Appendix L - Description of Spatial Analysis and Maps

Showing the Overlap of the Initial Area of Concern and the Species Habitat Areas

I. Labeled Uses and Associated Land Cover Types for Chlorothalonil

The following use list is derived from label use information. It is used as a basis for the spatial mapping of chlorothalonil. Table 1 shows which land cover types are used to represent the spatial area of the use (*e.g.*, the use footprint). The land cover classes were not designed to represent each use specifically, but were chosen as the best spatial representation of a use area available. For example, dumpster use sites are associated with all developed landcover classes, including developed open space, since there is a possibility dumpsters can be found there.

Table 1 Mapping layers and associated use sites.

Land Cover Mapping Layer	Use list
Cultivated	Asparagus, beans (dried, succulent), bulb vegetable, blueberry, brassica, broccoli, Brussels sprouts, cabbage, carrot, cauliflower, celery, cole crops, corn, cranberry, cucumber, curcurbits, fruiting vegetables, garbanzos, garlic, ginseng, grasses grown for seed, horseradish, leek, lentils, lupine grain, melon, mint/peppermint/spearmint, mushrooms, onion, parsnip, peanuts, potato, pumpkin, shallot, soybeans, squash, strawberry, sugar beet, tomato, yam.
Orchards/vineyards	Almond, apricot, banana, cherry, filbert, mango, nectarine, passion fruit, peach, pistachio, plantain, plum, prune, stone fruit
Residential	Commercial and industrial lawns, ornamentals (plants and trees), rose
Pasture/hay	Grass forage/fodder hay
Turf	Golf course, Commercial and industrial lawns, ornamentals (lawns, turf, sod farms),
<no representative landcover>	Christmas tree/conifer plantations and nurseries

II. Initial Area of Concern

After determining uses from label information and obtaining the representative NLCD landcover classes, a potential use 'footprint' map is made. This includes all areas within the state of California where the pesticide could be applied, and is shown in Figure 1 for chlorothalonil. The footprint of potential use represents the chemical's initial area of concern, and is based on available NLCD land cover data and derived map layers.

Some uses such as Christmas tree farms, conifer plantations and nurseries cannot be represented adequately through existing land cover classes. These use site could be equally associated with one or more land cover classes to which chlorothalonil has

representative uses on. The geographically constrained uses for plantations and nurseries, and the likelihood that these uses will be picked up by one or more of chlorothalonil's land use layers makes it likely that it will be adequately represented.

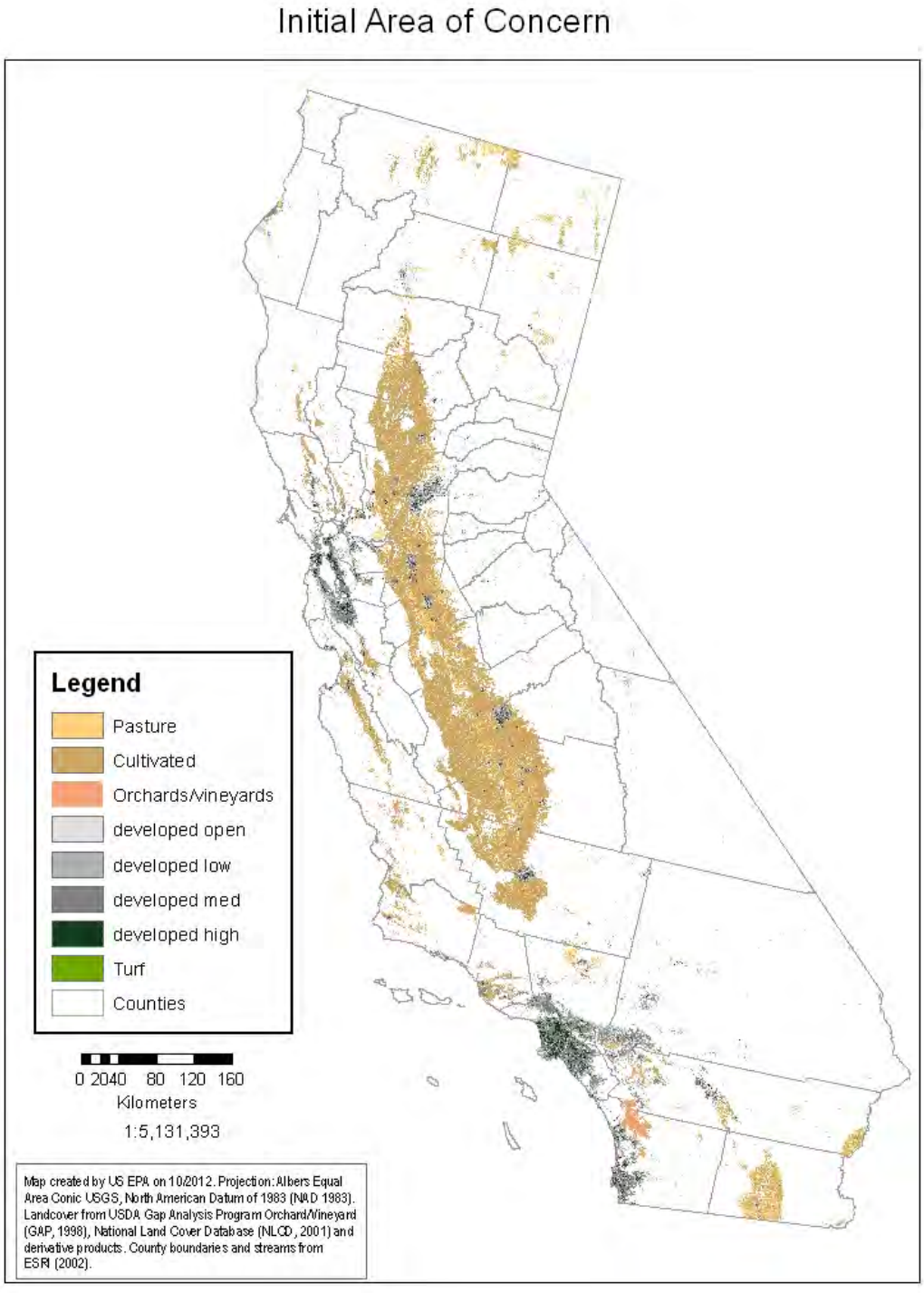

Figure 1 Potential use areas or initial area of concern for chlorothalonil.

A. Land Cover

Land cover layers for the initial area of concern analysis were obtained from the National Land Cover Dataset (NLCD 2001) for the majority of land use types. The NLCD data was released as a nationally consistent, regionally indexed dataset in January 2007. California Gap Analysis Project (GAP) data from the Biogeography Lab from UCLA-Santa Barbara (1998) were obtained for the orchard and vineyard uses. These raster files were converted to vectors using simplification and majority filter routines and merged into NLCD. The turf layer was derived from 2001 NLCD developed areas with the impervious surface layer removed. The rights-of-way land cover layer was derived by combining road and rail information from TeleAtlas (2007) using the U.S. Department of Transportation's National Pipeline Mapping System (1999). Table 2 lists the NLCD 2001 as a surrogate for actual land use practices from which pesticide use is inferred and derived layers used for initial area of concern representation.

Table 2 Layer names and descriptions for 2001 NLCD and derived layers.

Layer name	Base source	Description
Cultivated Crops (includes sod farms)	NLCD	Grid code 82: Areas used for the production of annual crops, such as corn, soybeans, vegetables, and tobacco, 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.
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.
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.
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.
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.
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.
Open Water	NLCD	Grid code 11: All areas of open water, generally with less than 25% cover of vegetation or soil.
Orchards and vineyards	CA GAP	Grid codes 11210, 11211 and 11212. This is the only CA GAP reference.
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.
Wetlands	NLCD	Grid codes 90, 95: Woody wetlands and emergent herbaceous.

Layer name	Base source	Description
Turf	NLCD	A derived NLCD class based on developed classes and the impervious surface layer with corrections applied.
Rights-of-way	US DOT; TeleAtlas	A derived class using road, rail, and pipeline coverages.

Non-agricultural turf and rights-of-way uses are depicted by the combination of all four developed classes, 21 – 24. All the map layers depicted in Table 2 are used to create the footprint maps. Actual analysis for the downstream dilution (discussed below) uses a subset of these layers.

B. Initial Stream Reaches

In addition to the land cover classes described above, the initial area of concern includes stream segments found within those land cover areas. The stream segments are obtained from the NHDPlus dataset (2005) (http://www.horizon-systems.com/NHDPlus/documentation.php), which includes land cover information summarized by stream segment catchment based on the 1992 NLCD data set. As one moves downstream within a stream network, the size of the contributing landscape drainage area (watershed) increases. The contributing area of each NLCD land cover class (1992) is provided for each reach's catchment in the NHDPlus dataset. Using these data, a cumulative percent cropped area (PCA) is calculated for each stream reach, based on the area of all land cover types to which chlorothalonil might be applied, divided by the total upstream contributing drainage area. The PCA is used along with RQs and LOCs to arrive at a downstream dilution distance as described in Section III B. Because of increasing spatial land cover averaging over larger areas, PCAs tend to decrease with increasing travel distance downstream resulting in an effect that may be considered as "dilution". Pesticide exposures in streams within the initial area of concern are conservatively assumed to be represented by the estimated environmental concentrations used in RQ calculation.

III. Spatial Extent of the Effects Determination

Based on the results of the risk quotient calculations for chlorothalonil which is independent of spatial analysi: a Likely to Adversely Affect (LAA) and modification to critical habitat determination was concluded for the Bay Checkerspot Butterfly (BCB, *E. editha bayensis*), California Tiger Salamander Central California DPS (CTS-CC DPS, *A. californiense*), Delta Smelt (DS, *H. transpacificus*), California Tiger Salamander: Santa Barbara County DPS (CTS-SB DPS, *A. californiense*), and Tidewater Goby (TG, *E. newberryi*). The spatial extent of the LAA effects determination is the area where there is overlap between the area of potential LAA effects with critical habitat, habitat, or occurrence sections (see Figure 2). This area of potential LAA effects includes the initial area of concern for application of chlorothalonil on cultivated, pasture/hay, orchards/vineyards, residential and turf and the total area where there is potential for direct and/or indirect effects to occur using EFED standard assessment procedures via off-site transport mechanisms. The extent of potential off-site transport is determined by

deriving an aquatic and terrestrial spray drift distance using AgDRIFT and an estimate of the downstream distance where LOCs are exceeded using the downstream dilution model. Figure 2 is a diagram depicting overlap of a potential area of LAA effects and species habitat, critical habitat, or occurrence sections which would result in an LAA effects determination or Habitat Modification Determination for critical habitat. Figure 3 is a diagram depicting lack of overlap of a potential area of LAA effects and species habitat, critical habitat, or occurrence sections which would result in a No Effect determination or No Habitat Modification Determination for critical habitat.

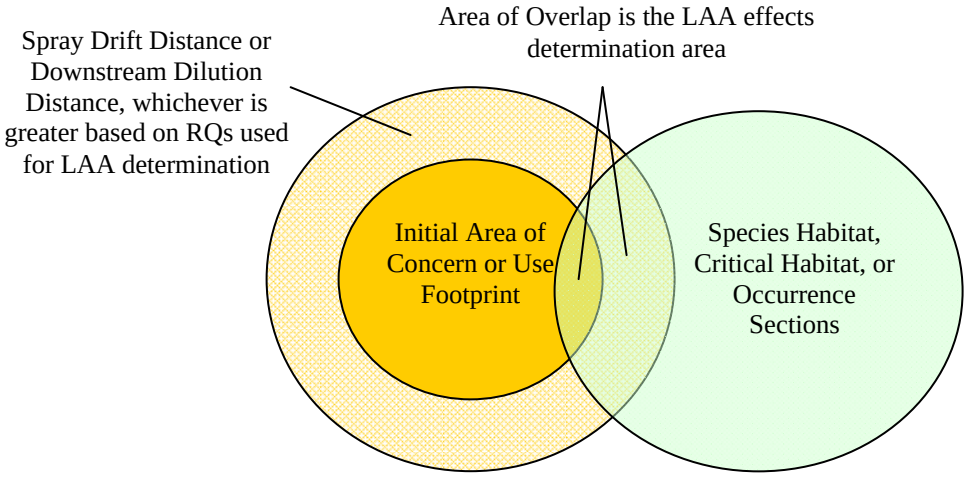

Figure 2 Conceptual diagram depicting an overlap of the area of potential LAA effect and the habitat, occurrence sections, or critical habitat of a species. If there is overlap, a LAA effects determination or habitat modification determination is made for the species.

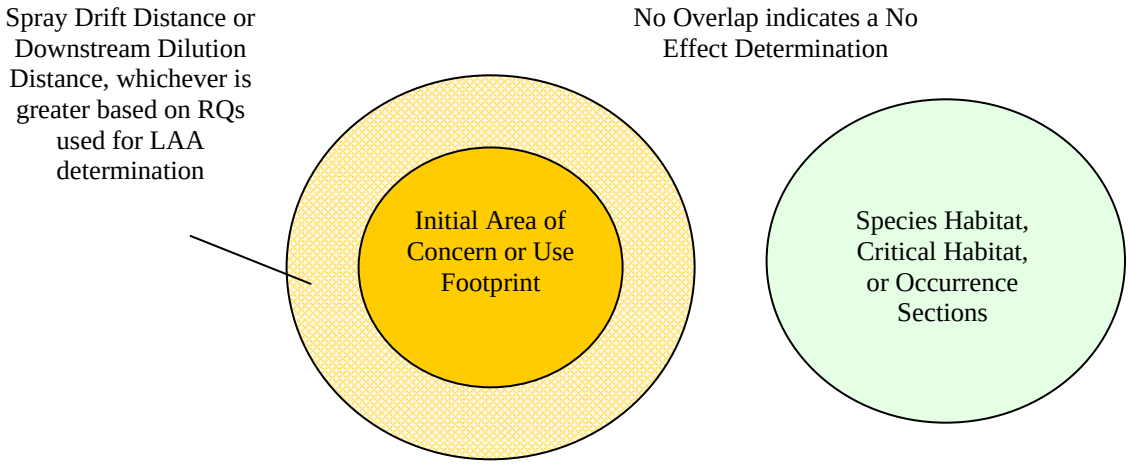

Figure 3 Conceptual diagram depicting no overlap of the area of potential LAA effect and the habitat, occurrence sections, or critical habitat of a species. If there is no overlap, a No Effect determination is made for the species.

The identified direct and/or indirect effects are anticipated to occur only for those currently occupied core areas, occurrence sections, and areas of designated critical habitat for the San Francisco Bay Species (SFB) that are located 230 to >1000 ft (which includes the 150 ft buffer for estuarine/marine areas) from legal use sites where chlorothalonil is applied to cultivated, orchards/vineyards, pasture/hay, residential and turf land cover areas. Downstream extent analysis shows that 258 km is the furthest distance downstream from the initial area of concern, or largest area of potential LAA effects, that could have LOC exceedances. The downstream dilution distance is representative of the maximum continuous downstream dilution from the edge of the initial area of concern where direct/indirect effects and/or critical habitat modification may occur. This distance reflects the largest distance whether from potential for direct or indirect effects. It is possible that areas of potential indirect effects could have a larger area than areas of direct effects. Lotic (*i.e.*, flowing) water bodies within the downstream extent distance that overlap with the SFB habitat potentially contain concentrations of chlorothalonil sufficient to result in LAA determination and/or modification of critical habitat. Results of cumulative downstream dilution analysis are presented in Table 3, below.

Table 3 Summary of inputs and resulting downstream extent estimated based on the RQ:LOC for a specific taxon. These distances reflect the distance from the use area where there is potential for direct effects to the identified taxon.[1]

Taxon	RQ:LOC	Downstream extent (km)
Delta Smelt	52.8	258
Tidewater Goby	52.8	258
CA Freshwater Shrimp	264	258
CA Tiger Salamander	52.8	258

1 The land cover types run with the downstream dilution model include: cultivated, orchards/vineyards, pasture/hay, residential and turf land cover classes.

The geographic distribution and locations of the SFB species are based on three sources of data: critical habitat, occurrence sections from the stipulated injunction (*Center for Biological Diversity (CBD) vs. EPA et al*. (Case No. 07-2794-JCS)), and distribution largely from Recovery Plans. Maps 4-9, in Section 2.5 (Assessed Species) of the effects determination, represent the range for the Delta Smelt, San Francisco Garter Snake, California Freshwater Shrimp, California Clapper Rail, California Tiger Salamander, and Bay Checkerspot Butterfly. The Tidewater Goby occurrence sections and critical habitat are depicted in a separate appendix to represent its range for the following named locations North Coast, Greater Bay Area, Central Coast, Conception, and LA/Ventura. The habitat maps also show the overlap of land cover and species habitat corresponding to chlorothalonil use patterns that result in an LAA determination for these species. It does not show the spray drift distance or the downstream dilution distance *e.g.*, areas in

addition to the initial area of concern where LAA direct or indirect effects may occur. The actual area of overlap is greater when off-site transport via spray drift is included for each land cover type. The buffers may be different for each land cover type due to varying application rates and/or methods for different use patterns. The actual area of overlap would also be greater if the downstream dilution distance were shown on the map. Further analysis of the extent of drift and downstream dilution for each land cover type and the overlap with habitat can be included as part of the consultation process, if needed.

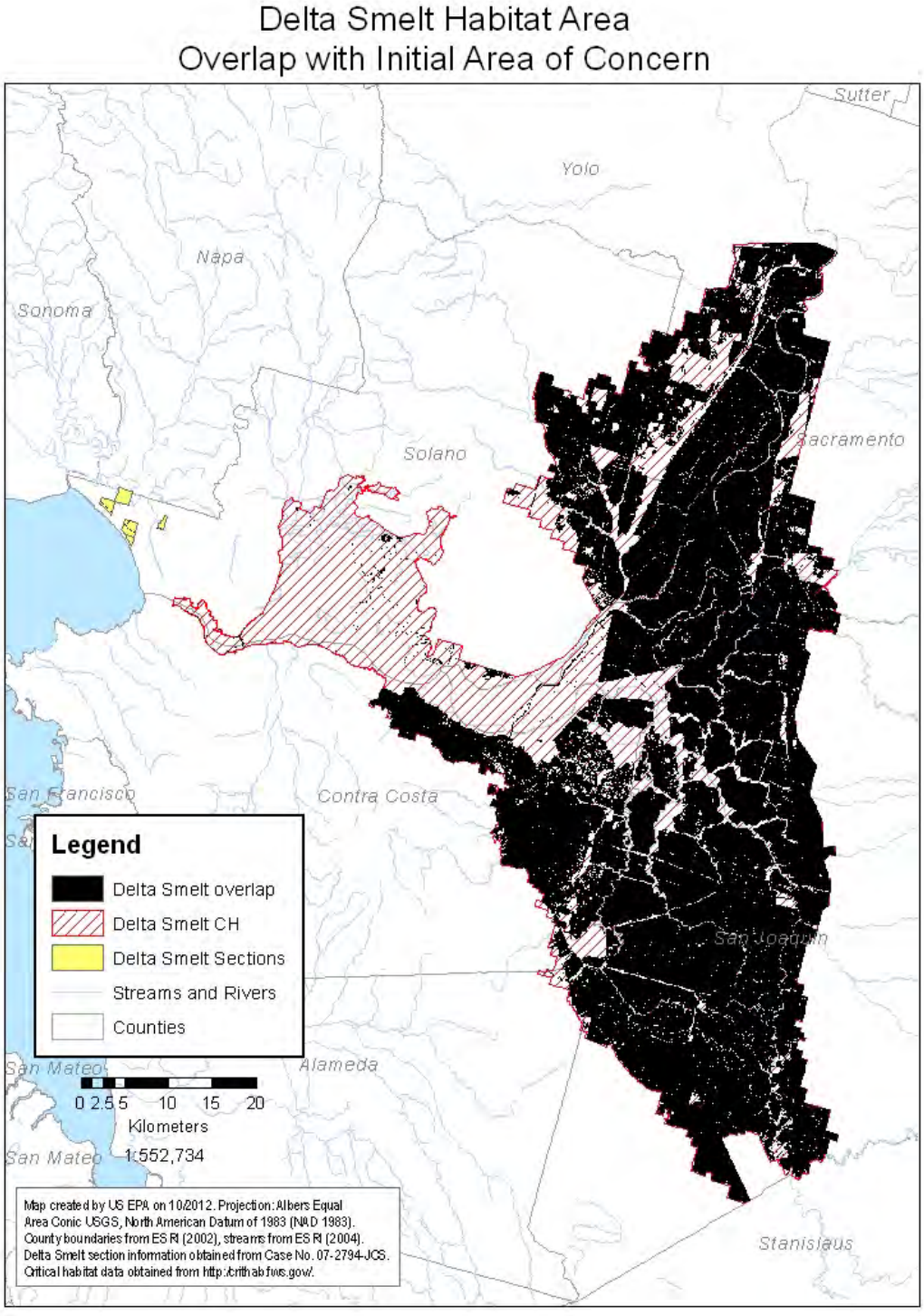

Figure 4 Map showing the overlap of Delta Smelt critical habitat and sections (from Case No. 07-2794-JCS) with NLCD cultivated, orchards/vineyards, pasture/hay, residential and turf-derived classes.

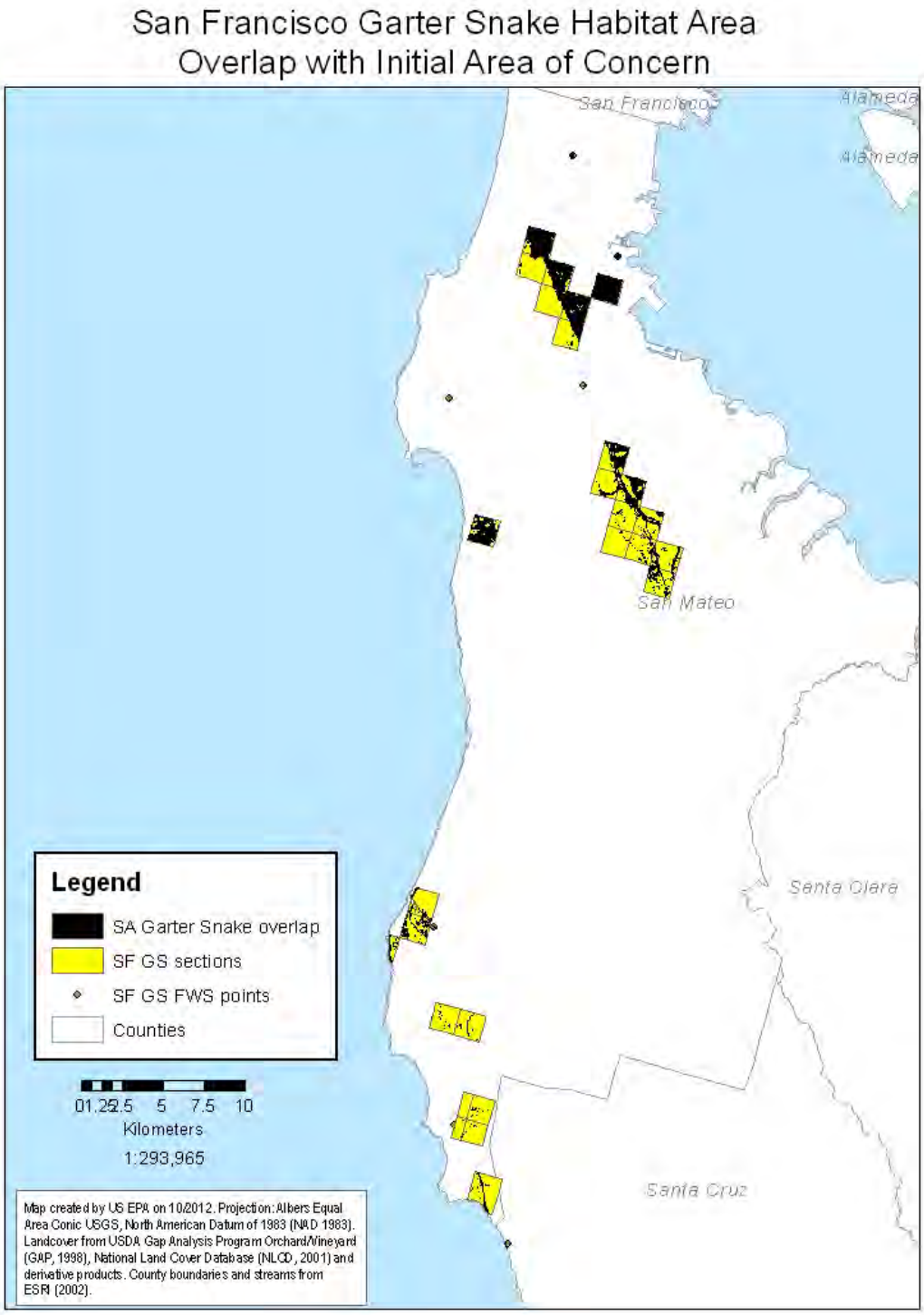

Figure 5 Map showing the overlap of San Francisco Garter Snake sections (from Case No. 07-2794-JCS) and point data (from USFWS Recovery Plan) with NLCD cultivated, orchards/vineyards, pasture/hay, residential and turf-derived classes.

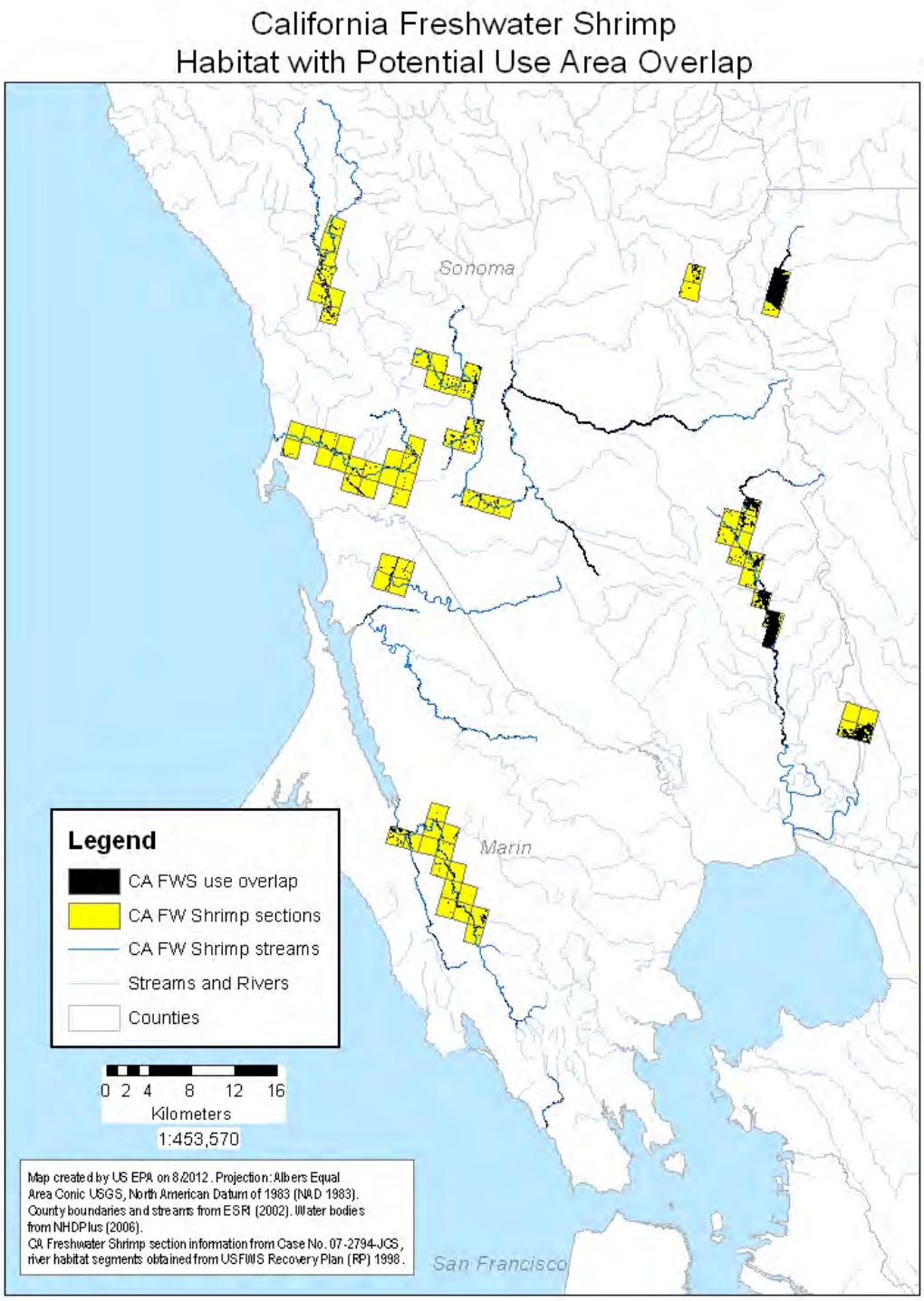

Figure 6 Map showing the overlap of California Freshwater Shrimp sections (from Case No. 07-2794-JCS) and river habitat segments (from 1998 USFWS Recovery Plan) with NLCD cultivated, orchards/vineyards, pasture/hay, residential and turf-derived classes.

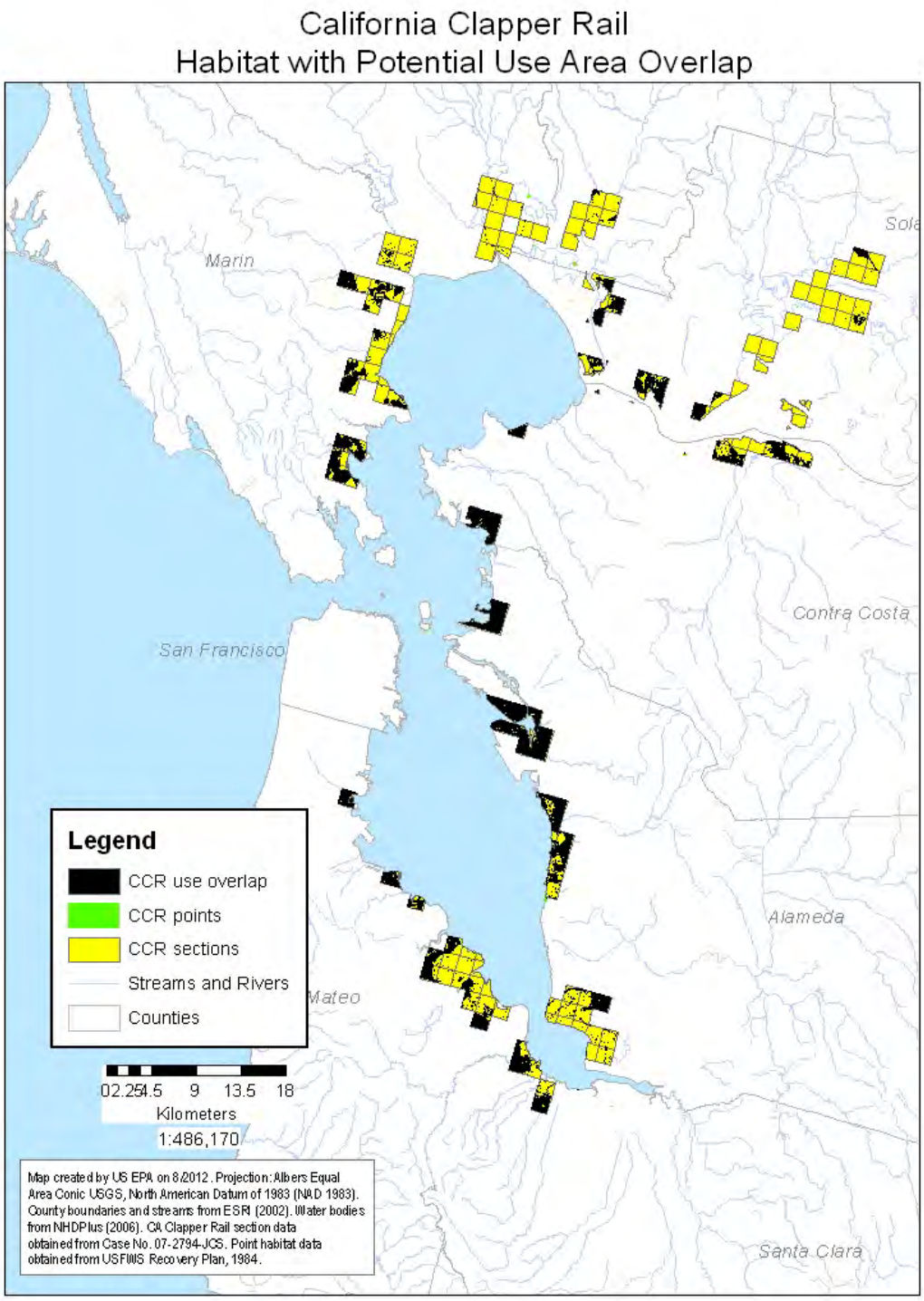

Figure 7 Map showing the overlap of California Clapper Rail sections (from Case No. 07-2794-JCS) and point data (from USFWS 1984 Recovery Plan) with NLCD cultivated, orchards/vineyards, pasture/hay, residential and turf-derived classes.

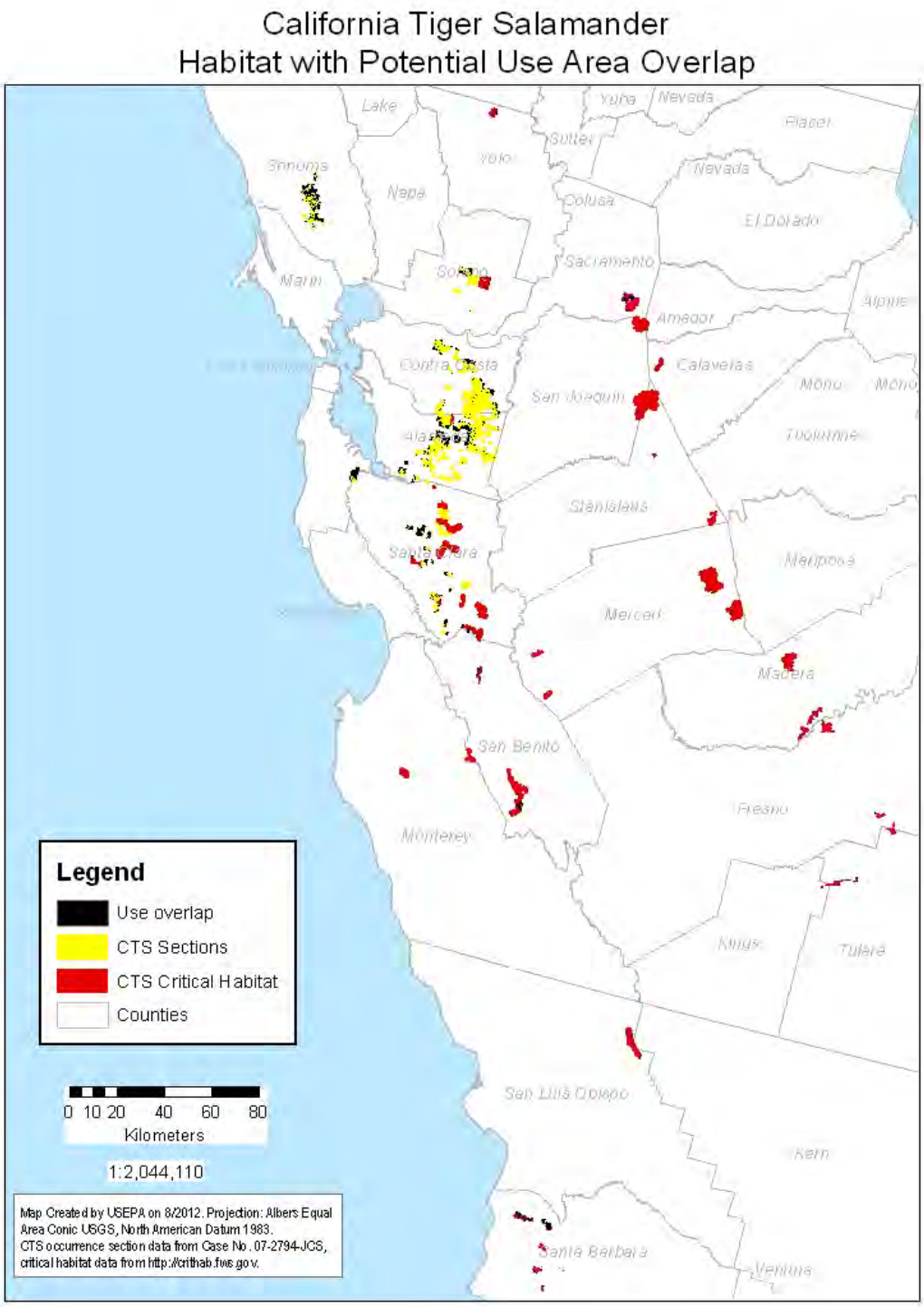

Figure 8 Map showing the overlap of California Tiger Salamander sections (from Case No. 07-2794-JCS) and critical habitat data (from USFWS) with NLCD cultivated, orchards/vineyards, pasture/hay, residential and turf-derived classes.

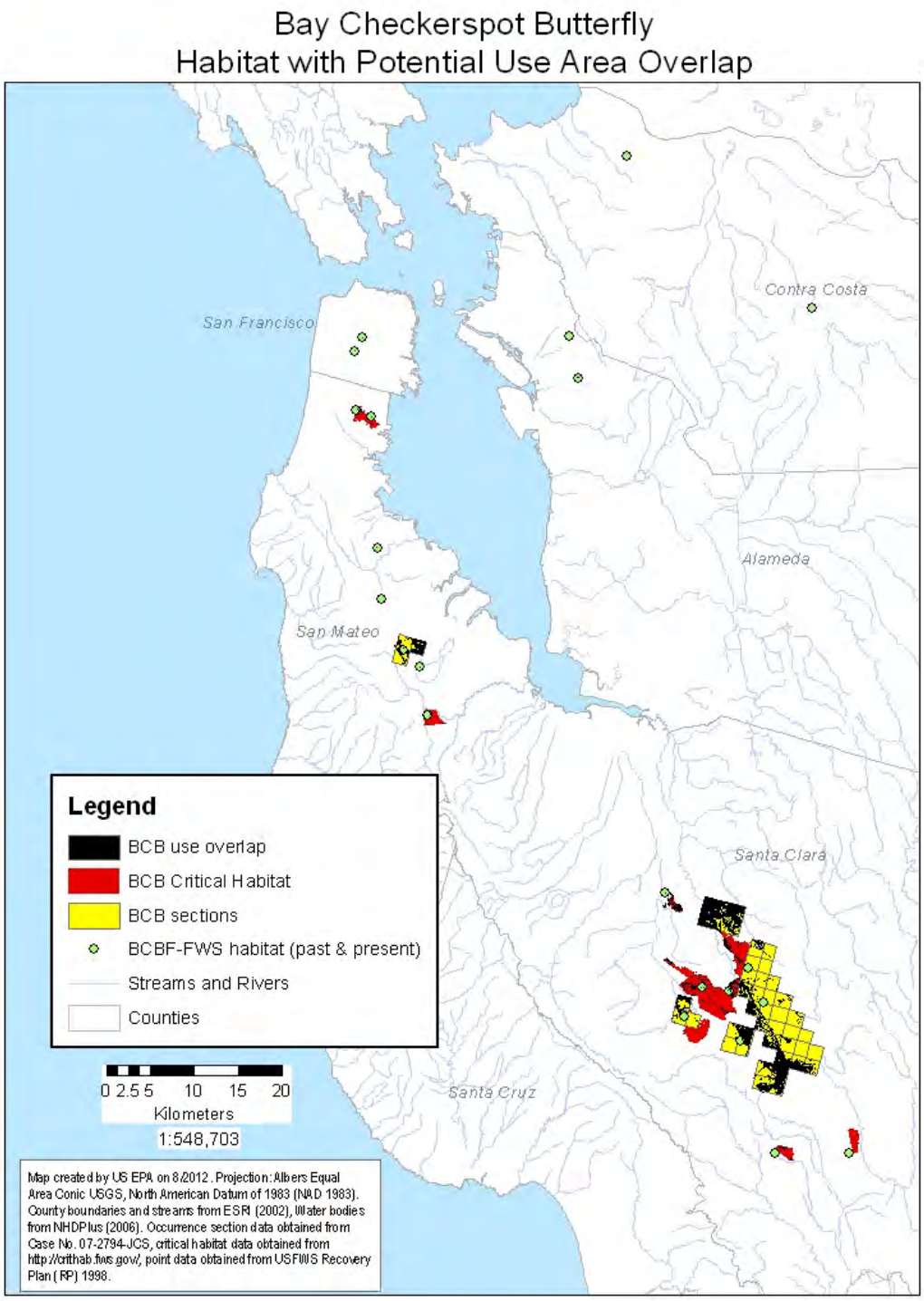

Figure 9 Map showing the overlap of Bay Checkerspot Butterfly critical habitat (from FWS) and sections (from Case No. 07-2794-JCS) with NLCD cultivated, orchards/vineyards, pasture/hay, residential and turf-derived classes.

A. Spray Drift Area

AgDRIFT and/or AgDISP spray drift models are used to determine the distance from the initial area of concern where no direct or indirect effects are expected to occur. Water bodies representing potential habitat areas are not excluded from risk to receiving spray drift.

B. Downstream Dilution

The downstream dilution approach is used to determine the downstream extent of exposure in flowing streams and rivers where direct/indirect effects and/or habitat modification may occur. The downstream component, combined with the initial area of concern, define the downstream dilution area. The downstream extent includes the area where predicted levels of exposure could potentially exceed the highest RQ (risk quotient) to LOC ratio. The approach 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.

As previously noted, the dilution approach uses the NHDPlus dataset for the downstream analysis. After the stream segments in the initial area of concern are identified, the dilution model traverses downstream from each stream segment. At each downstream node, the threshold PCA is compared to the aggregate cumulative PCA. If the cumulative PCA for that segment exceeds the threshold, the stream segment is included in the downstream extent. This continues downstream until the cumulative PCA no longer exceeds the threshold.

The extent of downstream dilution is derived by identifying the stream segment that represents the maximum continuous length of stream miles downstream from the outer boundary of the initial area of concern.

In order to determine the downstream extent of the entire “LAA” area, a conservative assumption is made that all streams exiting the boundary of the initial area of concern are the same length as the identified longest stream reach and extend the maximum distance. For example, if the analysis indicates that 100 streams exiting the initial area of concern have concentrations above the LOC and the average length of these streams is 200 feet but the maximum length for any one stream is 1,000 feet; the analysis will conservatively assume that all streams exiting the initial area of concern have concentrations above the LOC for 1,000 feet downstream. It is likely, however, that this conservative assumption will result in an overestimation of stream reaches that are identified as “LAA”. Although the maximum continuous downstream distance is reported, the overlap of potentially impacted stream reaches with species habitat is not depicted. However, shapefiles of the downstream analysis are available for further consideration as part of the consultation process, if needed.

IV. 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 National Land Cover Data Set (Homer et. al, 2007) represents a comprehensive collection of national land use and land cover information for the United States obtained between 1994-1998. Three additional data sets were used as land cover types to depict use categories not available in the NLCD dataset. These supplemental data include orchard and vineyard land cover data from the California Gap Analysis Project data (Davis, 1998), rights-of-way data derived from road and pipeline data from Teleatlas (2007), and the turf layer derived from NLCD 2001 developed class with corrections applied.

The hydrographic data are from the NHDPlus data set and the generalized streams and rivers layer is from Environmental Systems Research Institute (ESRI). The NHDPlus data set contains the most current and accurate nationwide representation of hydrologic data also depicted in maps. At a spatial scale of 1:100,000, the NHDPlus data set might omit the smallest streams and water bodies. In addition, in some isolated instances, there are errors in the data including missing or disconnected stream segments and incorrect assignment of flow direction.

OPP will continue to identify and incorporate (as appropriate) additional land cover data sets for other land classes not captured in this assessment. In addition, as new updates to existing data occur, these will be evaluated and incorporated as appropriate.

References for GIS Maps

Center for Biological Diversity vs EPA Case No. 07-2794-JCS.

Davis, F. W., D. M. Stoms, A. D. Hollander, K. A. Thomas, P. A. Stine, D. Odion, M. I. Borchert, J. H. Thorne, M. V. Gray, R. E. Walker, K. Warner, and J. Graae. 1998. *The California Gap Analysis Project--Final Report*. University of California, Santa Barbara, CA. Available online at http://www.biogeog.ucsb.edu/projects/gap/gap_rep.html. Orchard/vineyard layer.

EPA Environmental Fate and Effects Division NLCD-derived turf from developed and impervious layer classes.

EPA Environmental Fate and Effects Division, rights-of-way layer derived from road, rail and pipeline from TeleAtlas (2007) and US DoT (1999).

ESRI Data and Maps DVD, 2002. (1:24,000). Available online at www.esri.com.

Homer, C. C. Huang, L. Yang, B. Wylie and M. Coan. 2004. *Development of a 2001 National Land cover Database for the United States. Photogrammetric Engineering and Remote Sensing*, Vol. 70, No. 7, July 2004, pp. 829-840. Available online at http://www.mrlc.gov/pdf/July_PERS.pdf. NLCD layers.

Homer, C., Dewitz, J., Fry, J., Coan, M., Hossain, N., Larson, C., Herold, N., McKerrow, A., VanDriel, J.N., and Wickham, J. 2007. Completion of the 2001 National Land Cover Database for the Conterminous United States. *Photogrammetric Engineering and Remote Sensing*, Vol. 73, No. 4, pp 337-341.

NHD Plus Dataset, 2005, Available online at http://www.horizon-systems.com/NHDPlus/documentation.php.

Sacramento San-Joaquin Delta Fact Sheet. California Department of Water Resources. Available online at http://www.water.ca.gov/deltainit/docs/factsheet.pdf.

Simley, J.D., Carswell Jr., W.J., 2009, *The National Map*—Hydrography: U.S. Geological Survey Fact Sheet 2009-3054, 4 p. Available online at nhd.usgs.gov.

TeleAtlas. 2007. "Dynamap 2000." Version No. 17.1. Released April 2007. USPS Current to February 2007.

U.S. Department of Transportation's National Pipeline Mapping System. 1999. USDoT/Baker. Office of Pipeline Safety, Washington, D.C. 03/30/1999. Available online at www.npms.rspa.dot.gov.

Delta Smelt

U.S. Fish and Wildlife Service. 1995. *Sacramento-San Joaquin Delta Native Fishes Recovery Plan*. U.S. Fish and Wildlife Service, Portland, Oregon. Available online at http://ecos.fws.gov/docs/recovery_plan/961126.pdf. (Accessed 24 November, 2009).

Delta Smelt, CTS, Valley Elderberry Longhorn Beetle, Bay Checkerspot Butterfly, Alameda Whipsnake, Tidewater Goby

U.S. Fish and Wildlife Service (USFWS). *Critical habitat maps (Delta Smelt, Calif. Tiger Salamander, Valley Elderberry Longhorn Beetle, Bay Checkerspot Butterfly, Alameda Whipsnake, Tidewater Goby)*. Available online at http://criticalhabitat.fws.gov. (Accessed 24 September 2009).

Salt Marsh Harvest Mouse, Calif Clapper Rail

U.S. Fish and Wildlife Service (USFWS). 1984. *Salt Marsh Harvest Mouse/California Clapper Rail Recovery Plan*. Available online at http://ecos.fws.gov/docs/recovery_plan/841116.pdf. (Accessed 24 November 2009).

SF Garter Snake

U.S. Fish and Wildlife Service (USFWS), 1985. *Recovery Plan for the San Francisco Garter Snake (Thamnophis Sirtalis Tetrataenia).* U.S. Fish and Wildlife Service, Portland, Oregon. 77pp. Available online at http://ecos.fws.gov/docs/recovery_plan/850911.pdf. (Accessed 24 November 2009).

CA FW Shrimp

U.S. Fish and Wildlife Service (USFWS), 1998. *California Freshwater Shrimp (Syncaris pacifica Holmes) Recovery Plan.* U.S. Fish and Wildlife Service, Portland, Oregon. 94pp. Available online at http://ecos.fws.gov/docs/recovery_plan/980731a.pdf. (Accessed 24 November 2009).

Bay Checkerspot Butterfly

U.S. Fish and Wildlife Service (USFWS), 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp. Available online at http://ecos.fws.gov/docs/recovery_plan/980930c_v2.pdf. (Accessed 27 November 2009 for the Bay Checkerspot Butterfly).

Tidewater Goby

U.S. Fish and Wildlife Service. 2005. *Recovery Plan for the Tidewater Goby (Eucyclogobius newberryi).* U.S. Fish and Wildlife Service, Portland, Oregon. Vi + 199 pp. Available online at http://ecos.fws.gov/docs/recovery_plan/051207.pdf. (Accessed 27 November 27, 2009).