Appendix C – Spatial Summary for Terrestrial and Aquatic Uses

Imazapyr

Use List

The following use list 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
Non-agriculture	Aquatic noncrop Forestry Manufacturing (including: roads, transmission lines, bare ground areas, pipelines under paved surfaces, industrial parks, plant sites, fencerows, utility rights-of-way, etc.) Noncrop (including: airports, military installations, schools/universities, libraries, hospitals, interchange ramps, waysides, unpaved roads, highway/railroad/utility rights-of-way, farmyards, fencerows, non-irrigation ditchbanks, etc.) Noncrop pasture/rangeland Nonresidential turf (i.e. improved sections of industrial grounds, athletic fields, cemeteries, parks, golf course roughs, institutional grounds) Residential nonfood Rights-of-way Shrubs and grassland

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 Landcover data sources for Imazapyr.

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	No

Land Cover Data Sources			
Layer name	**Base source**	**Description**	**non-NASS**
		all land being actively tilled.	
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 units.	Yes
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 code 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
Other	NLCD	All other uses combined. Includes shrub/scrub (grid code 52) and grassland/herbaceous (grid code 71).	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.

Spatially Determined Analysis for Terrestrial Uses

Table 3 Terrestrial spatial analysis for the initial area of concern, all which includes the following NLCD analysis: pasture, forest, shrub/scrub, grasslands, wetlands, open water, and all urban (open, low, medium and high).

Measure	RU1	RU2	RU3	RU4	RU5	RU6	RU7	RU8	Total
Initial Area of Concern (no buffer)									375,278 sq km
Established species range area (sq km)	3654	2742	1323	3279	3650	5306	4917	3326	28,197
Overlapping area with initial area of concern (sq km)	3651	2716	1303	3256	3524	4992	4617	3241	27,300
Percent area affected	*100%*	*99%*	*98%*	*99%*	*97%*	*94%*	*94%*	*97%*	*97%*
Established occurrence sections (959 total; 30 outside recovery units)	13	3	70	324	276	120	90	33	929
# CNDDB occurrence sections affected	13	3	70	324	276	120	90	33	929

Table 4 Terrestrial spatial Action Area results for forestry uses buffered to 26,460 ft plus all other uses not buffered.

Measure	RU1	RU2	RU3	RU4	RU5	RU6	RU7	RU8	Total
Initial Area of Concern (forestry with no buffer)									97,374 sq km
Action Area (26,460 ft buffered initial area of concern)									355,934 sq km
Established species range area (sq km)	3654	2742	1323	3279	3650	5306	4917	3326	28,197

Overlapping area with forestry only (sq km)	3654	2742	1323	3279	3650	5306	4917	3326	28,197
Percent area affected	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
Established occurrence sections (959 total; 30 outside recovery units)	13	3	70	324	276	120	90	33	929
# CNDDB occurrence sections affected	13	3	70	324	276	120	90	33	929

Spatially Determined Analysis for Aquatic Uses

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 Imazapyr.

Measure	Total
Total California stream miles	332,962
Total stream miles in initial area of concern	222,188
Total stream miles added downstream	7,450

Total stream miles in final action area	229,638

A Note on Limitations and Constraints of Tabular and Geospatial Sources

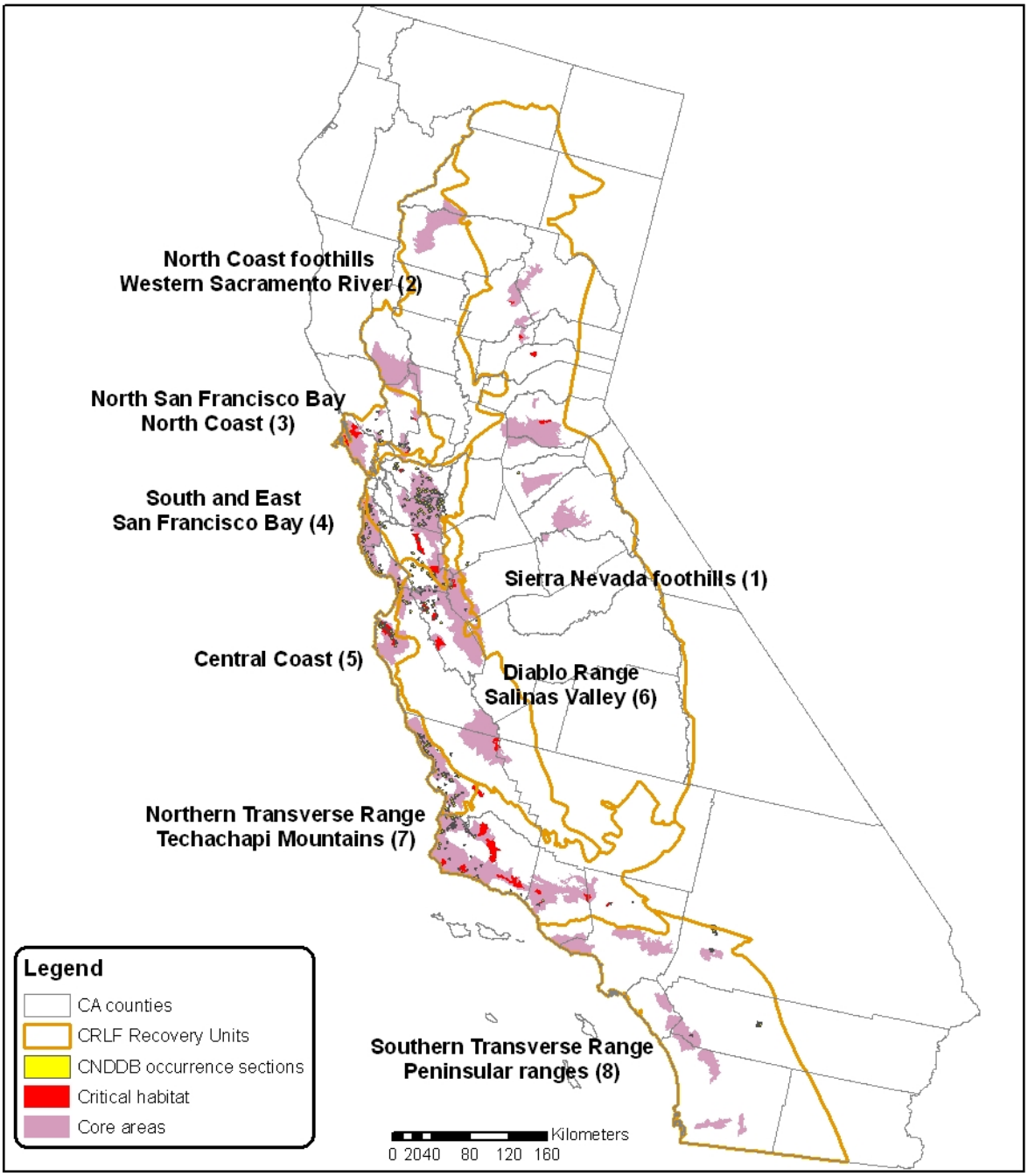
The geographic data sets used in this analysis are limited with respect to their accuracy and timeliness. The NASS Census of Agriculture (NASS 2002) contains adjusted survey data collected prior to 2002. Small use sites, and minor uses (e.g., specialty crops) tend to be underrepresented in this dataset. 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.

Reference Maps

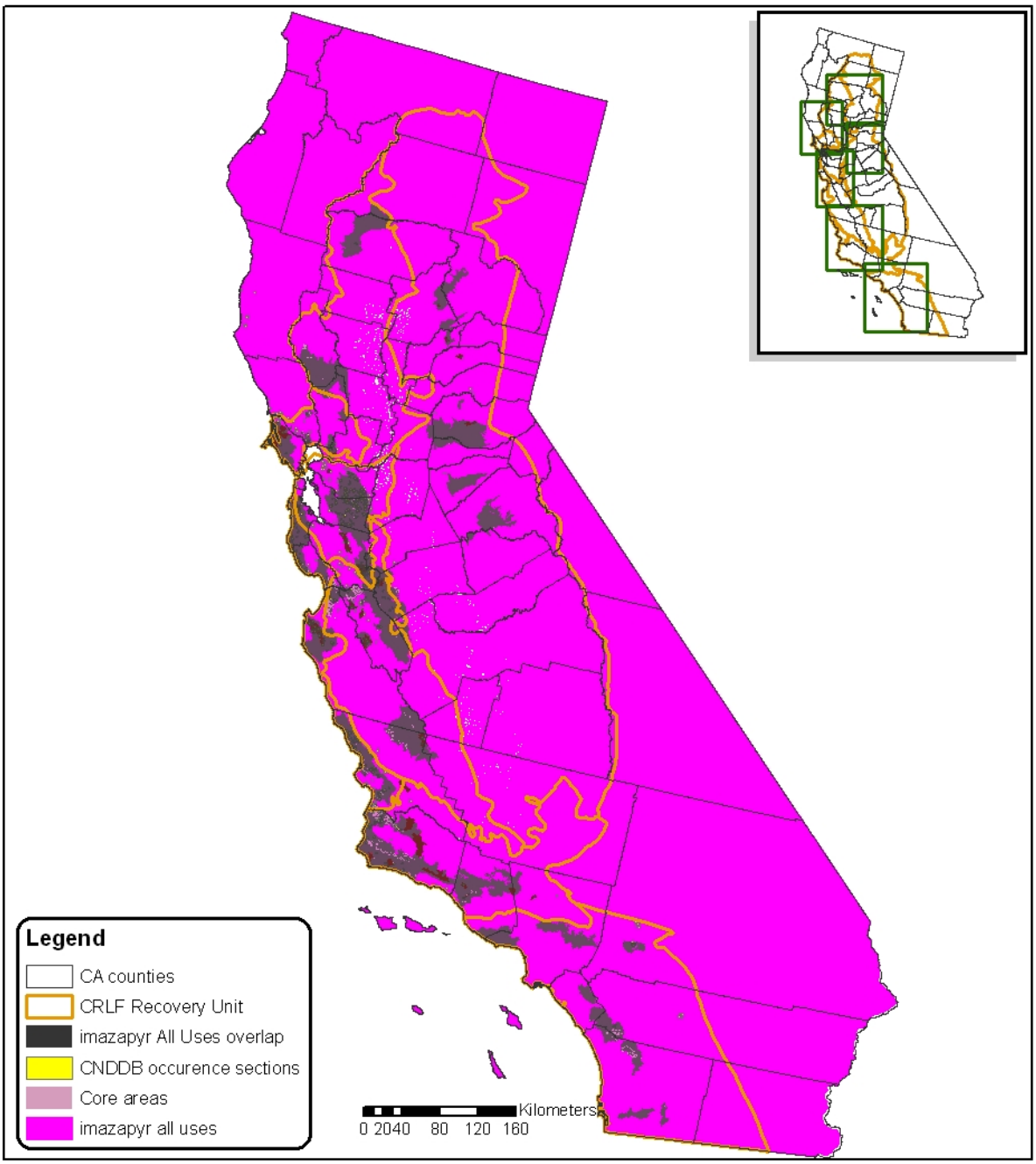
CRLF Recovery Units and Habitat Areas



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

Imazapyr - Initial Area of Concern with Habitat Overlap



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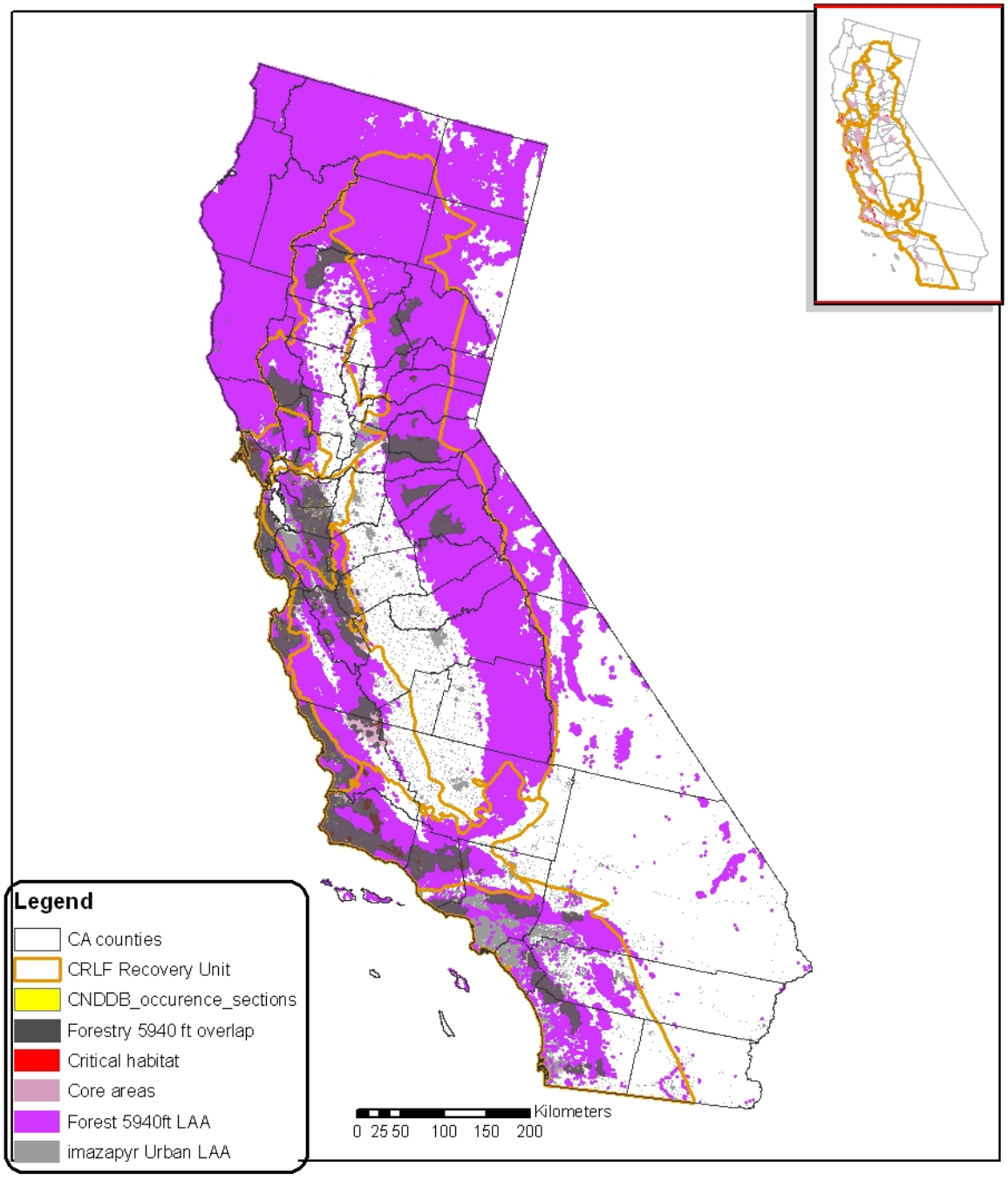
Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. July, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

Imazapyr - LAA, Overview



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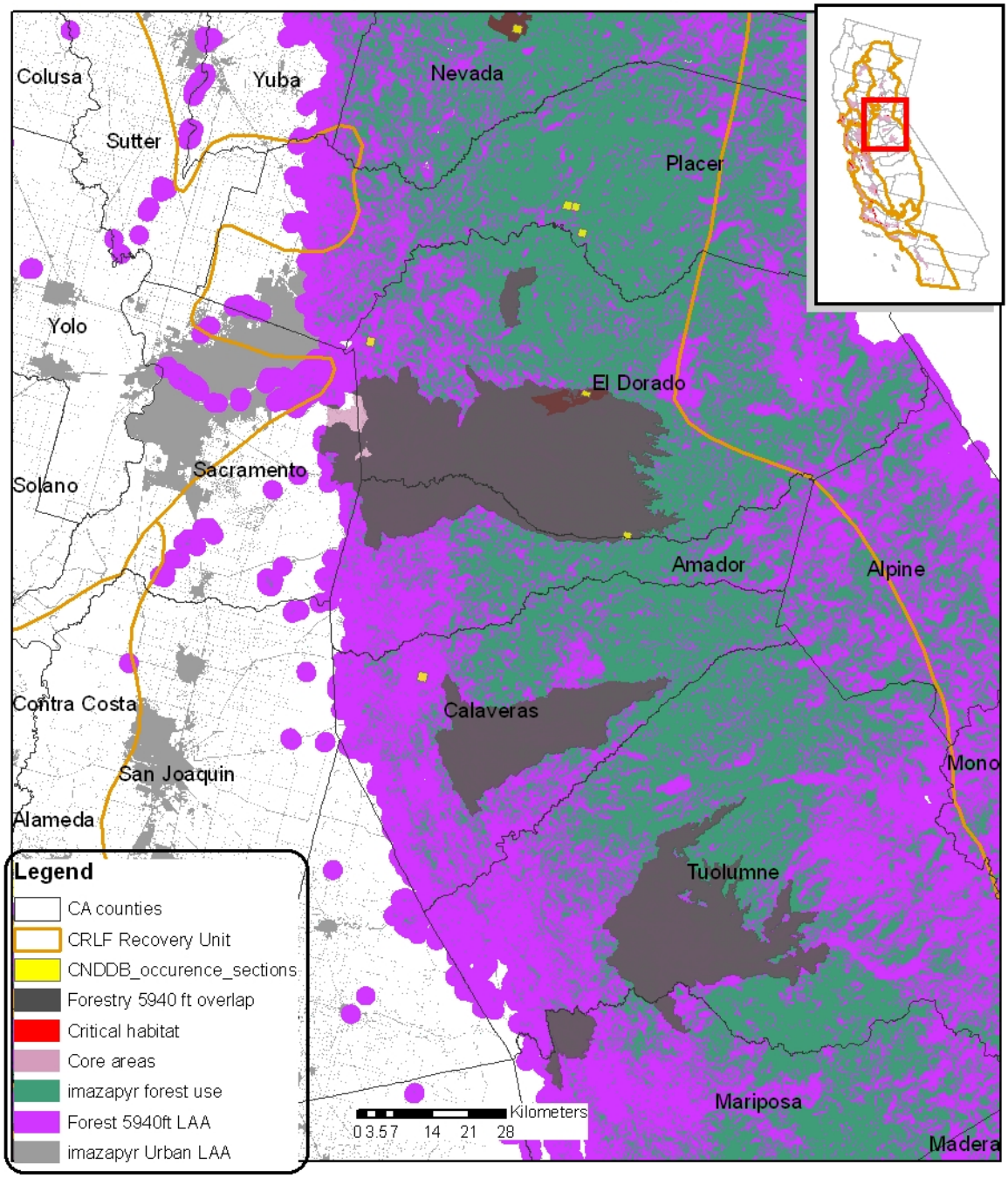
Map created by US Environmental Protection Agency, Office of Pesticides Programs, Environmental Fate and Effects Division. June, 2007. Projection: Albers Equal Area Conic USGS, North American Datum of 1983 (NAD 1983)

Imazapyr - LAA, Recovery Unit 1



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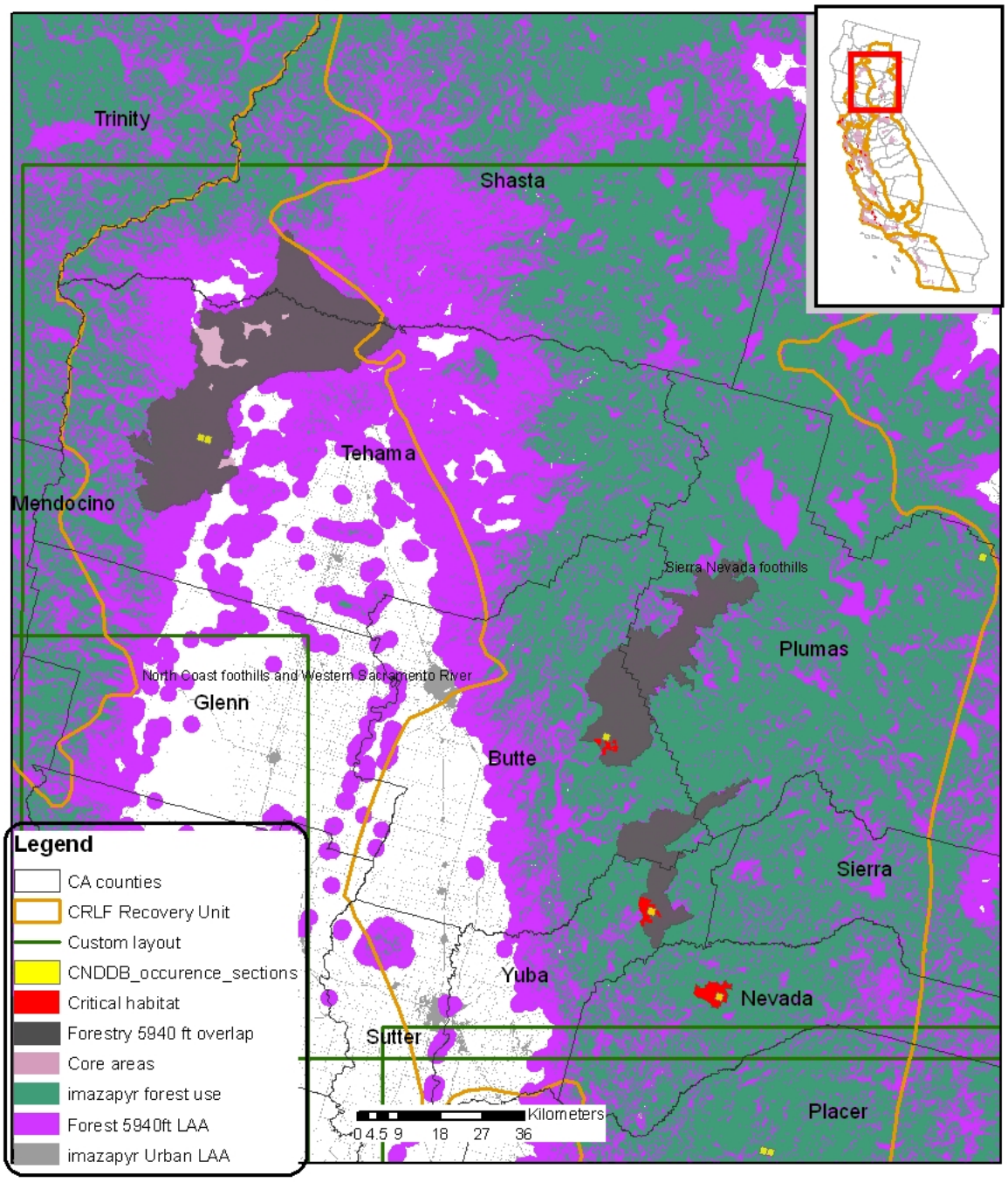
Imazapyr - LAA, Recovery Unit 1, 2



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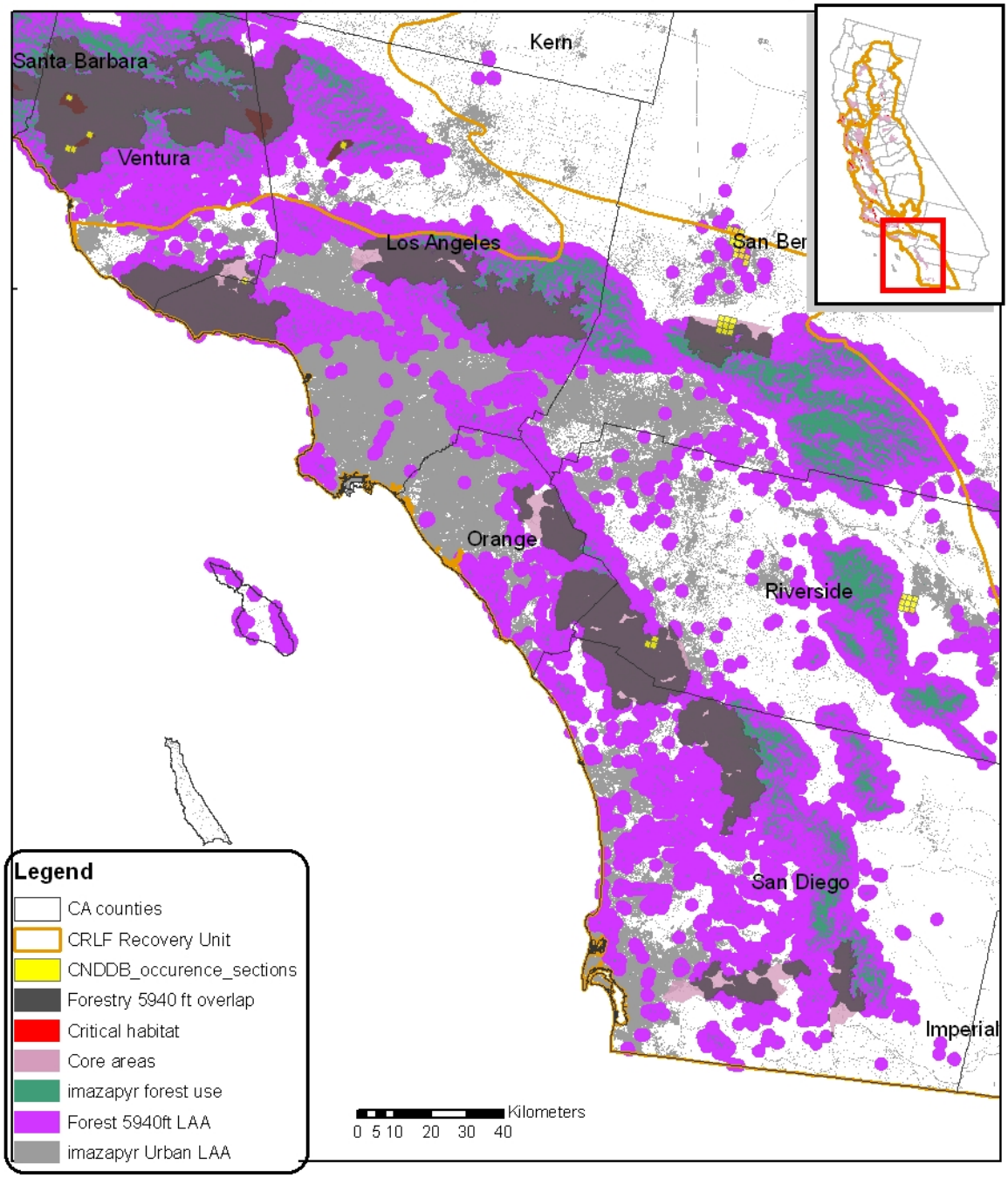
Imazapyr - LAA, Recovery Unit 7, 8



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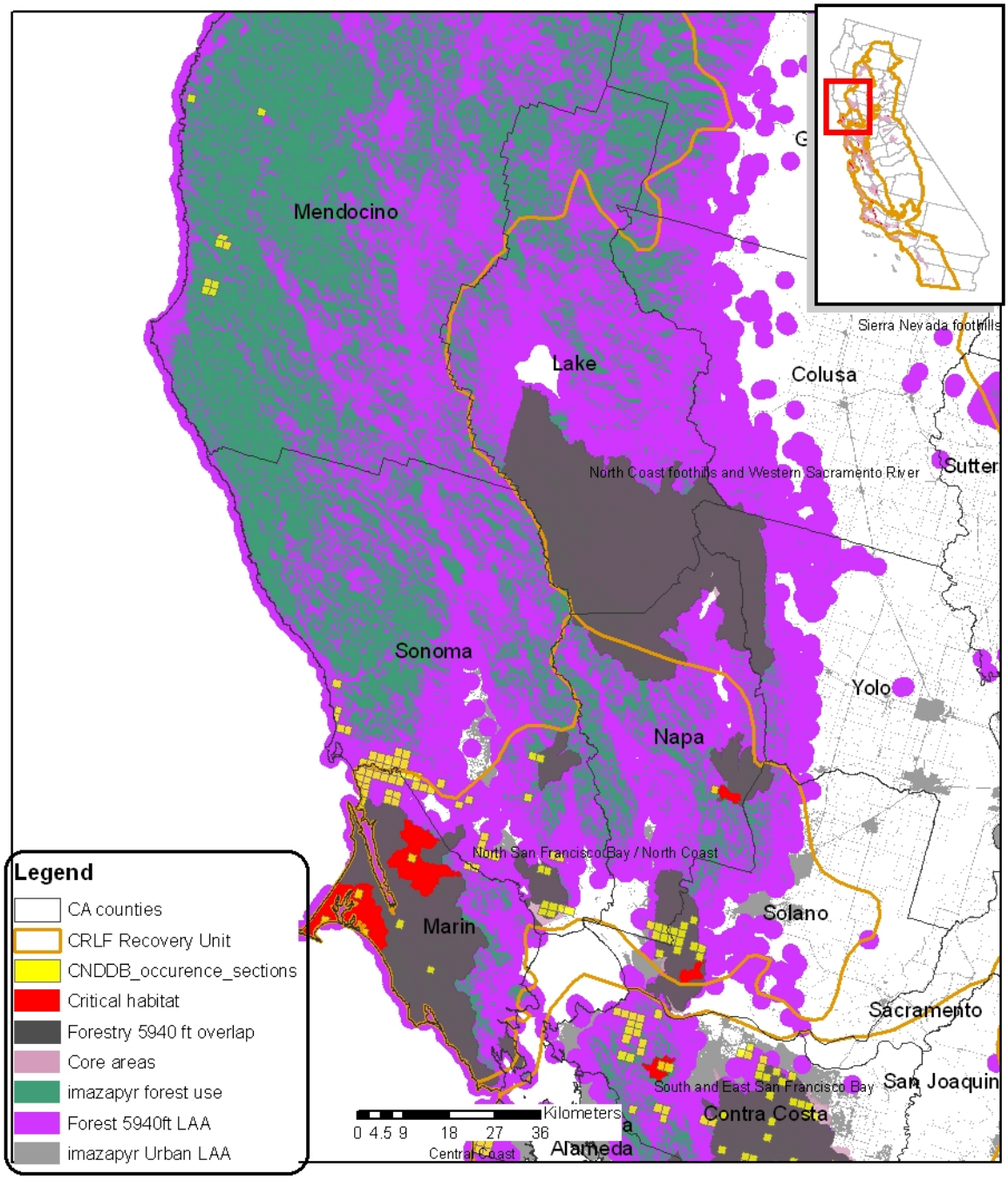
Imazapyr - LAA, Recovery Unit 2, 3



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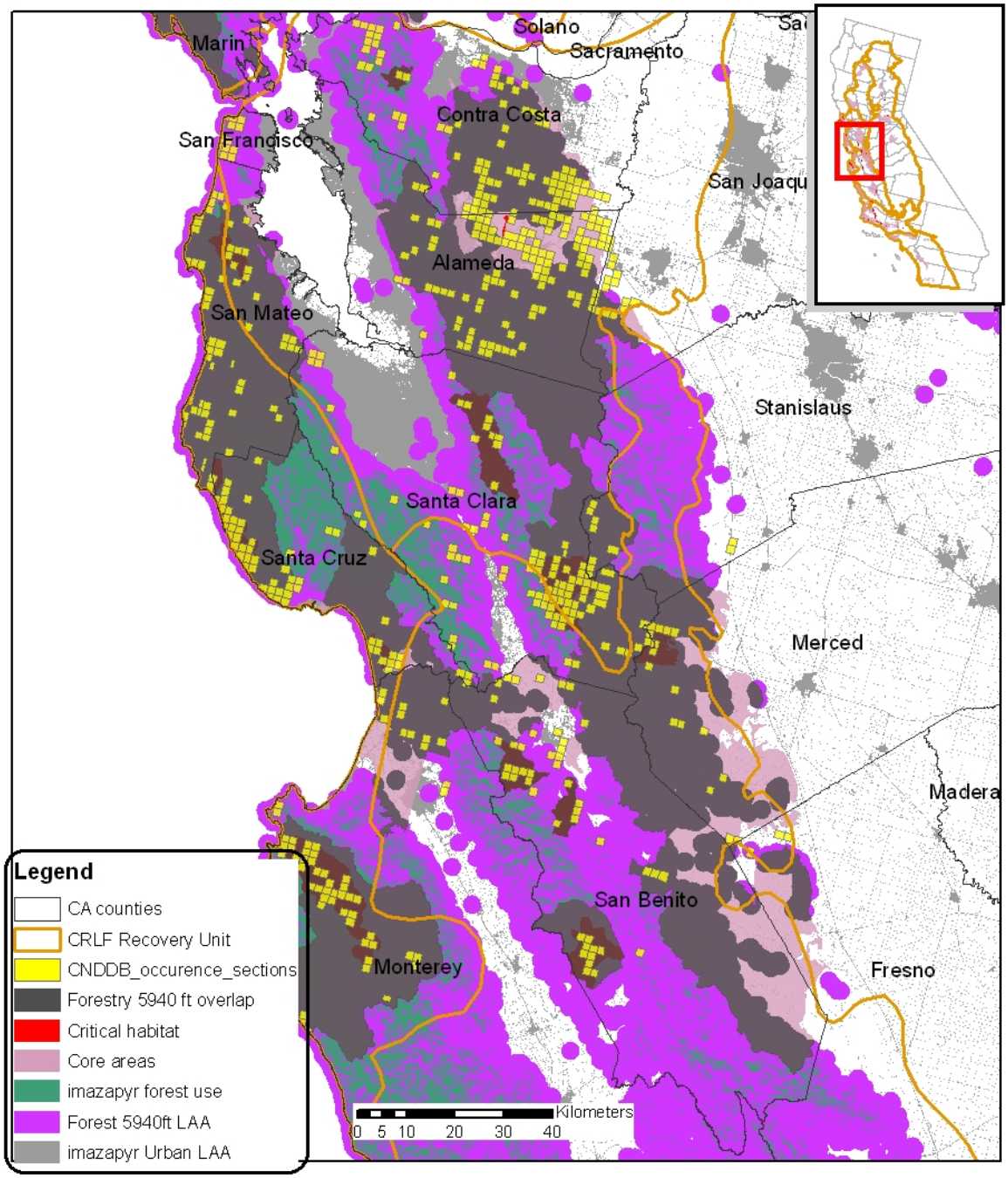
Imazapyr - LAA, Recovery Unit 4, 5, 6



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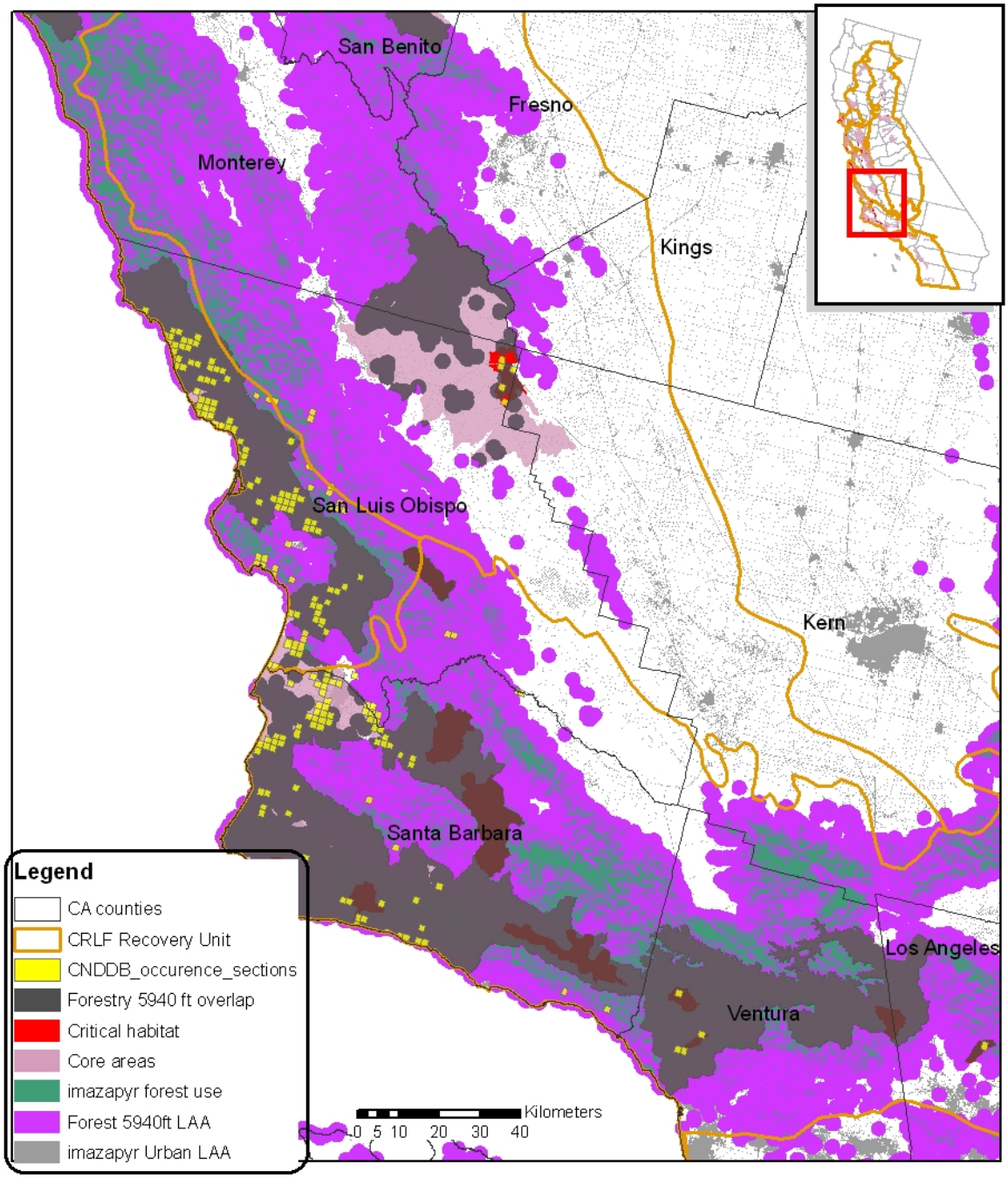
Imazapyr - LAA, Recovery Unit 5, 6, 7



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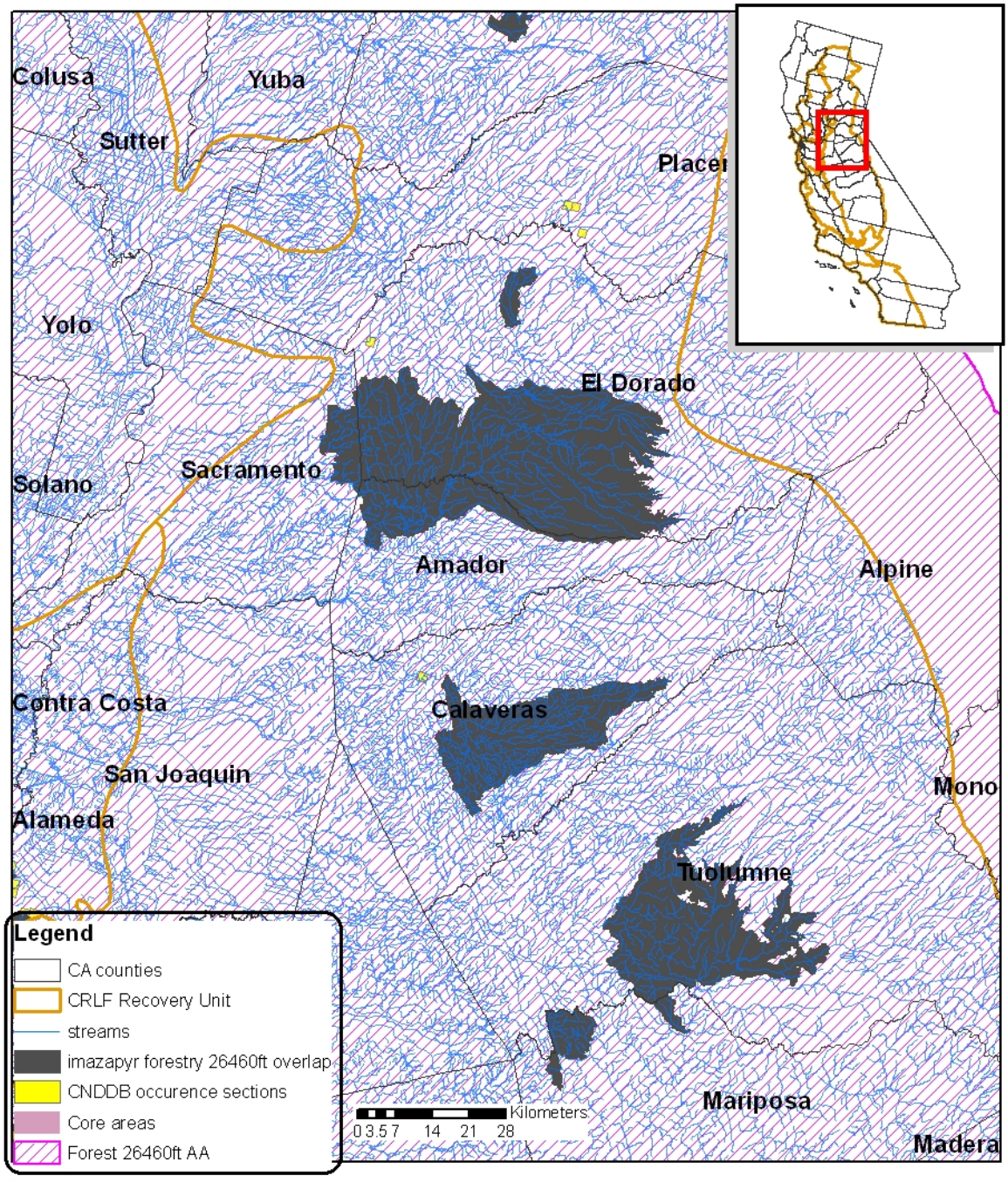
Imazapyr - AA, RU 1



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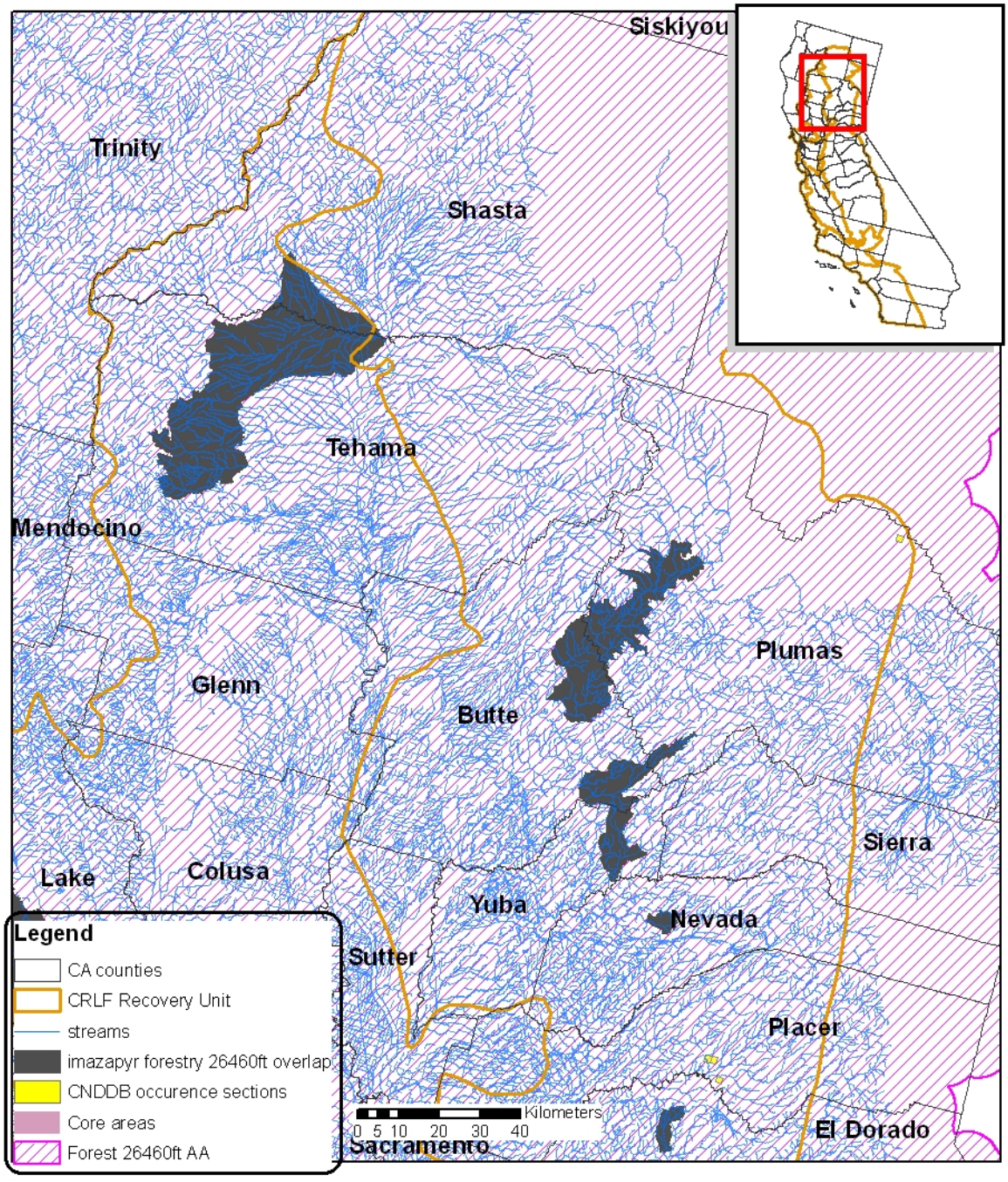
Imazapyr - AA, RU 1, 2



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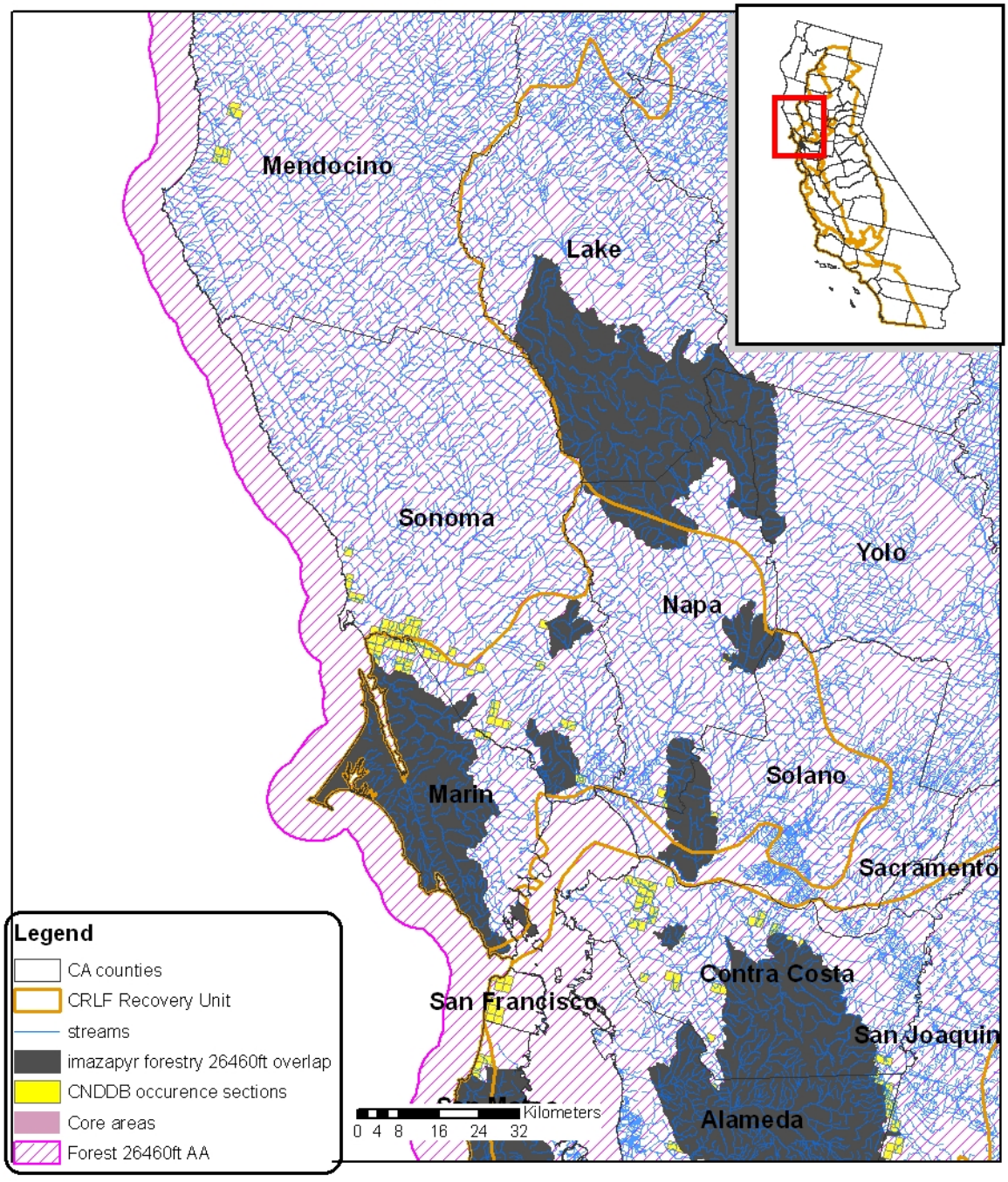
Imazapyr - AA, RU 2,3



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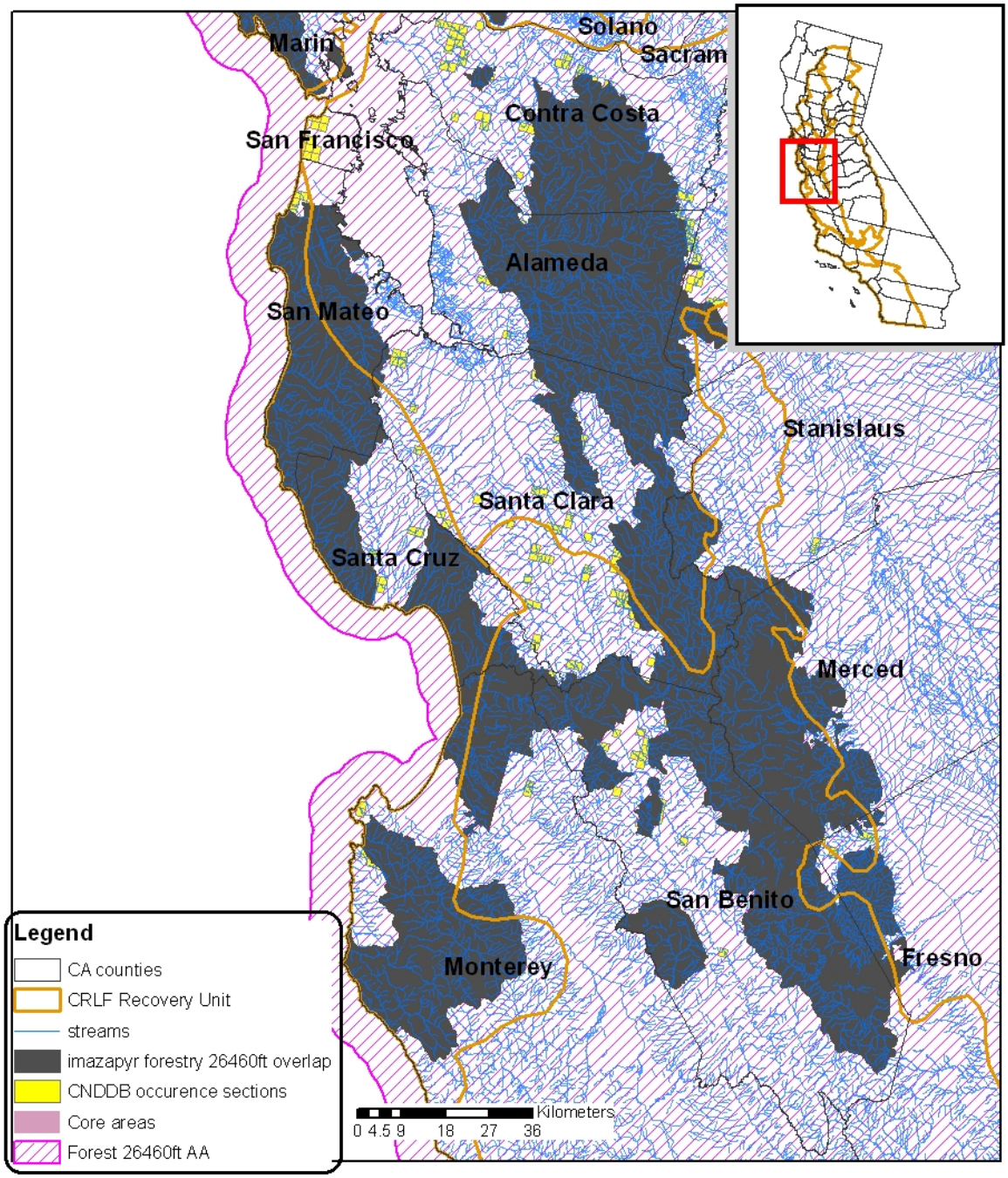
Imazapyr - AA, RU 4, 5, 6



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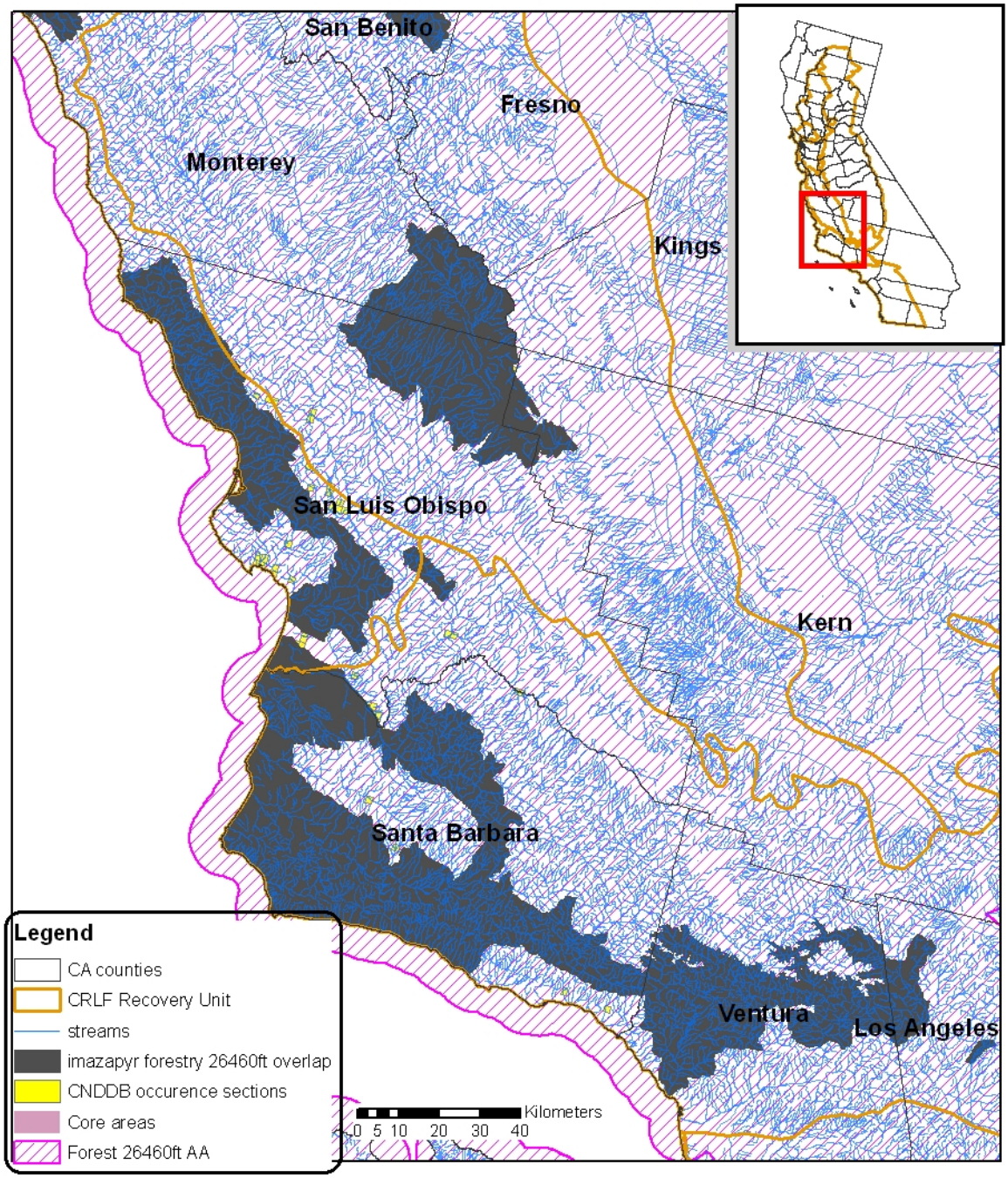
Imazapyr - AA, RU 5, 6, 7



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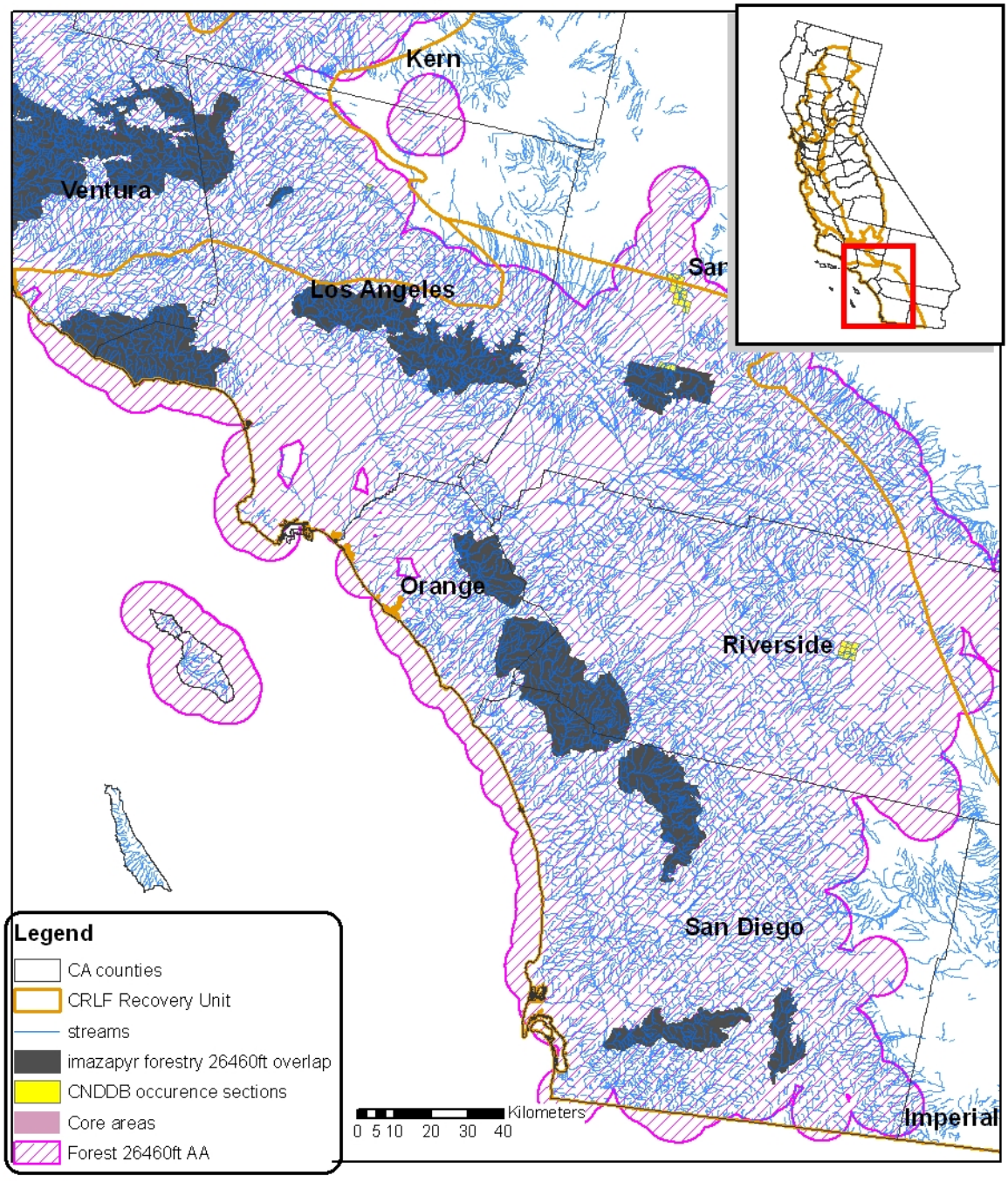
Imazapyr - AA, RU 7, 8



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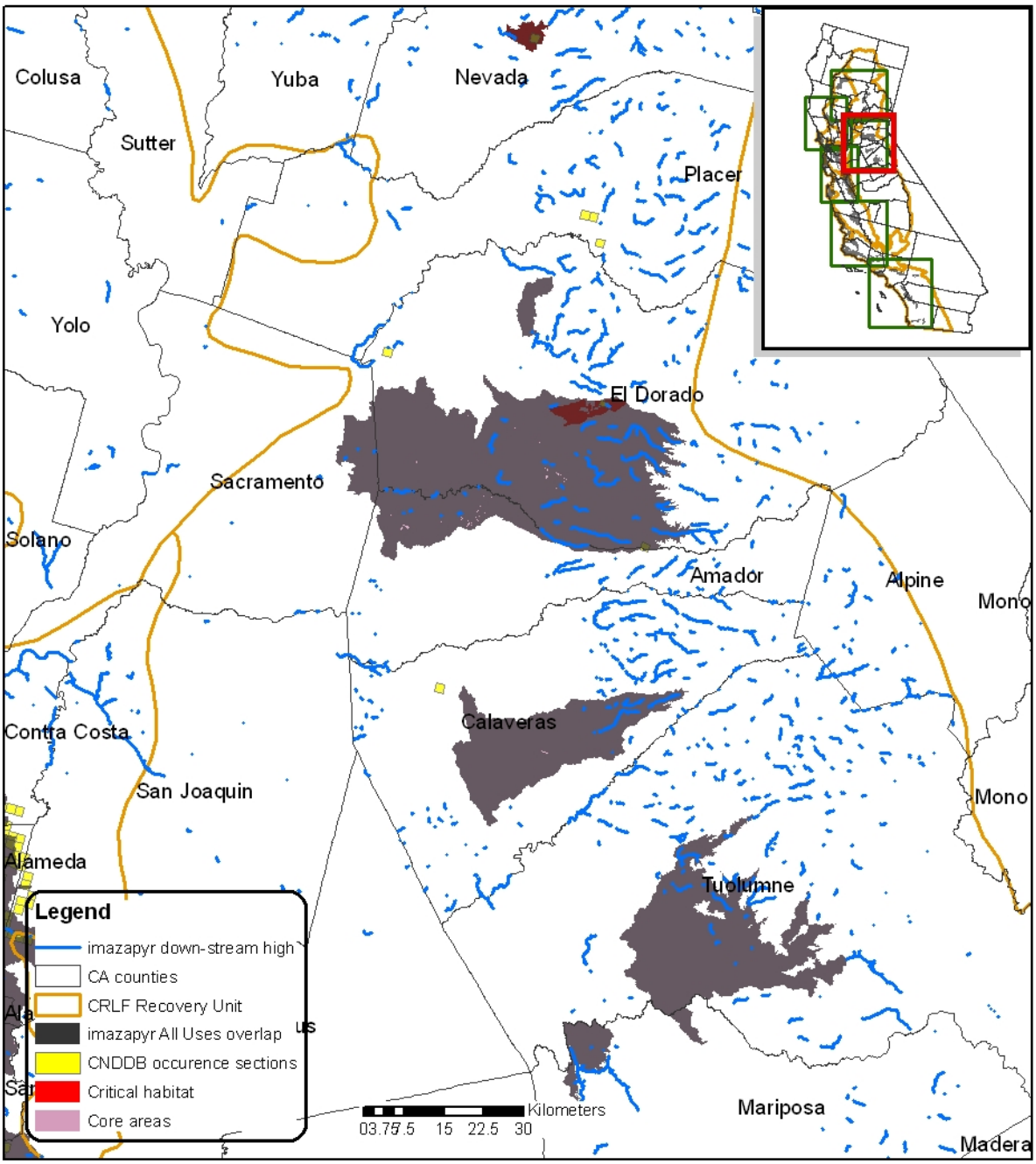
Imazapyr - Recovery Unit 1



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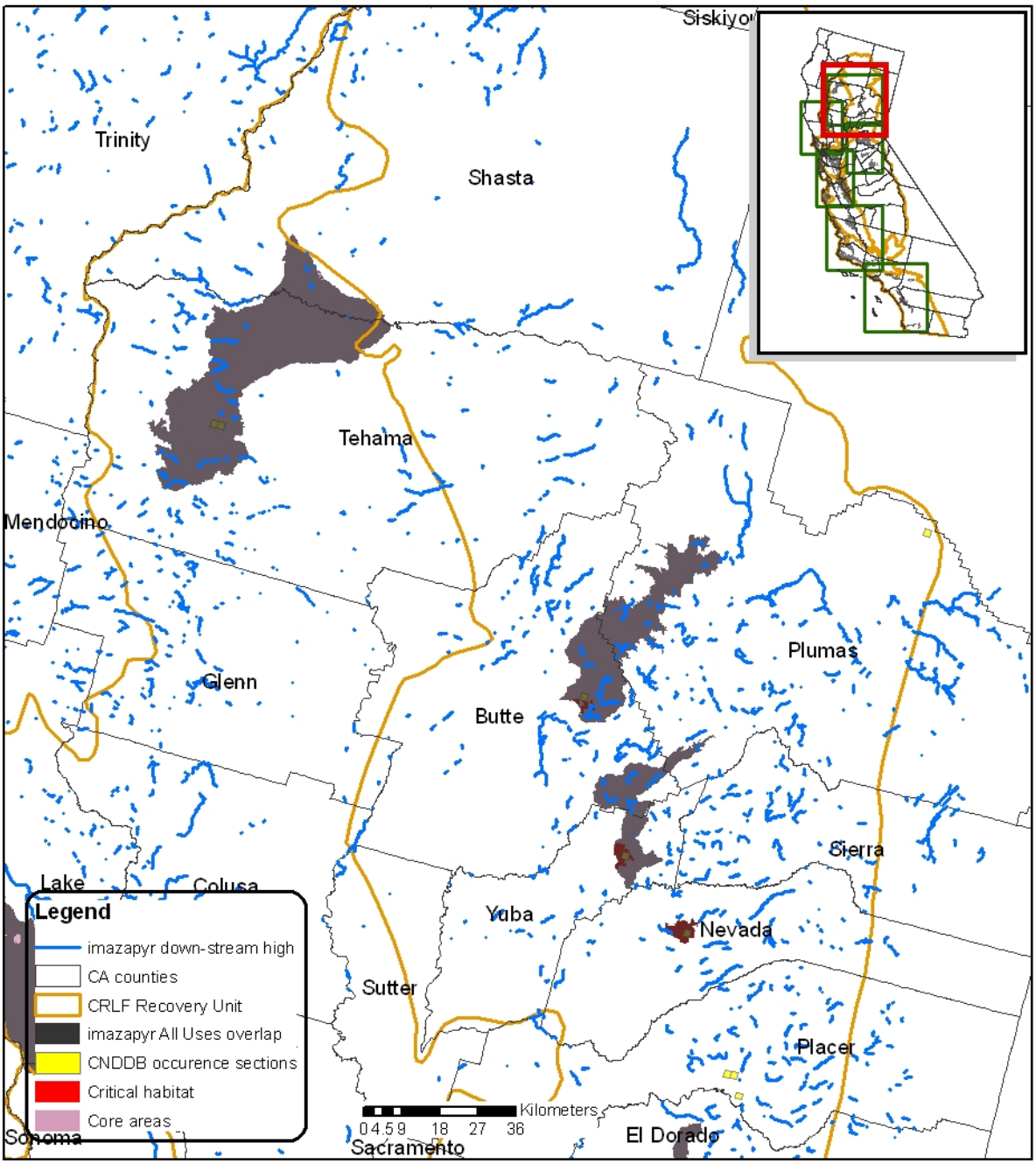
Imazapyr - Recovery Units 1, 2



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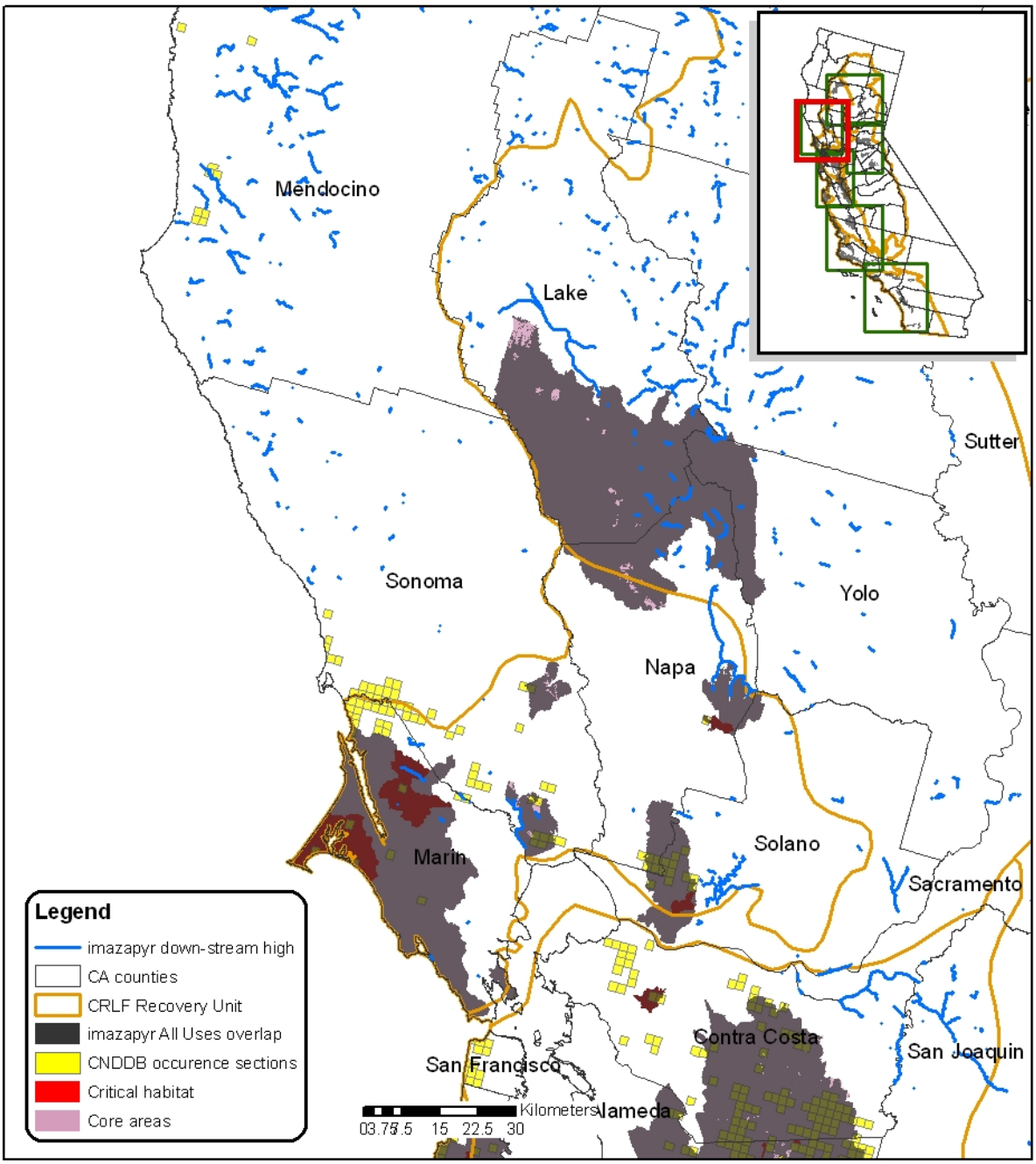
Imazapyr - Recovery Units 2, 3



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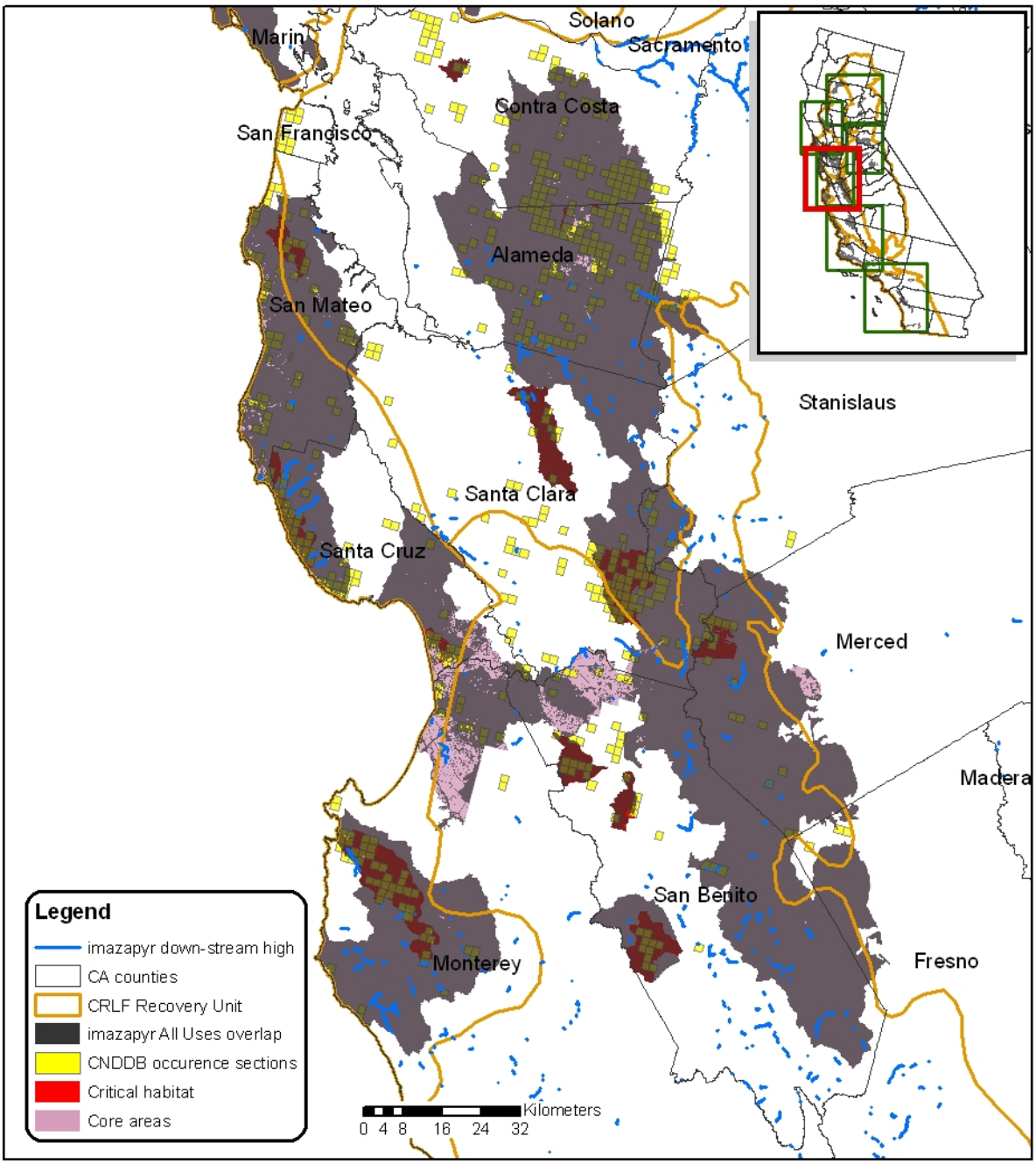
Imazapyr - Recovery Units 4, 5, 6



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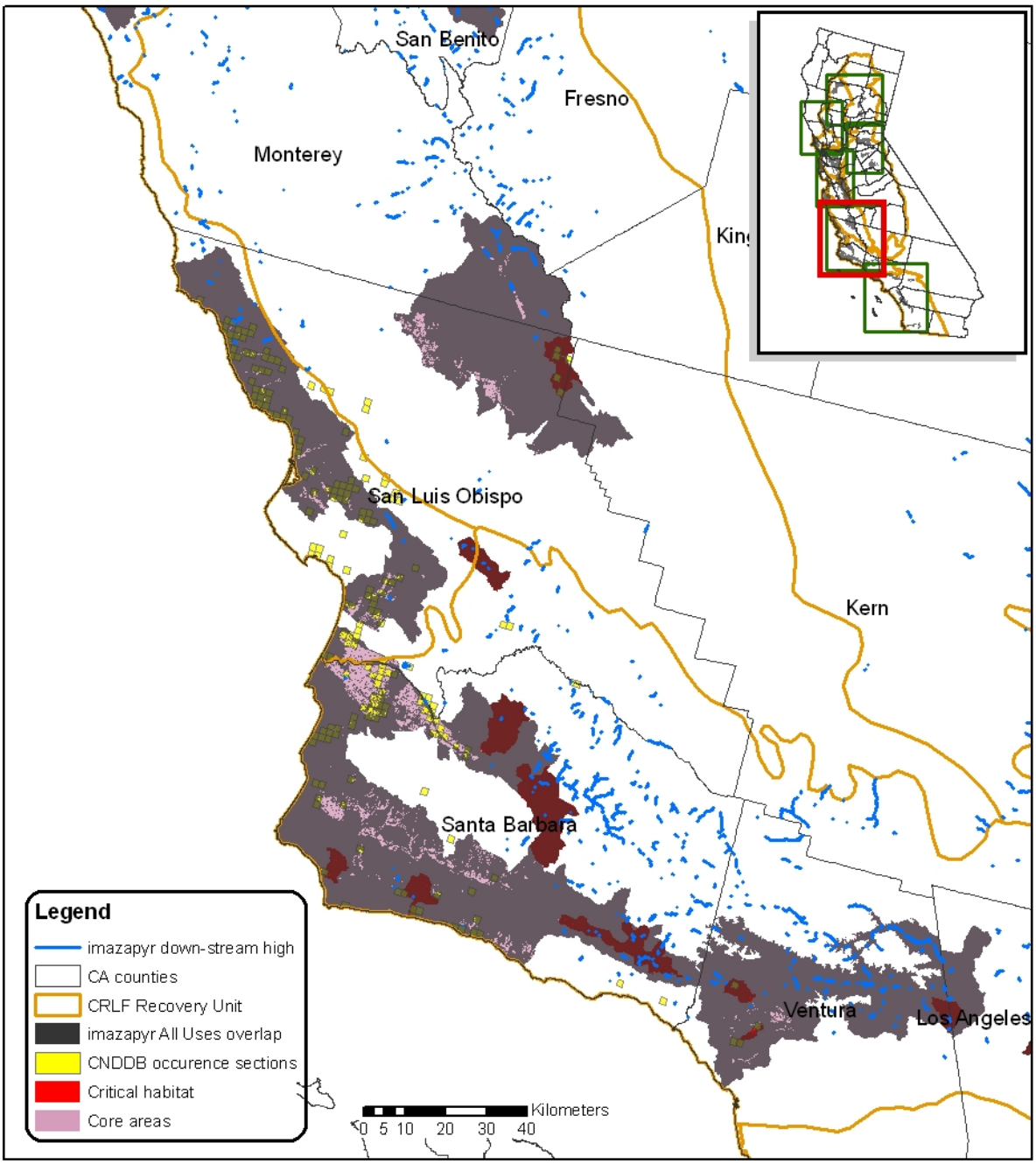
Imazapyr - Recovery Units 5, 6, 7



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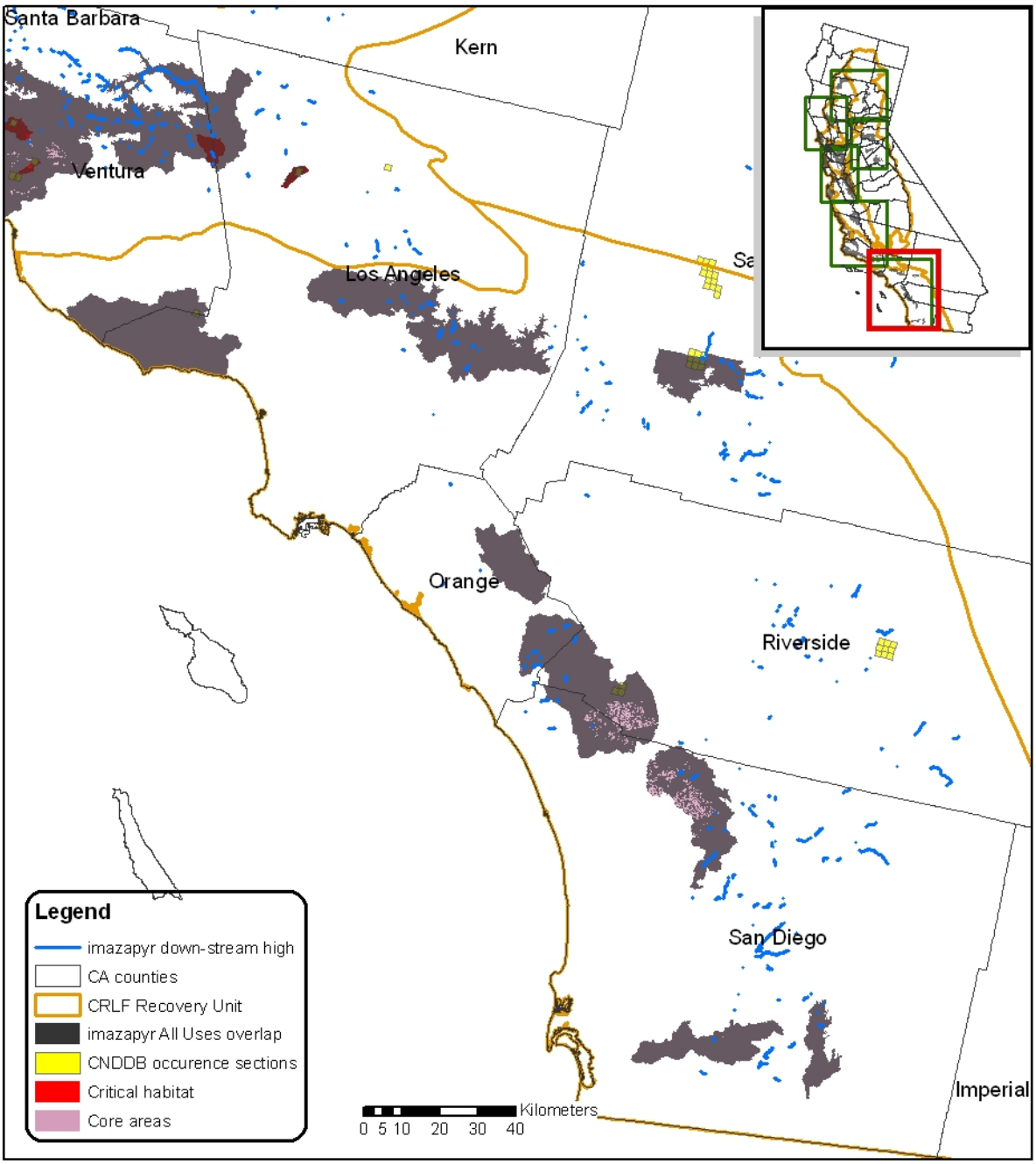
Imazapyr - Recovery Units 7, 8



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