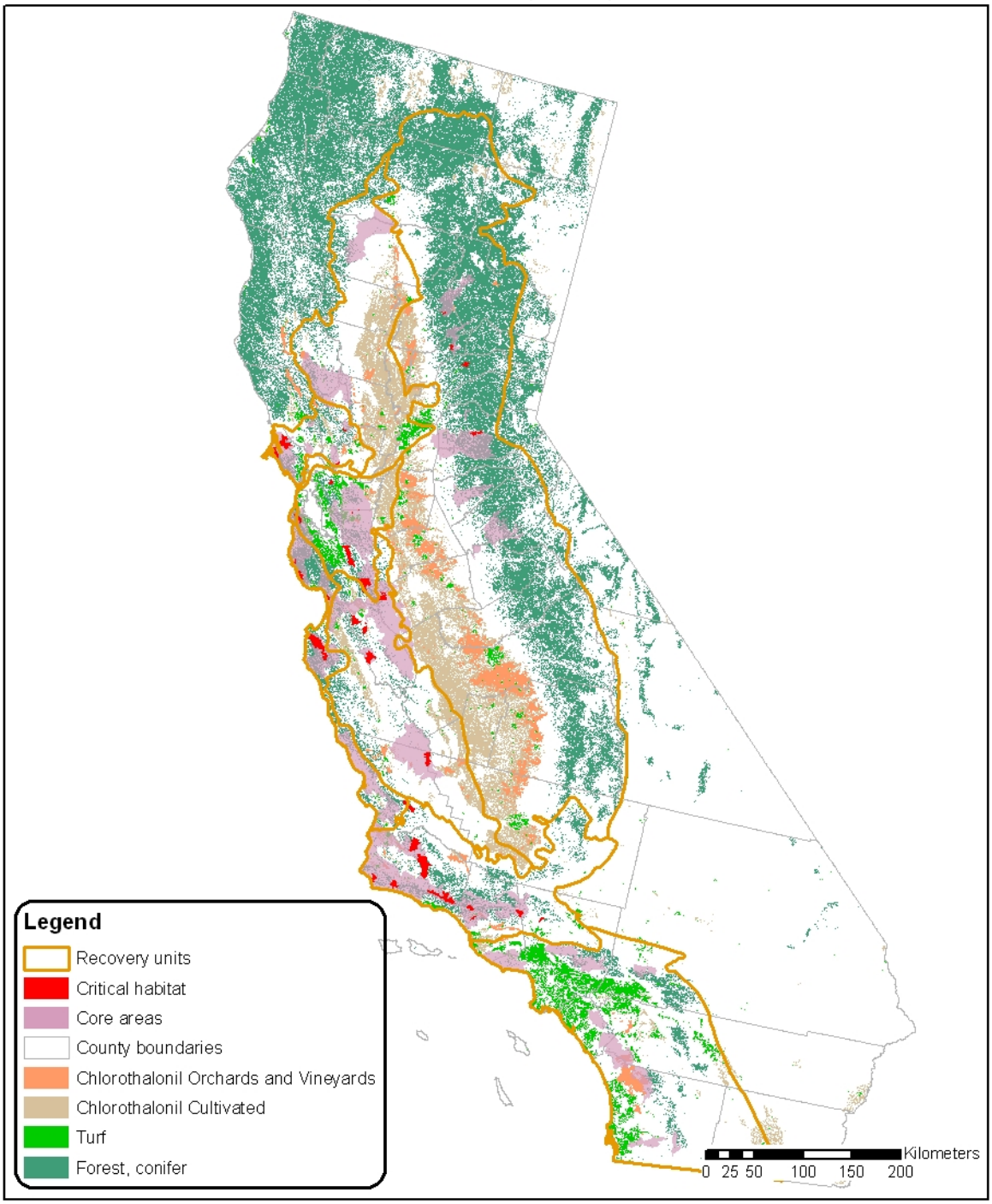
Recovery Unit 7 — 4,916 Area (sq km)

	Habitat Area	Use Overlap %
Los Angeles	192.4	3.9%
San Luis Obispo	53.9	1.1%
Santa Barbara	2,625.9	53.4%
Ventura	1,313.3	26.7%
Total area for RU 7:	4,186	85.1%

Recovery Unit 8 — 3,326 Area (sq km)

	Habitat Area	Use Overlap %
Los Angeles	811.8	24.4%
Orange	162.0	4.9%
Riverside	150.3	4.5%
San Bernardino	126.1	3.8%
San Diego	459.9	13.8%
Ventura	95.5	2.9%
Total area for RU 8:	1,806	54.3%

Chlorothalonil Cultivated, Orchards, Turf, & Conifer Land Use Sites



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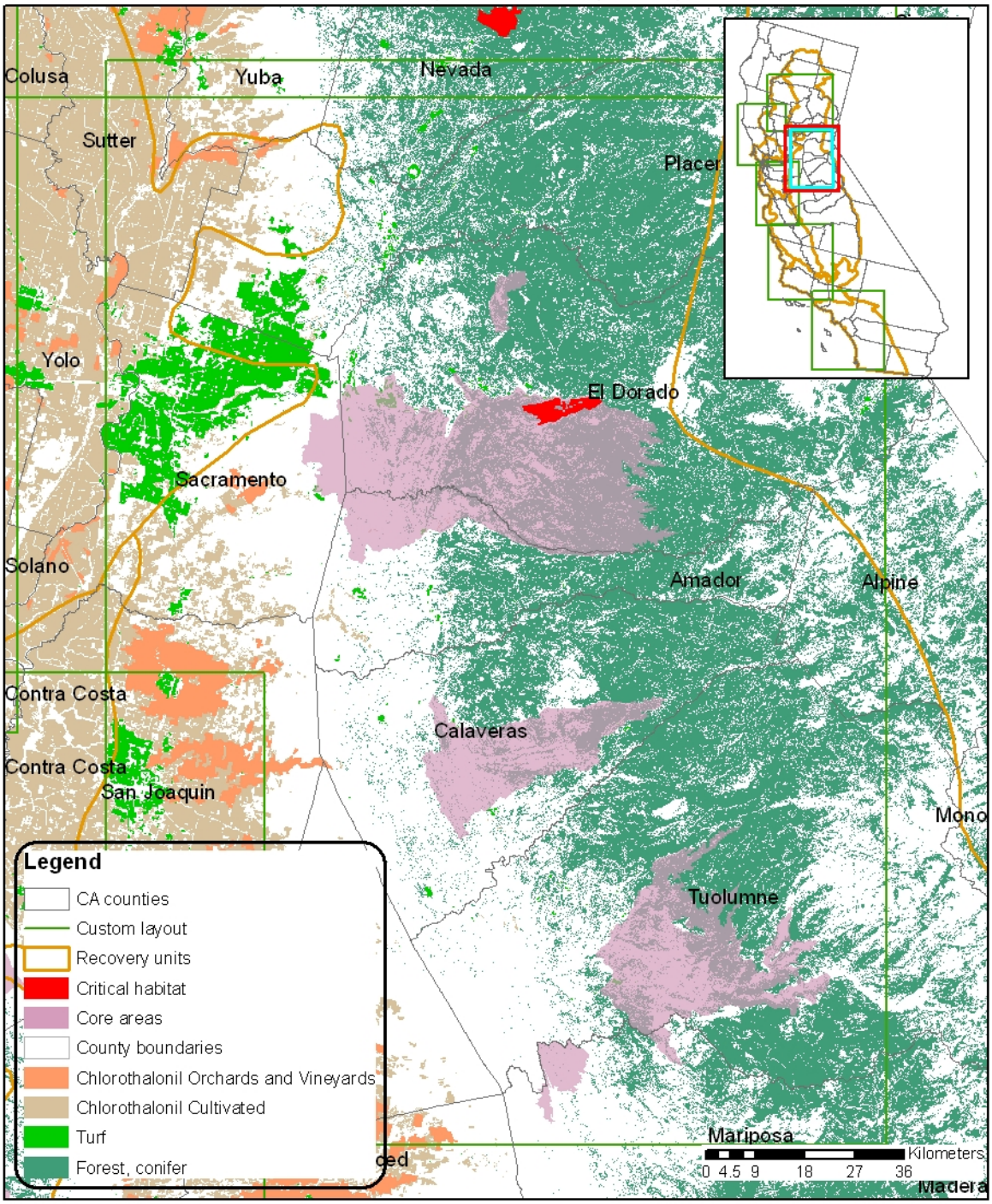
Chlorothalonil Cultivated, Orchards, Turf, & Conifer - RU 1



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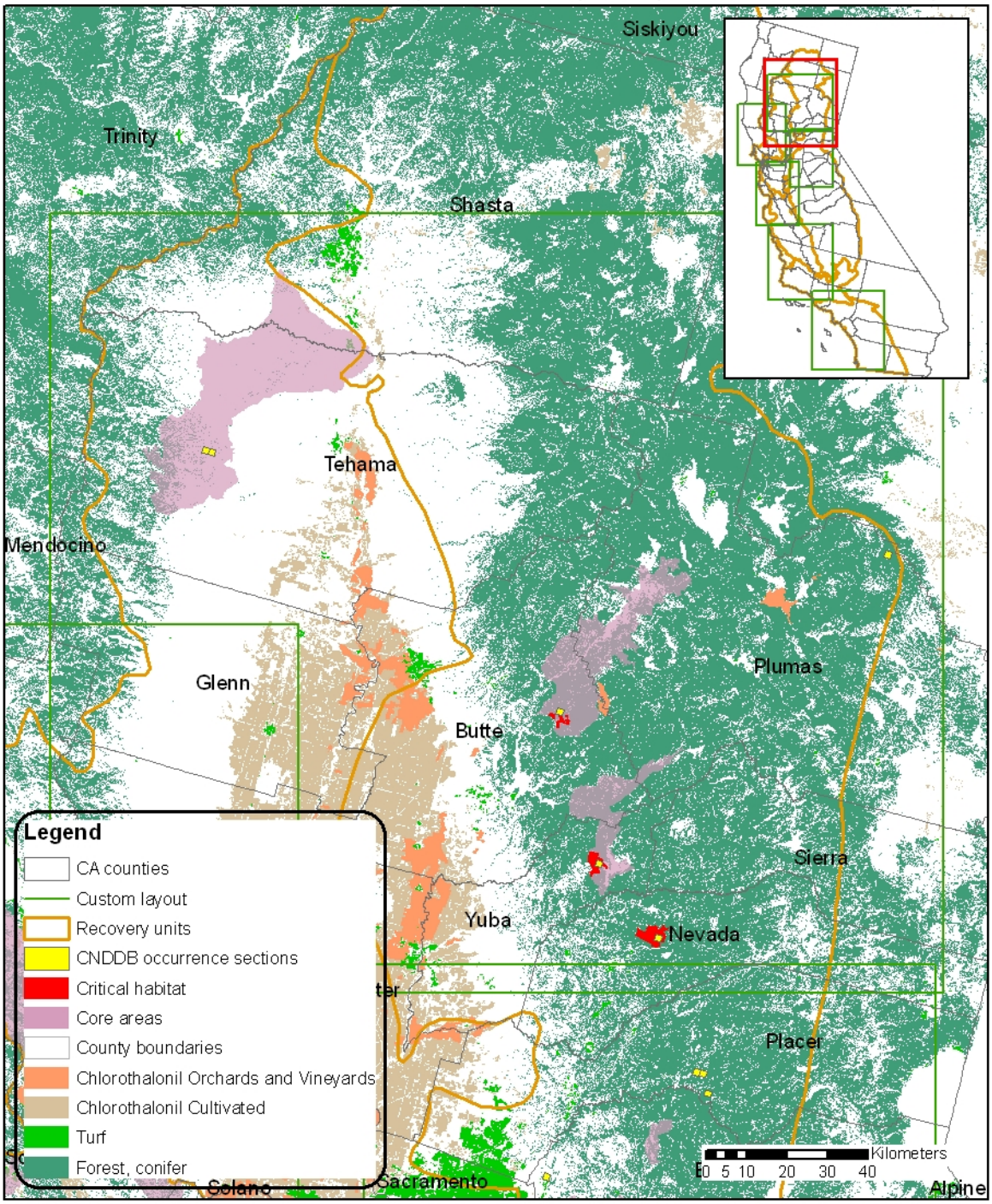
Chlorothalonil Cultivated, Orchards, Turf, & Conifer - RU 1, 2



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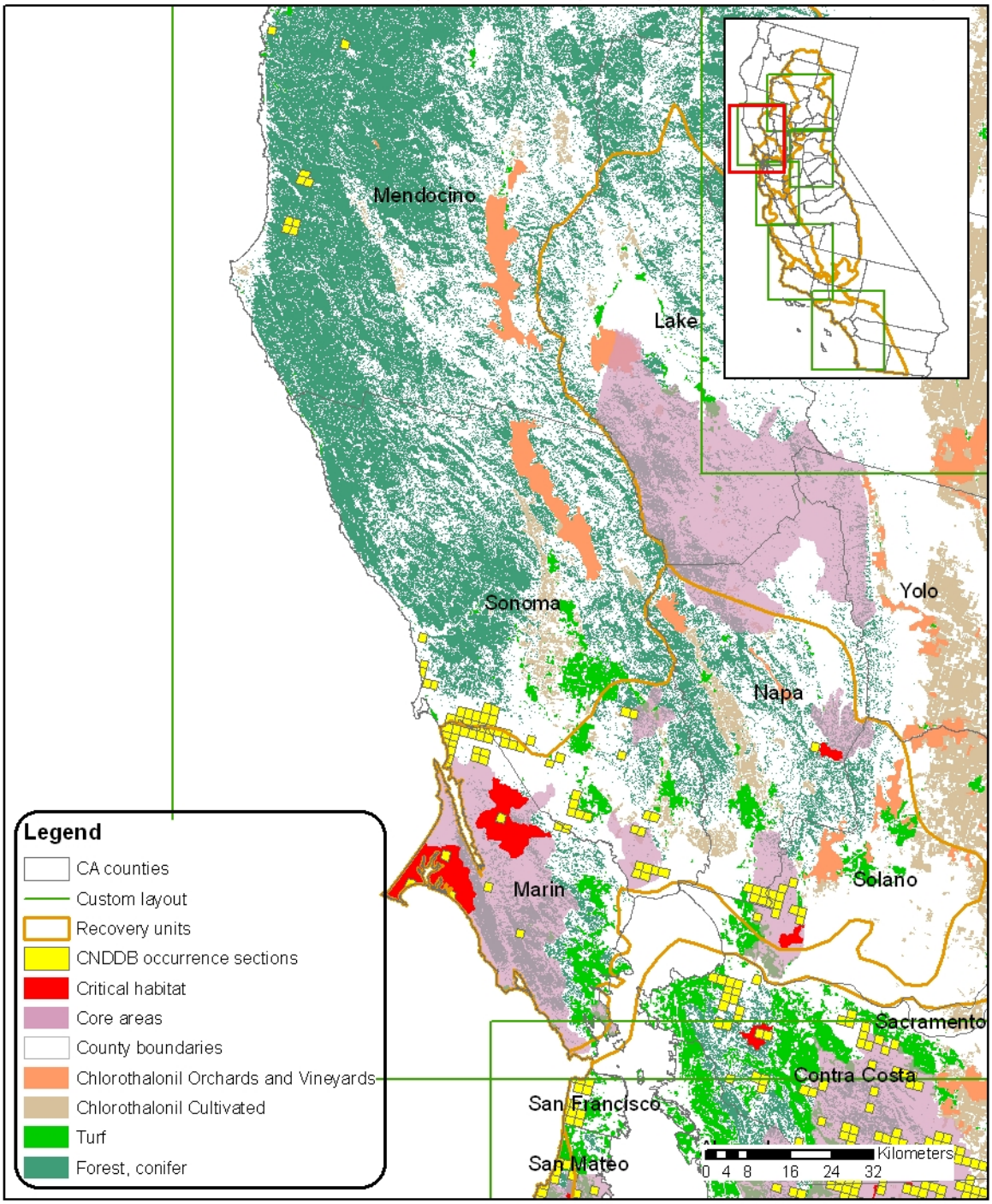
Chlorothalonil Cultivated, Orchards, Turf, & Conifer - RU 2, 3



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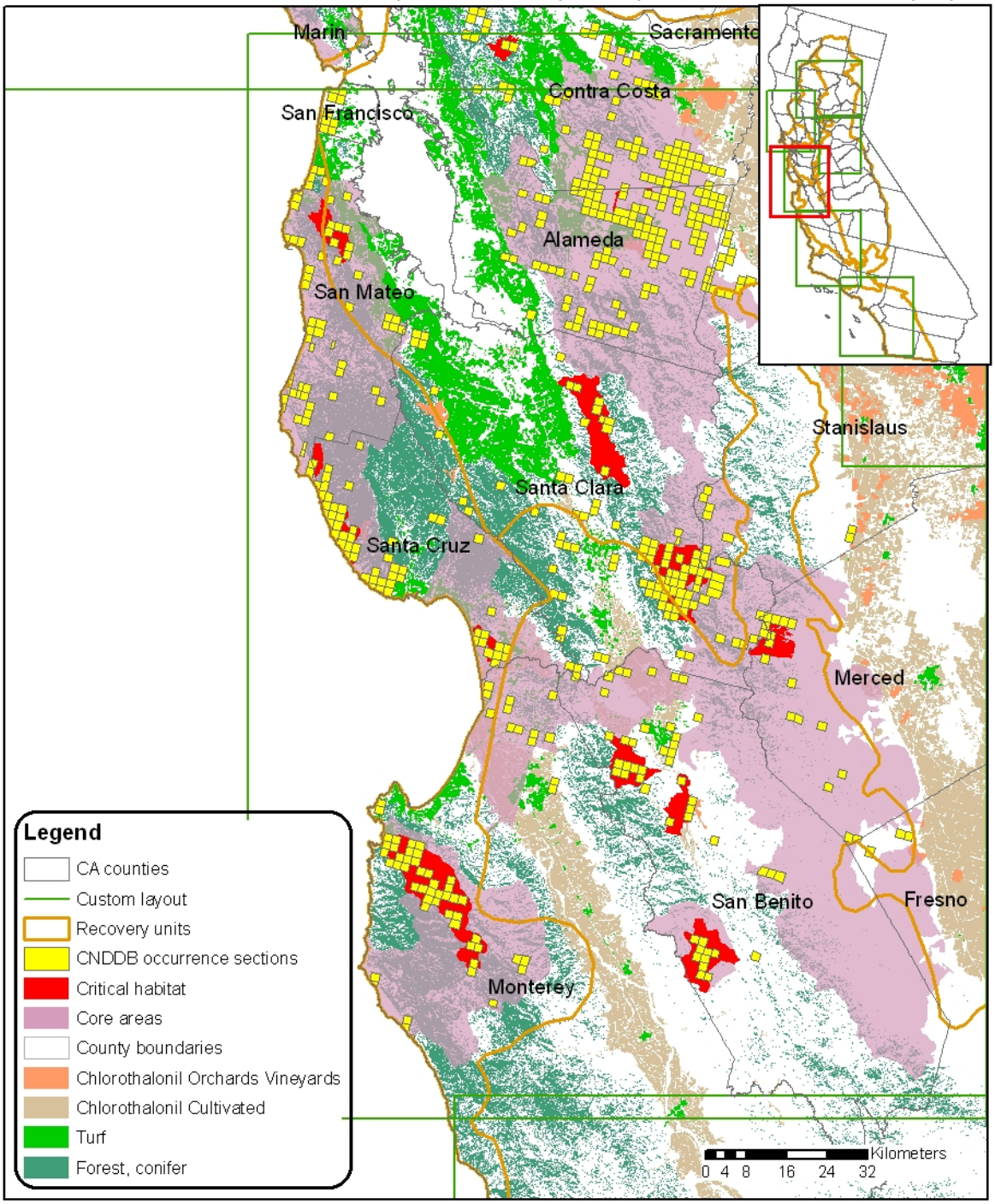
Chlorothalonil Cultivated, Orchards, Turf, & Conifer - RU 4, 5, 6



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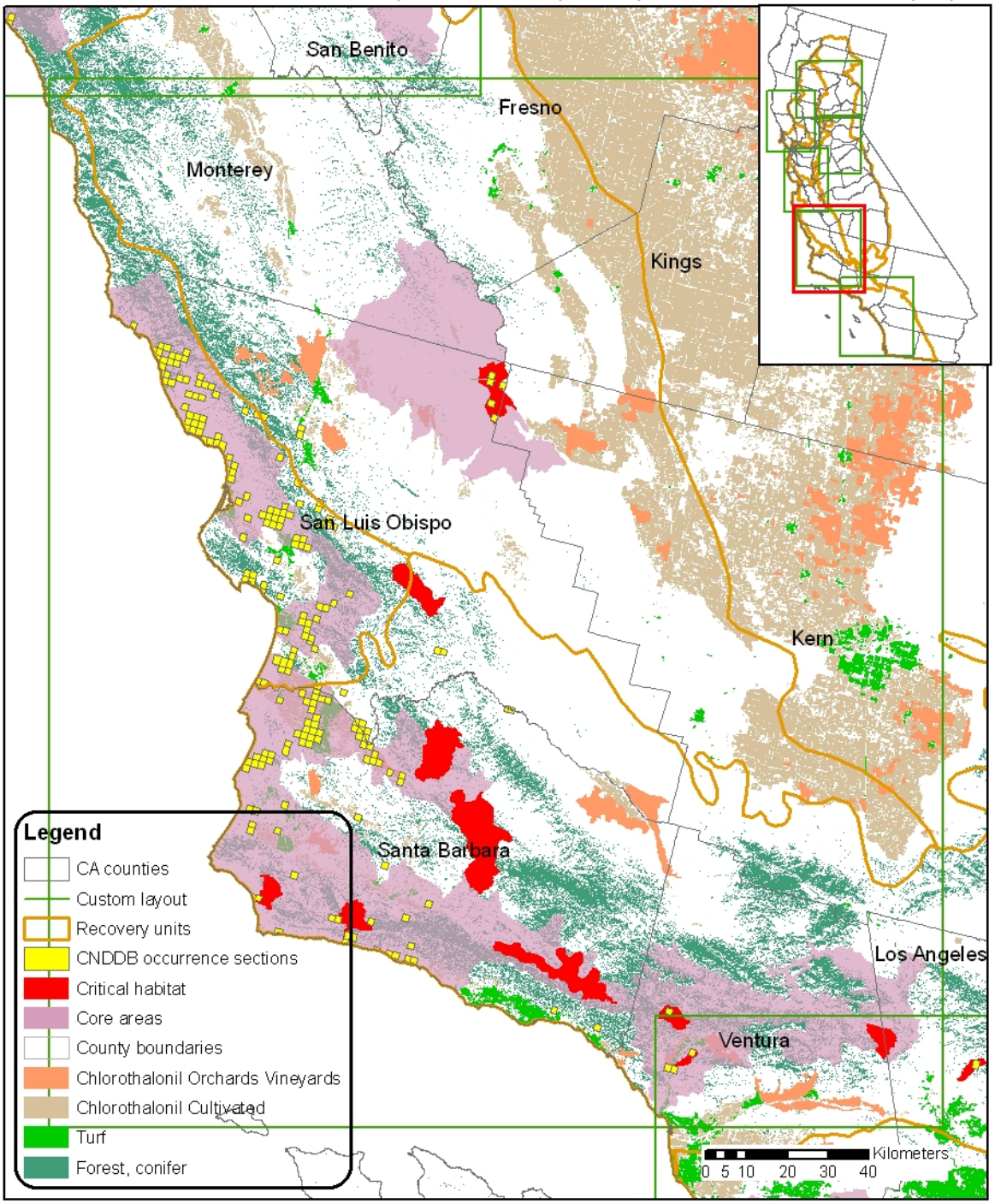
Chlorothalonil Cultivated, Orchards, Turf, & Conifer - RU 5, 6, 7



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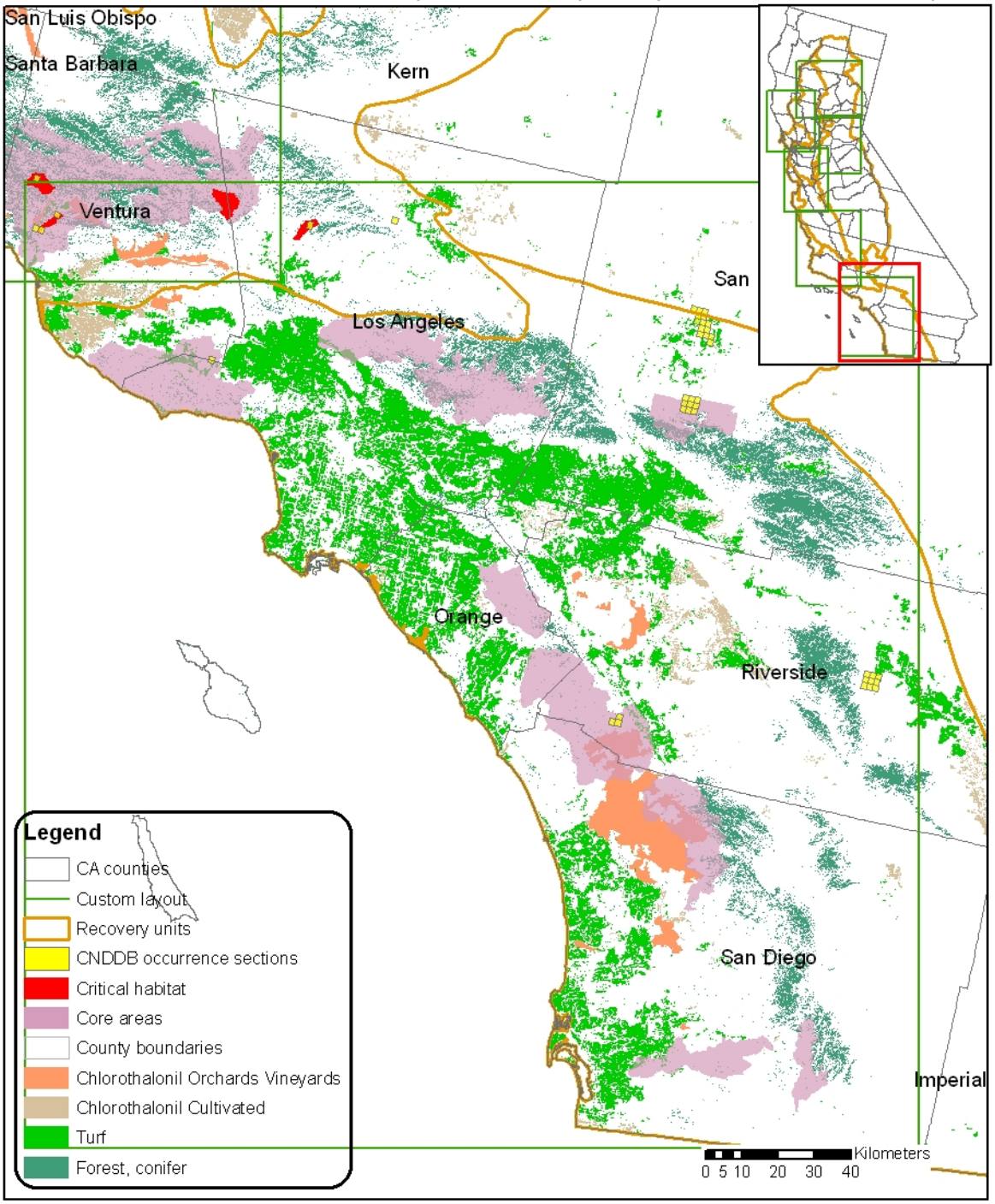
Chlorothalonil Cultivated, Orchards, Turf, & Conifer - RU 7, 8



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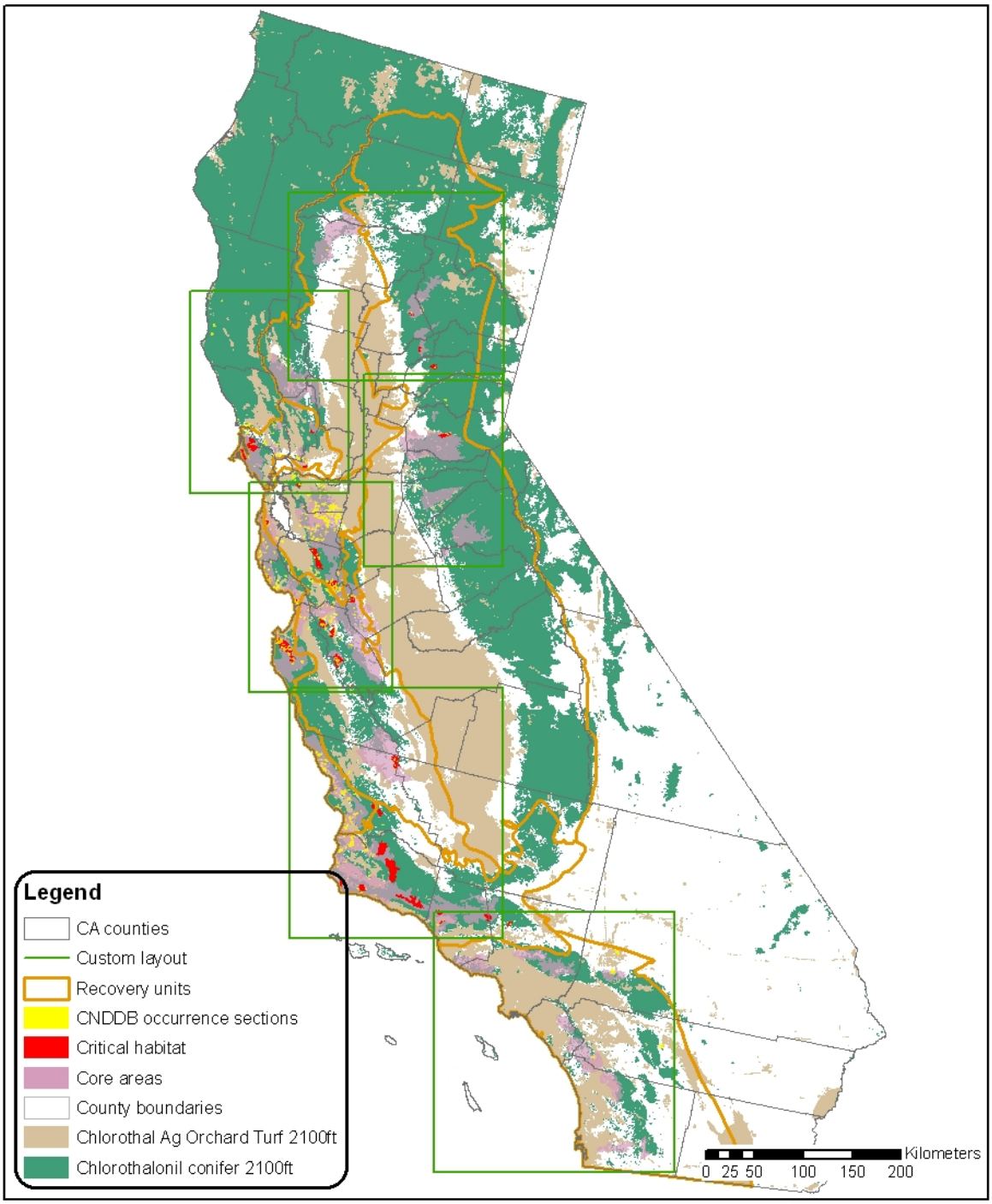
Chlorothalonil Cult. Orch, Turf & Conifer (2100ft buffer) - Action Area



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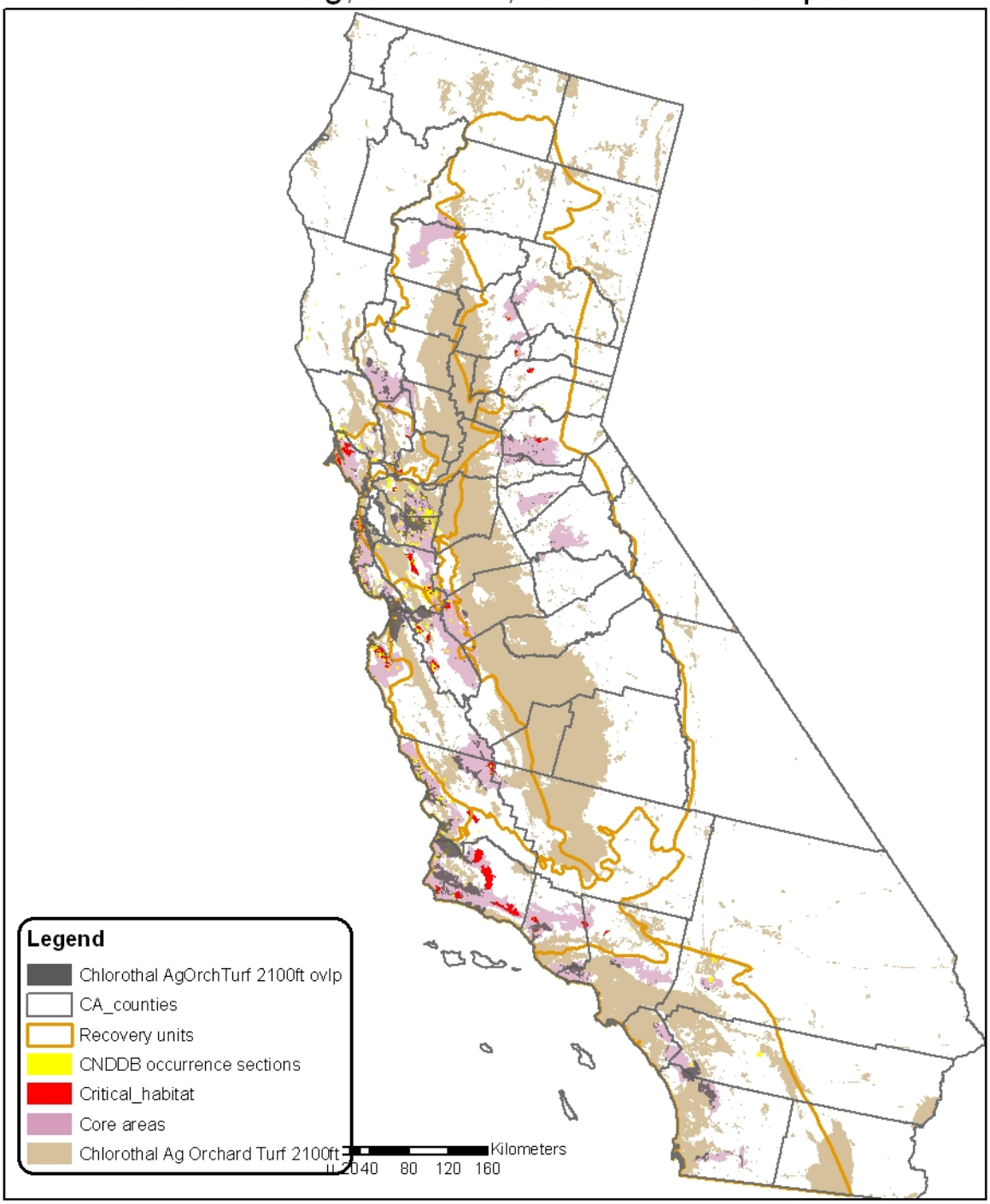
Chlorothalonil Ag, Orchards, Turf 2100ft Overlap Areas



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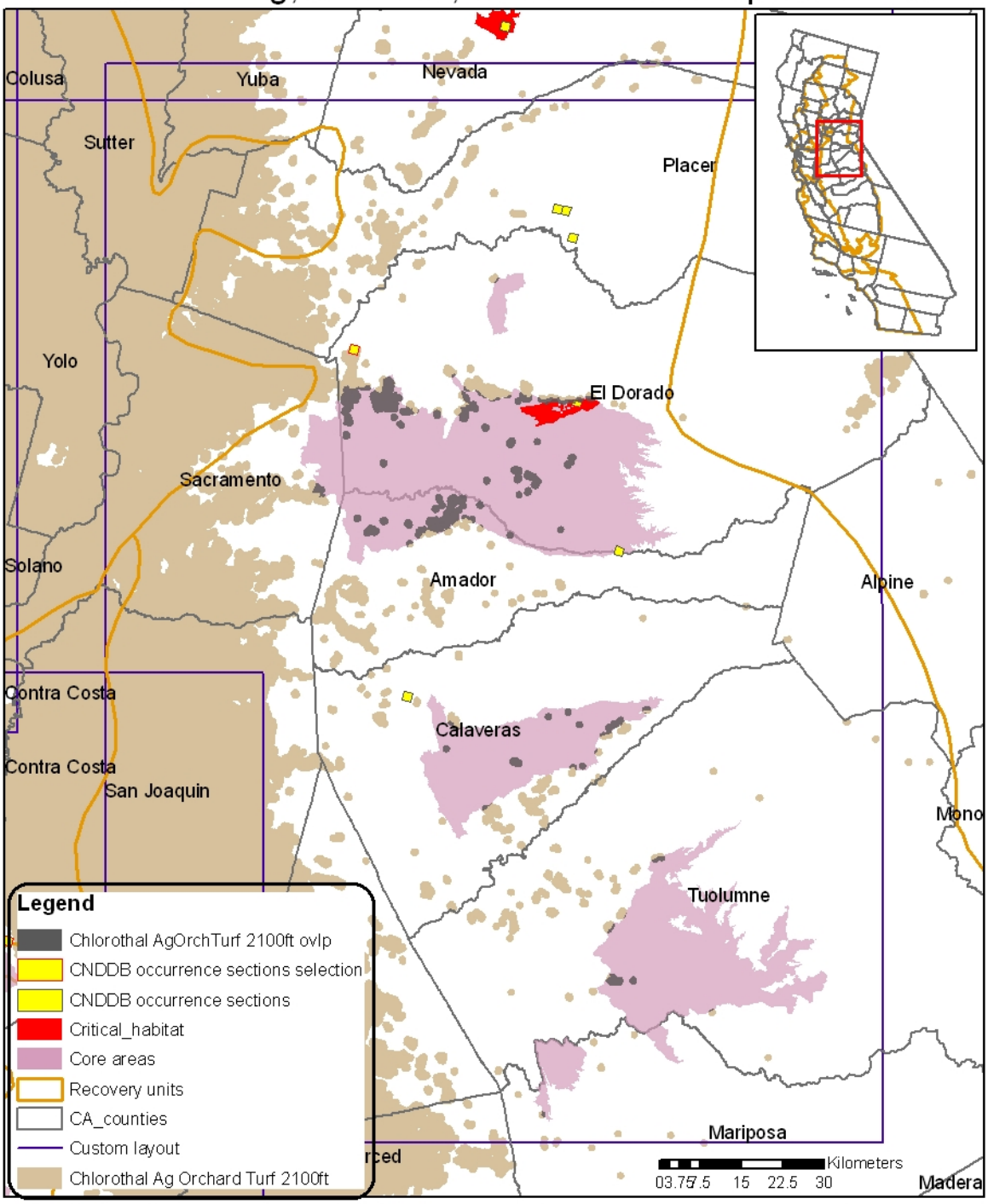
Chlorothalonil Ag, Orchards, Turf 2100ft Overlap Areas - RU 1



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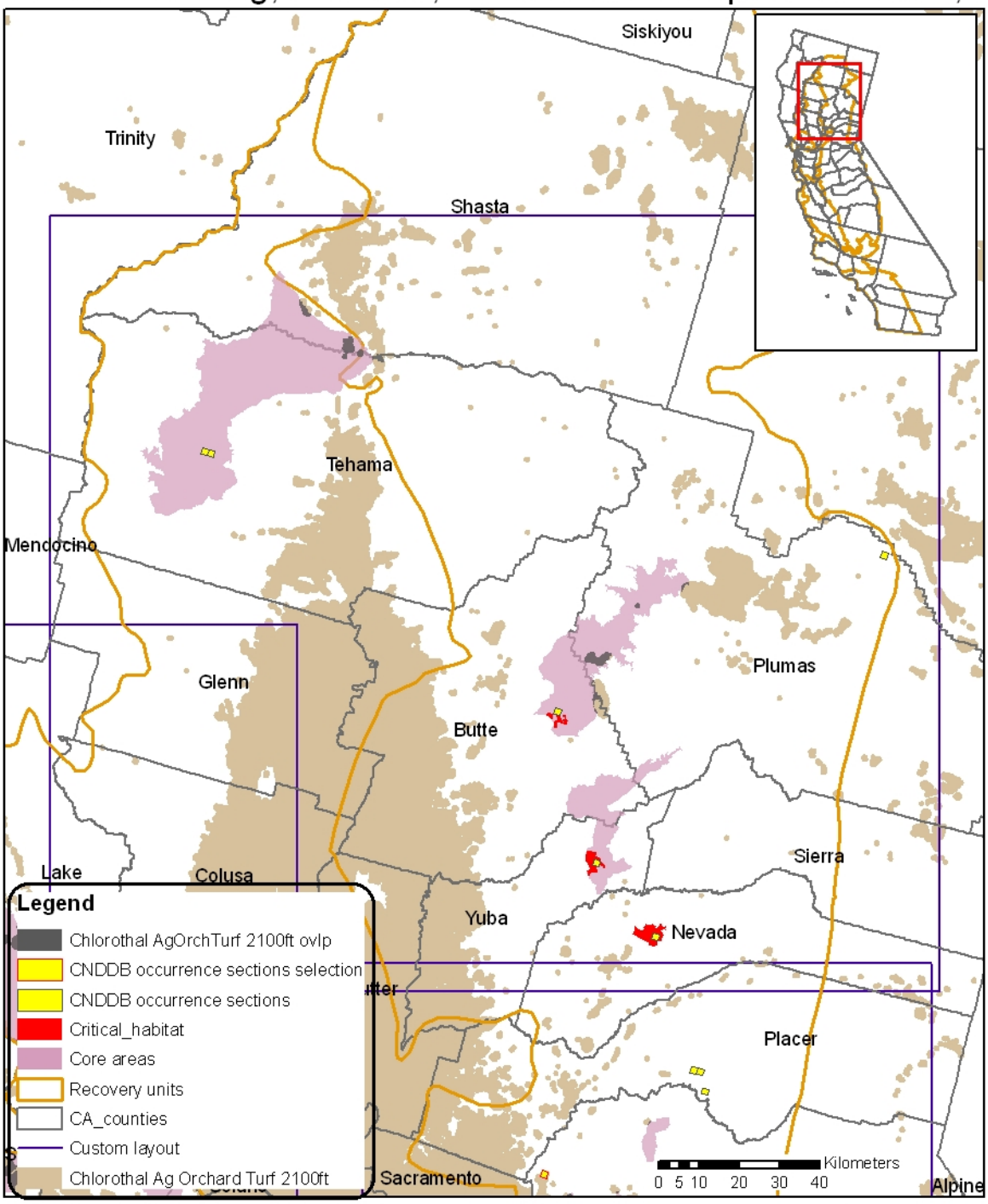
Chlorothalonil Ag, Orchards, Turf 2100ft Overlap Areas - RU 1, 2



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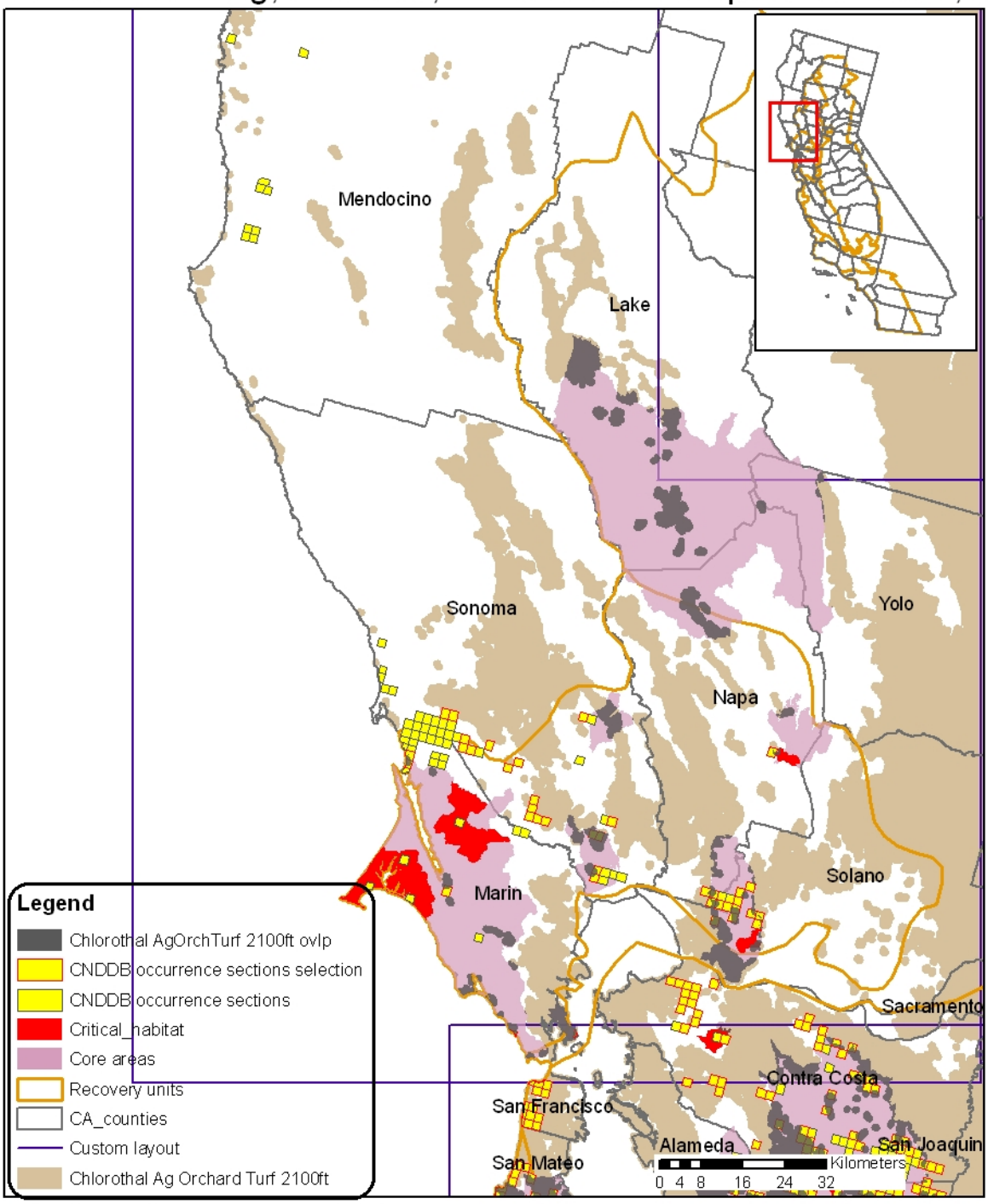
Chlorothalonil Ag, Orchards, Turf 2100ft Overlap Areas - RU 2, 3



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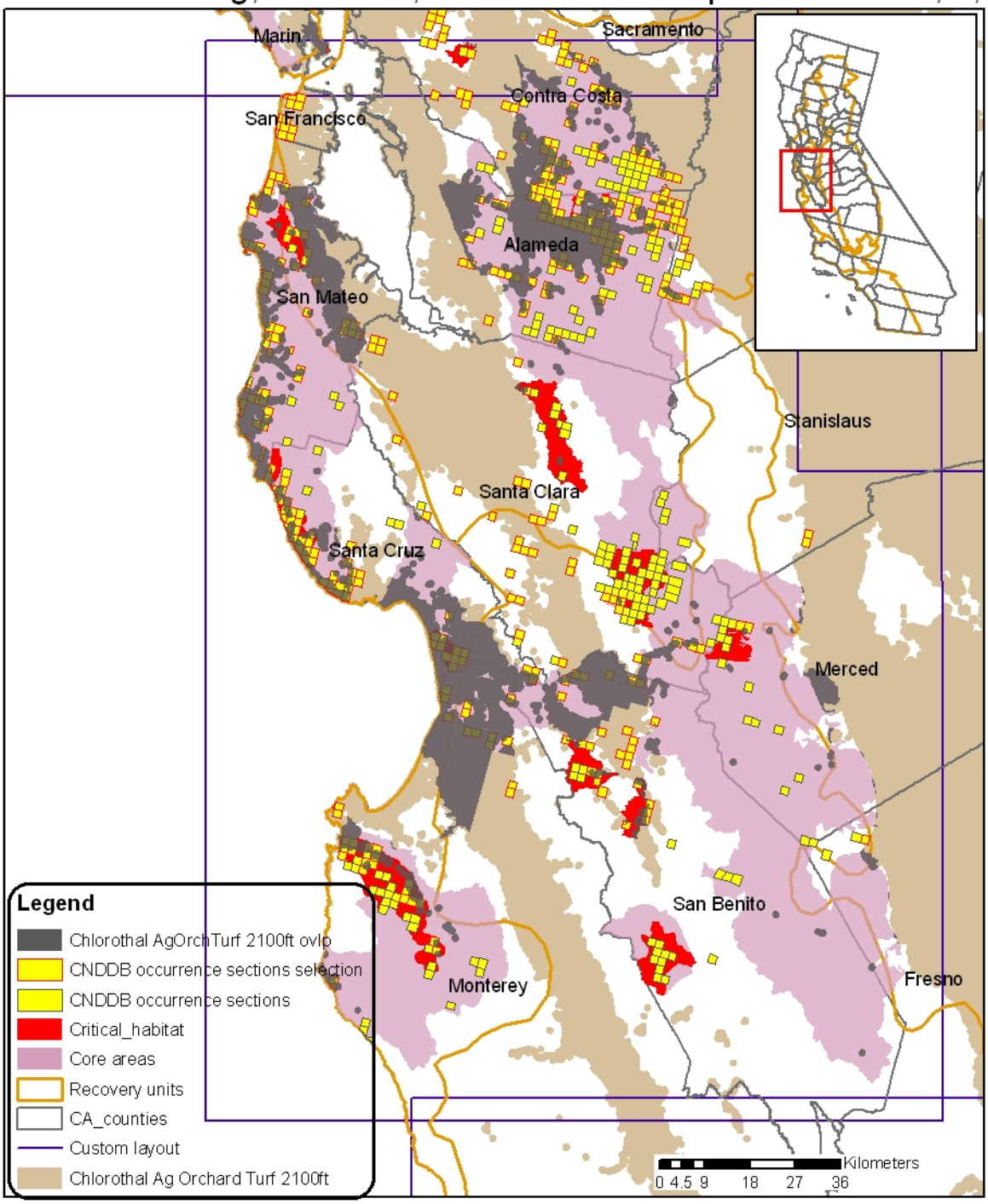
Chlorothalonil Ag, Orchards, Turf 2100ft Overlap Areas - RU 4, 5, 6



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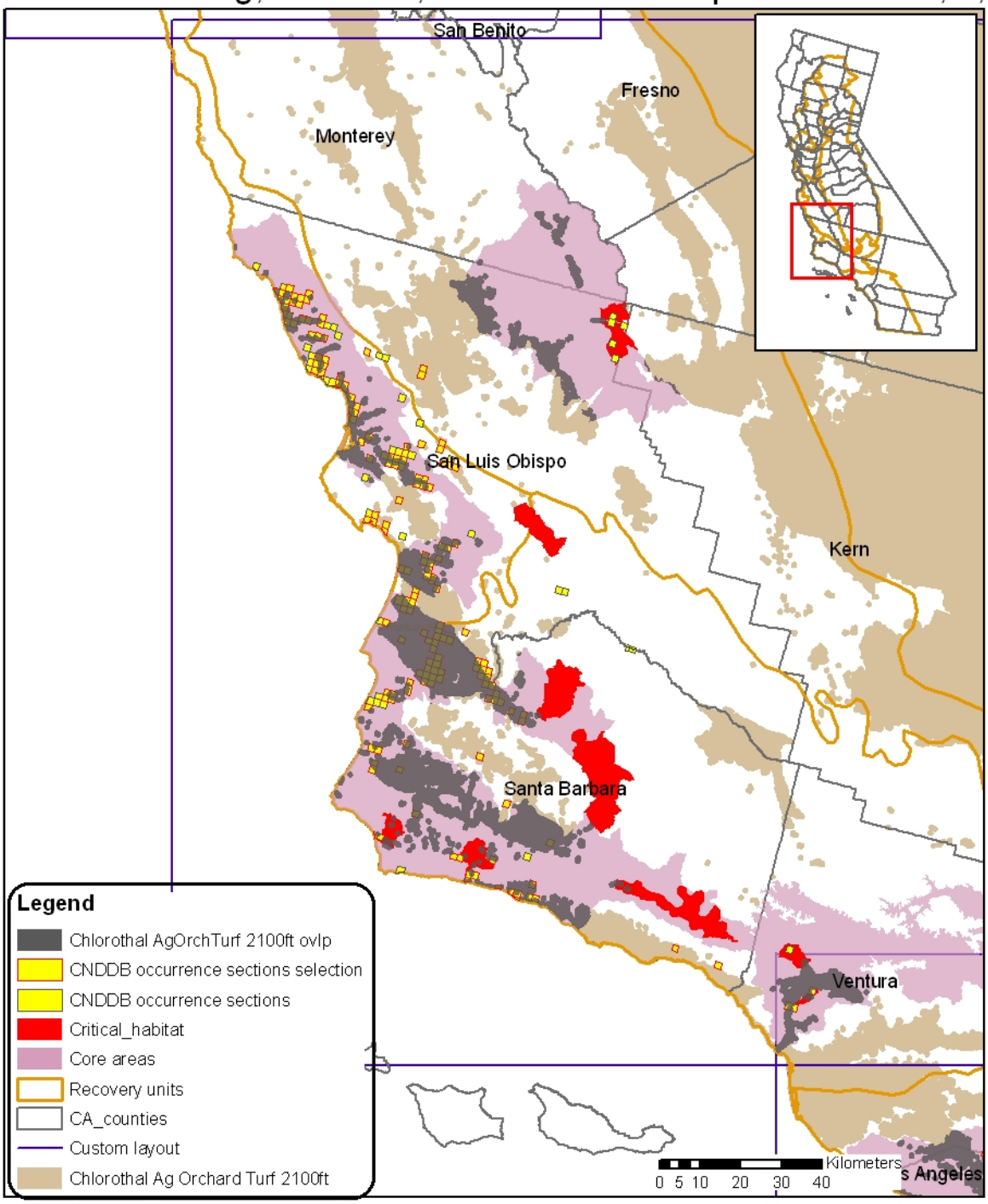
Chlorothalonil Ag, Orchards, Turf 2100ft Overlap Areas - RU 5, 6, 7



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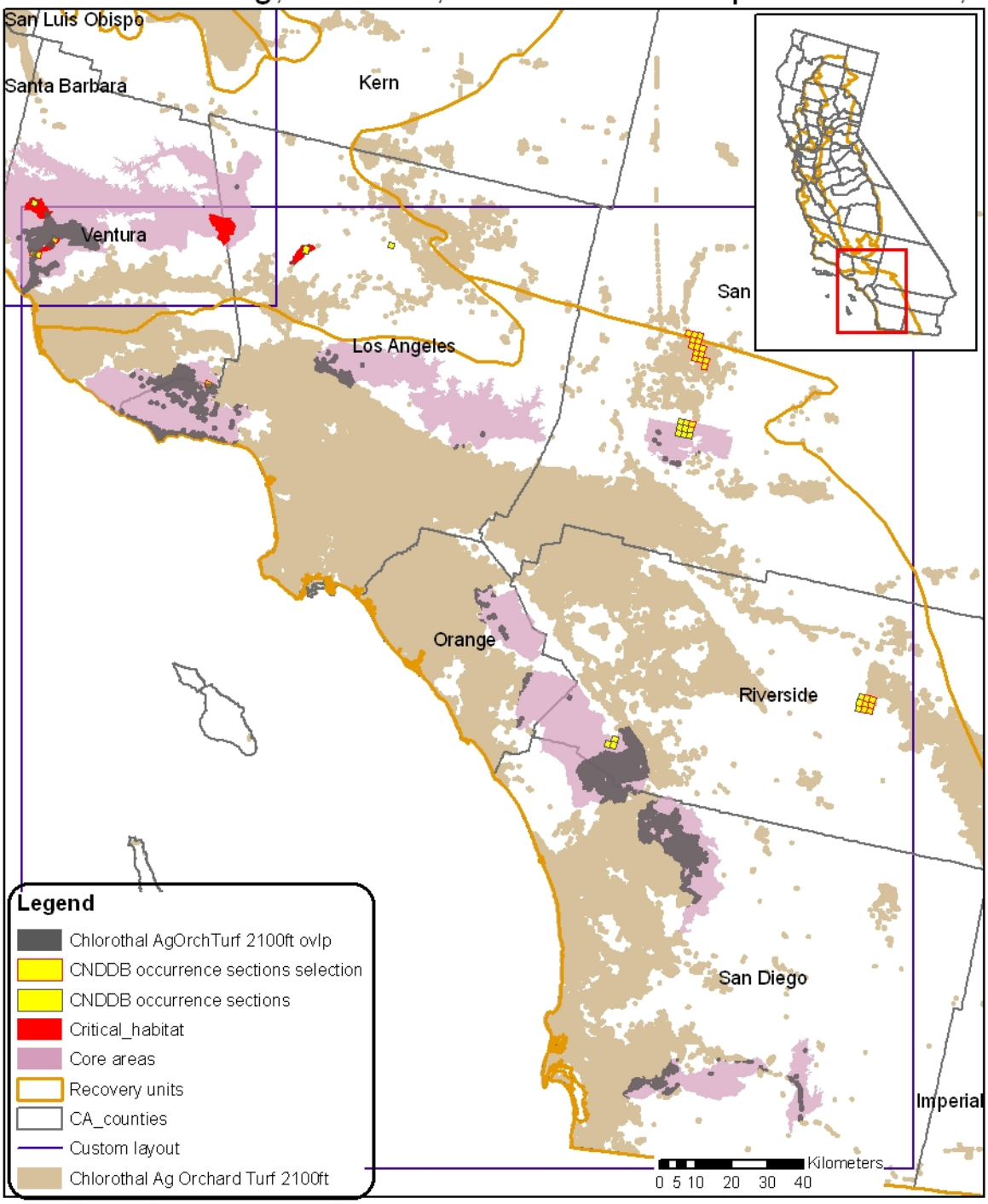
Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

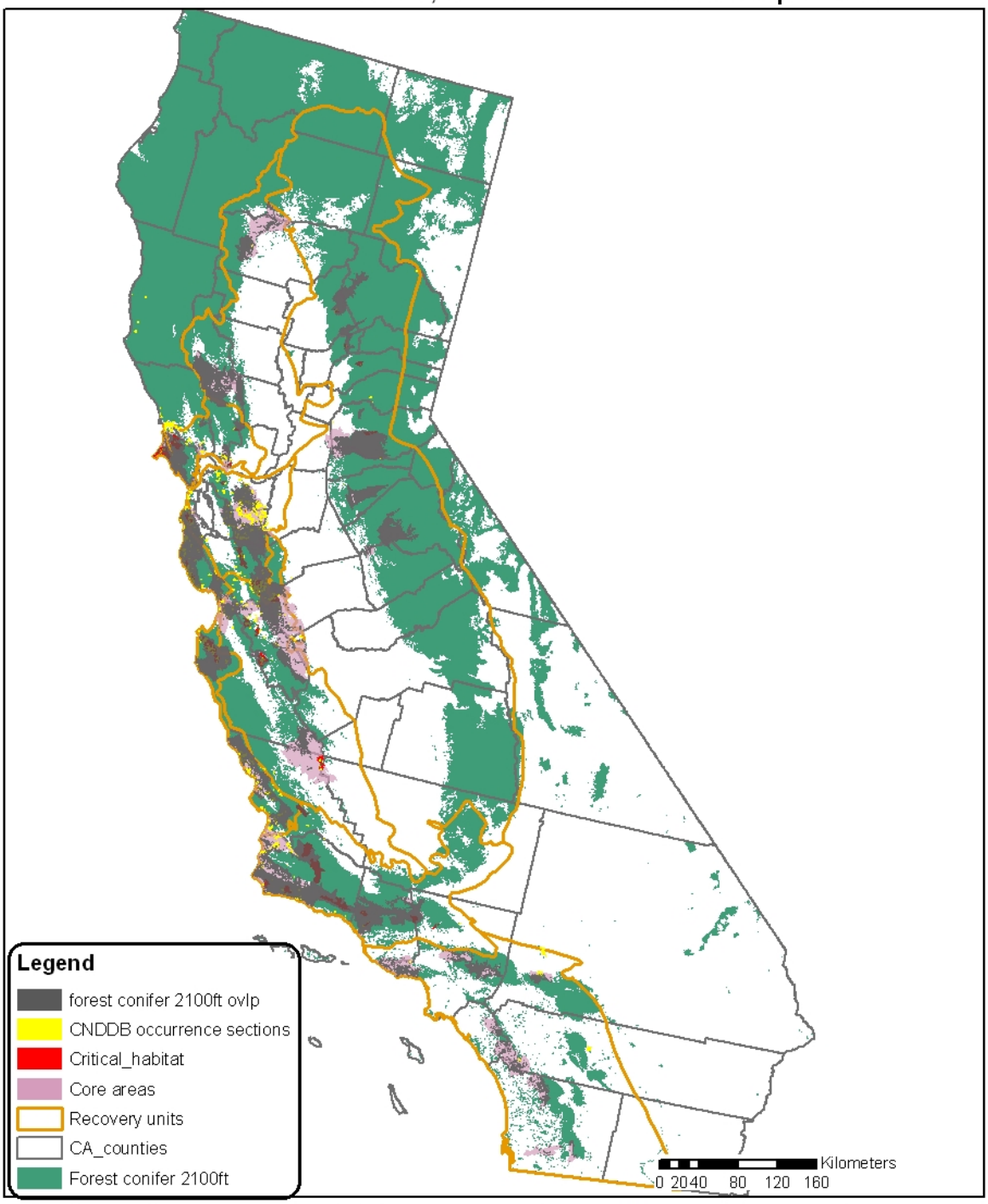
Chlorothalonil Ag, Orchards, Turf 2100ft Overlap Areas - RU 7, 8



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. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

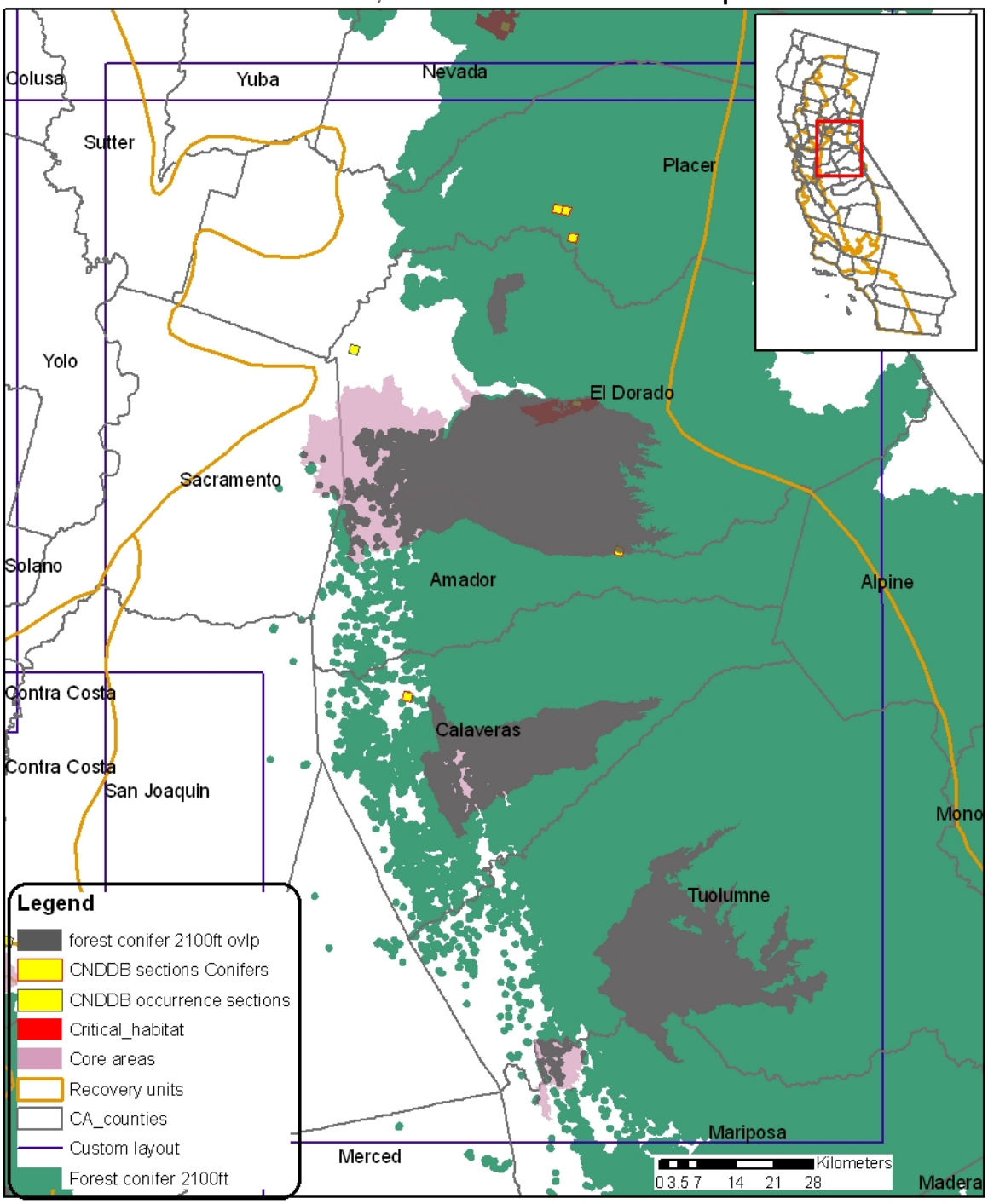
Chlorothalonil Forest, Conifer 2100ft Overlap Areas



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. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

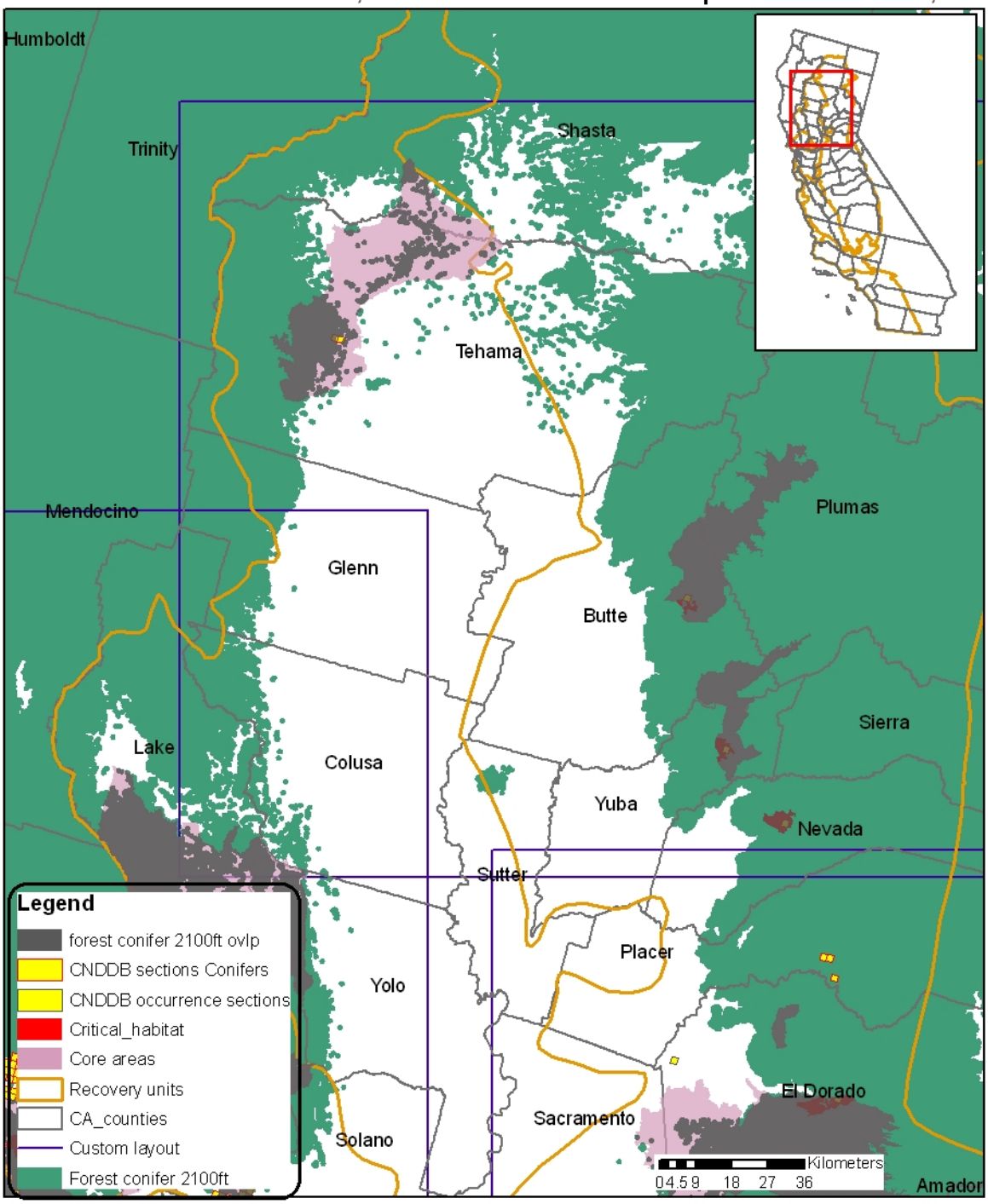
Chlorothalonil Forest, Conifer 2100ft Overlap Areas - RU 1



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. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

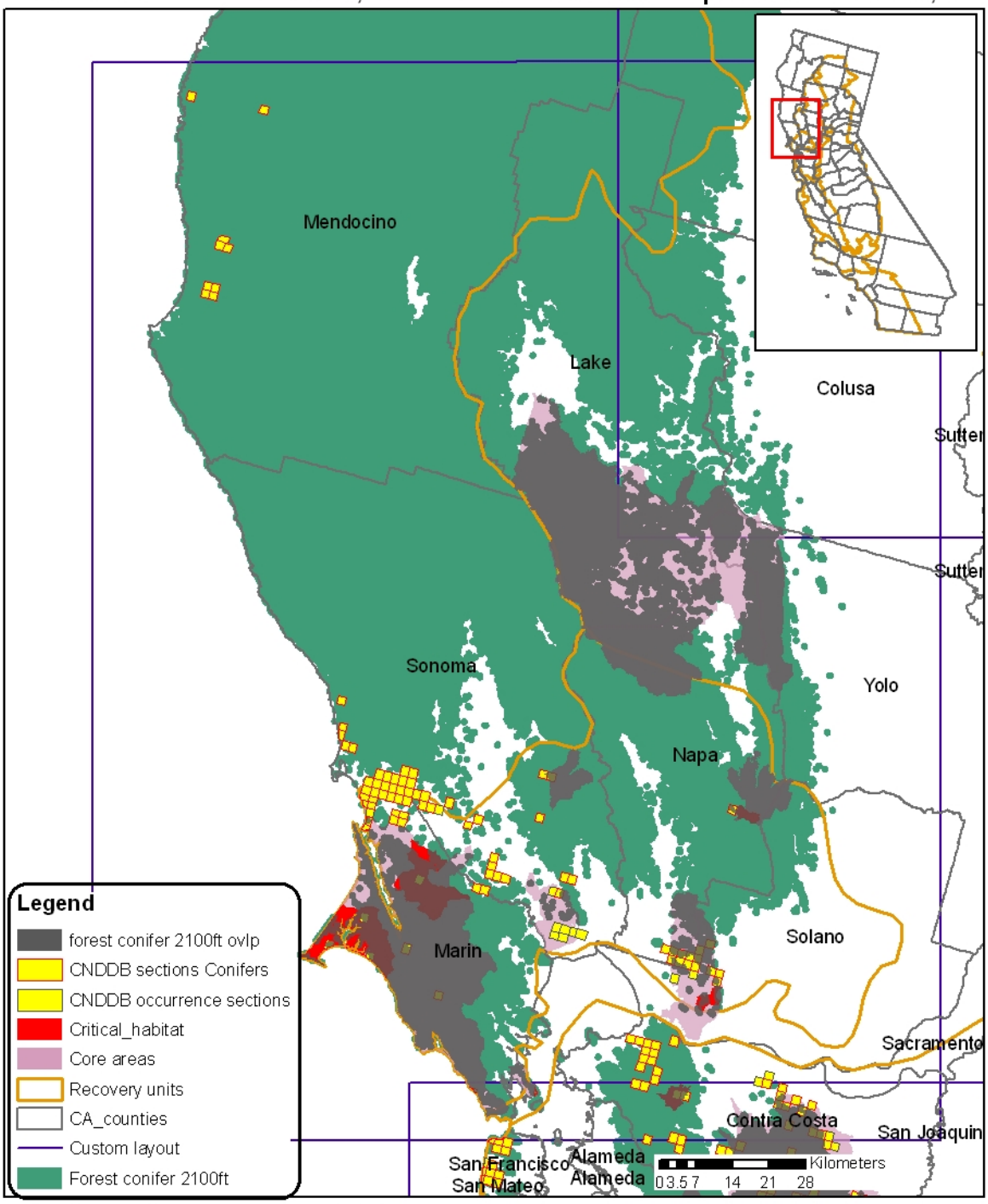
Chlorothalonil Forest, Conifer 2100ft Overlap Areas - RU 1, 2



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. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

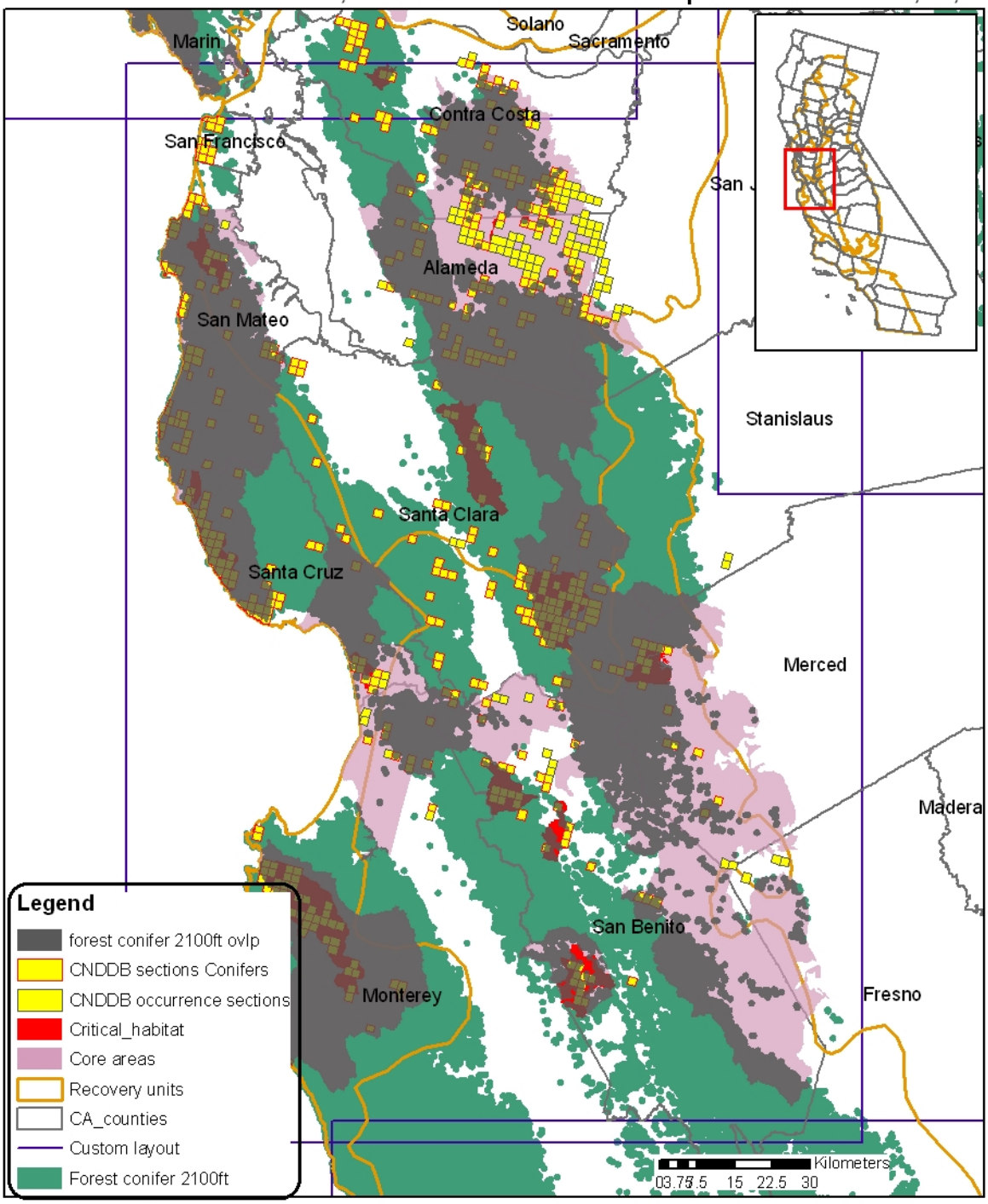
Chlorothalonil Forest, Conifer 2100ft Overlap Areas - RU 2, 3



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. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

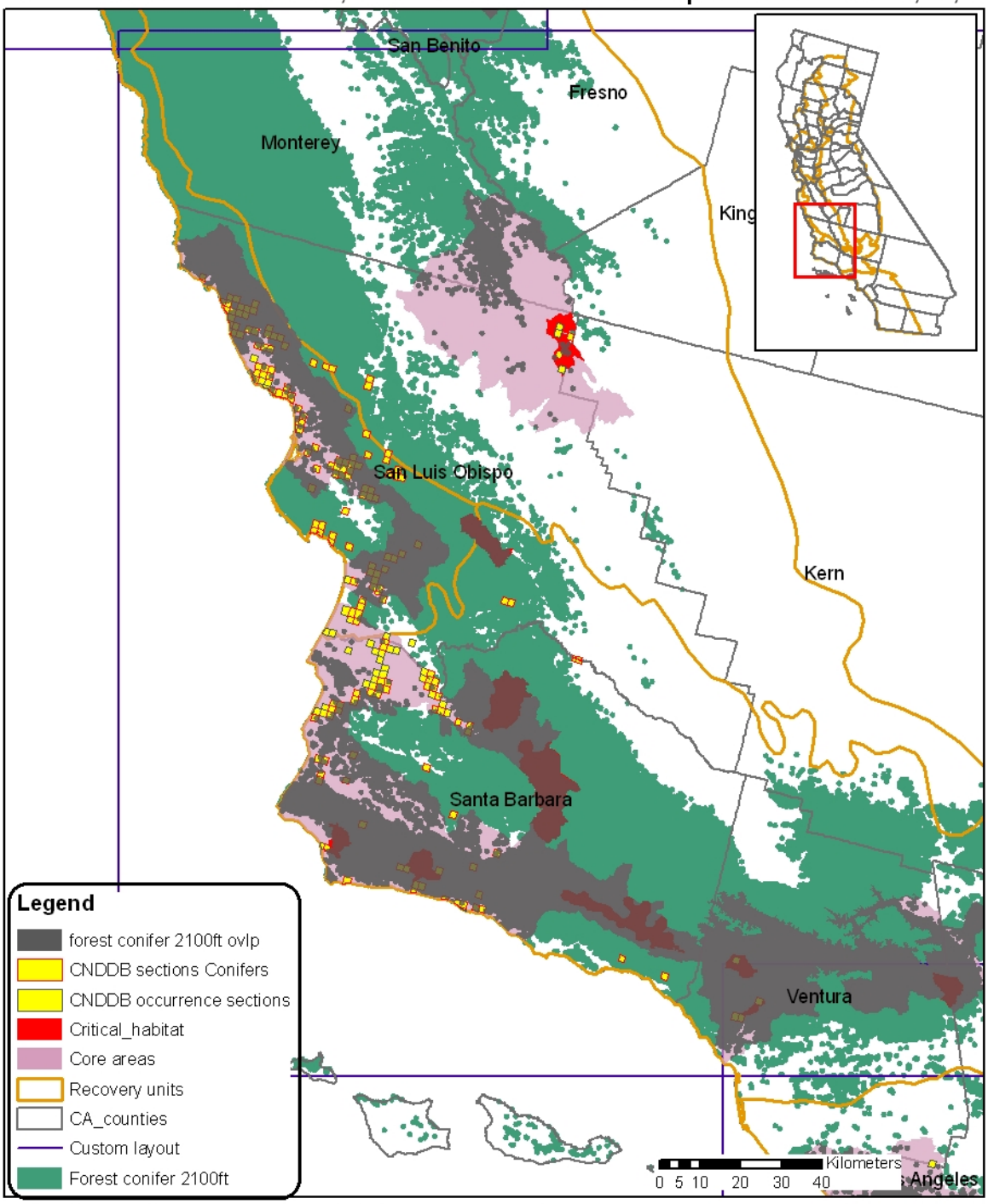
Chlorothalonil Forest, Conifer 2100ft Overlap Areas - RU 4, 5, 6



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. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

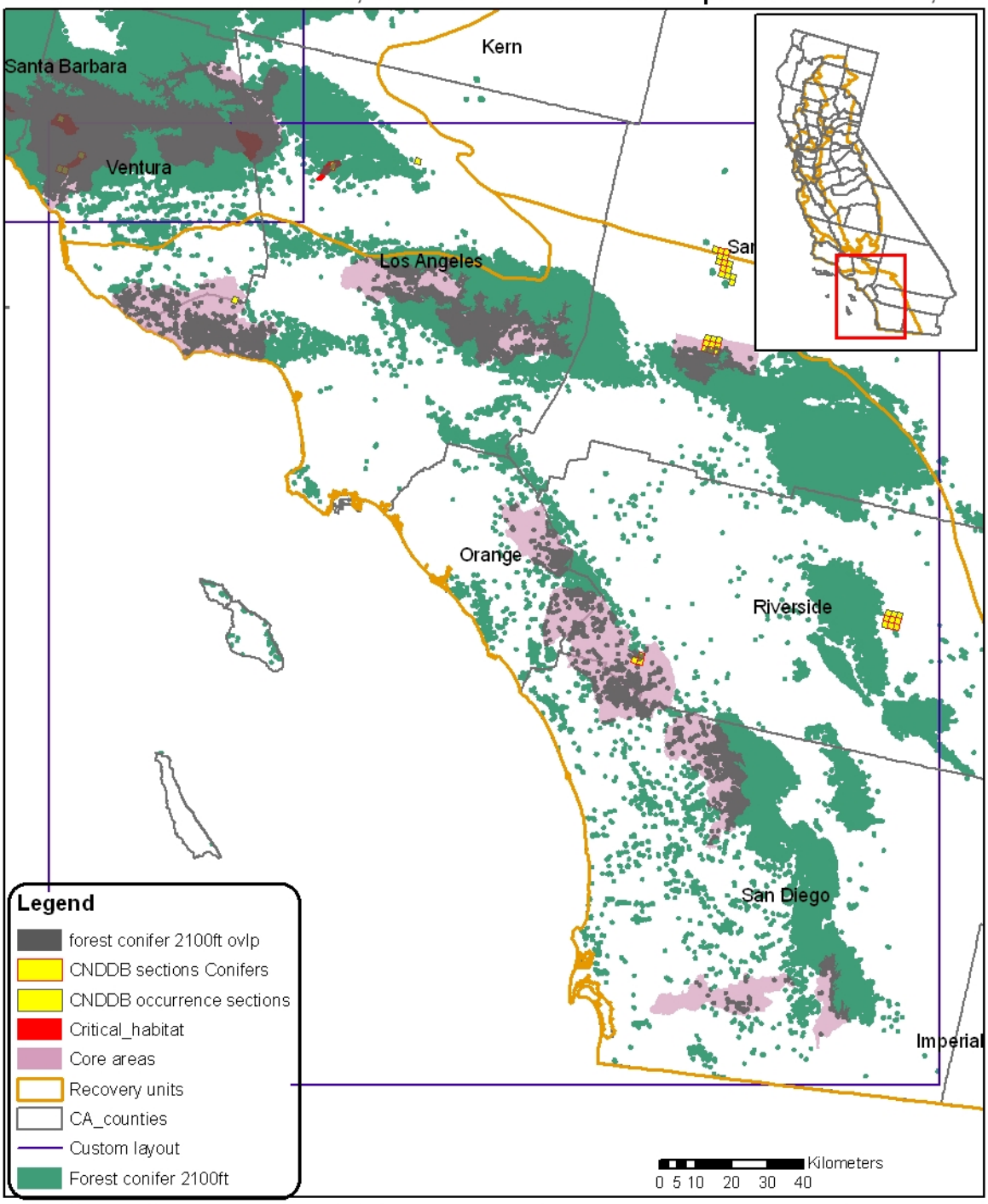
Chlorothalonil Forest, Conifer 2100ft Overlap Areas - RU 5, 6, 7



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. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

Chlorothalonil Forest, Conifer 2100ft Overlap Areas - RU 7, 8



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

Spatially Determined Analysis for Waterbodies

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.

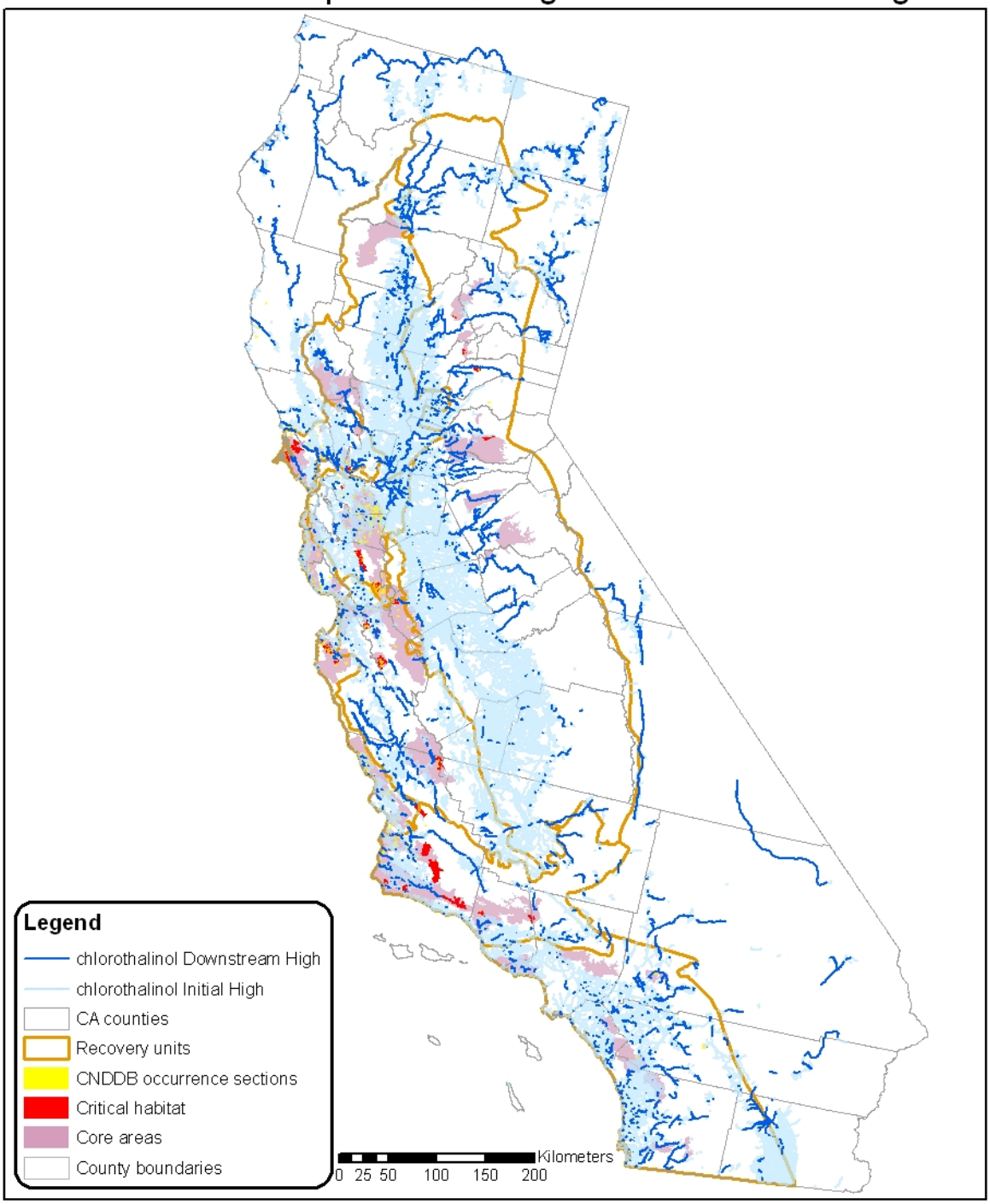
The dilution model uses the NHDPlus data set (http://www.horizon-systems.com/nhdplus/) as the framework for the downstream analysis. The NHDPlus includes several pieces of information that can be used to analyze downstream effects. For each stream reach in the hydrography network, the data provide a 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 summary results.

Measure	**Total**
Total California stream kilometers	332,962
Total stream kilometers in initial area of concern	73,515
Total stream kilometers added downstream	10,928
Total stream kilometers in final action area	83,443

Chlorothalonil Aquatic Initial High and Downstream High



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. October, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

A Note on 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.

References for GIS Maps

Crop Maps

ESRI, 2002. Detailed Counties, ESRI data and maps. (1:24,000) www.esri.com

GAP. Gap Analysis. National Biological Information Infrastructure. www.nbii.gov

NASS, 2002. USDA National Agriculatural Statistics Service. www.nass.usda.gov

MRLC, 2001. Multiresolution Land Characteristics (MRLC) www.mrlc.gov

Habitat Maps

US FWS 2002 California red-legged frog General Recovery Zones

US FWS 2002 California red-legged frog Core Areas

US FWS 2005 Final Critical Habitat for California red-legged frog

CNDDB Occurrence Sections – California Natural Diversity Database
http://www.dfg.ca.gov/bdb/html/cnddb.html

ESRI, 2002. Detailed Counties, ESRI data and maps. (1:24,000) www.esri.com