2015 Mitigation Needs Assessment for Transportation Projects for the Sacramento Valley Pilot Project for Regional Advance Mitigation Planning

Prepared for California Department of Transportation

Prepared by University of California, Davis

James H. Thorne, Jacquelyn Bjorkman, Ryan M Boynton, and Patrick R. Huber

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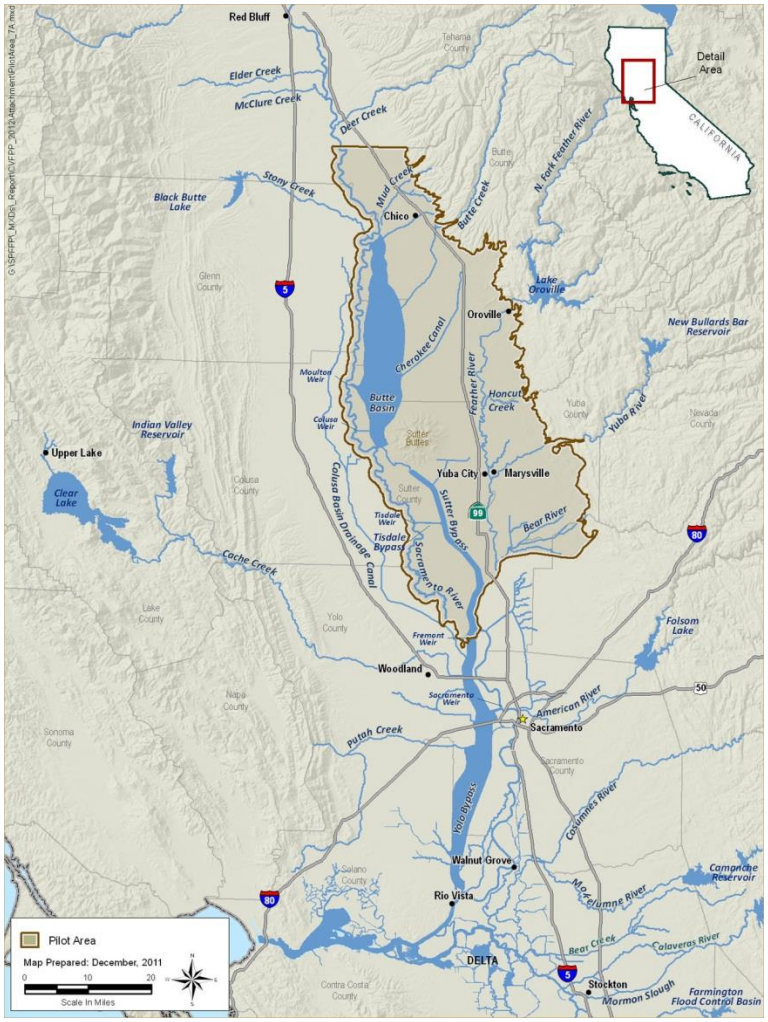

Map Credit: Ryan Boynton

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REGIONAL IMPACT ASSESSMENT FOR THE NORTH VALLEY PILOT PROJECT AREA

This report documents an assessment of the potential environmental impacts of transportation projects under development by Caltrans for a study area. The report is an update of a previous study, overseen by the by the Regional Advance Mitigation Planning (RAMP) working group (Regional Advance Mitigation Planning Work Group, 2011). The RAMP working group previously selected the pilot project area as a useful area in which to provide an application and test of methods to conduct a regional accounting of the expected impacts from multiple projects. This approach to impact assessment is an integral part of developing regional advance mitigation planning methodologies.

This report provides an overview of the legal obligations for Caltrans with regard to compensatory mitigation, with a listing of the federal and state acts that require special consideration, consultation or permits for impacts to species or habitat, and to the waters of the United States and California, including wetlands. Also provided within each regulation is the presiding jurisdiction or agency that issues the consultation and/or permit and a definition of what the law protects.

Following the legal overview is a description of the methods on how the impact assessment for the pilot project area was completed. The impact assessment process requires the following steps:

1. Define the regional assessment area for the pilot project
2. Estimate transportation project footprints
    a. Construct an inventory of transportation projects and assemble project information to be included in the assessment
    b. Create digital line files from county-route-postmile information from various long-range transportation plans (both SHOPP and STIP), and apply a first buffer to generate the areas occupied by current roads; then apply a second buffer to the road extent buffer to identify the area of impact from road project
3. Estimate impacts to wetlands and waterways, special-status species and their associated habitats
    a. Assembly of ecological and environmental data to be used in the impact assessment
    b. Overlay the road project footprints on the assembled ecological and environmental data to identify impacts

There were several categories of environmental impacts that were analyzed for this report: state and federally listed species and their suitable habitats, including salmonid fish; land cover types with varying legal status, including wetlands, oak woodlands and agricultural lands; and stream crossings. The environmental data assembly and processing are specific to each category, and the impact assessment process for each category of impacts is described separately.

Finally, the Results section of this report summarizes the estimates of impacts for each category of environmental impacts. Tables are presented with impacts listed by transportation project, county and watershed. Additionally, maps are provided for some impacts showing the entire pilot project area as well as maps of impacts for each transportation project.

LEGAL OBLIGATIONS FOR MITIGATION

Federal

There are a number of federal acts that transportation projects are subject to regarding environmental mitigation when Caltrans or FHWA is the federal lead agency. The Standard Environmental Reference (SER), Volume 1, Chapter 1, "Federal Requirements," provides a listing of laws and regulations including executive orders, policy, guidance, directives and advisories related to the National Environmental Policy Act (NEPA) compliance, which can be found here: http://www.dot.ca.gov/ser/vol1/sec1/ch1fedlaw/chap1.htm. The descriptions below account for the relevant clauses to environmental mitigation for the entire state. Note that some laws may not pertain to resources within the pilot project area, but are included for the sake of completion.

- **National Environmental Policy Act (NEPA):** Requires agencies to consider the potential environmental consequences of their proposals, document the analysis, and make the information available to the public for comment prior to implementation of a federal action. "Environment" includes the physical environment (air and water quality), natural environment (what RAMP is concerned with), and community impact (including noise).
- **Rivers and Harbors Appropriations Act, Section 10**: Prohibits the building of any wharfs, piers, jetties and other structures affecting navigable waters, and any excavation, or filling within navigable waters without the approval of the Chief of Engineers and authorization by the Secretary of the Army (USACE). Section 404 of the Clean Water Act jurisdiction encompasses areas regulated by Section 10; the Corps typically combines the permit requirements of Section 10 and Section 404 into one permitting process. The USACE consults with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) on activities that could impact listed species, however there are no permit requirements from these agencies for section 10.

- **Clean Water Act (CWA)**: All U.S. waters, including wetlands; U.S. Environmental Protection Agency (EPA) has ultimate jurisdiction of this federal law, however Congress delegated day-today administration of Section 404 permitting to the USACE, the Regional Water Quality Control Board (RWQCB) is authorized to issue permits under Section 402, and if no federal permit is required for Section 401 the State Water Regional Control Board (SWRCB) will regulate under Porter-Cologne Authority.
    - **Section 401**: For projects involving dredging, filling or otherwise impacting waters of the US or waters of the State a water quality certification from the SWRCB is required, and applications for water quality certification under CWA Section 401 are typically processed by the Regional Water Quality Control Board (RWQCB) for local jurisdiction.
    - **Section 402**: Storm water (National Pollutant Discharge Elimination System (NPDES) permits from the RWQCB are required for discharges from a municipal separate storm sewer system serving a population of 100,000 or more.

- **Section 404**: Permit program for discharge of dredged or fill material into US waters including wetlands, which authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearing, for the discharged of dredged or fill material into the waters of the United States as specific disposal sites. Section 404 of the Clean Water Act jurisdiction includes areas regulated by Section 10, so the USACE combines the permit requirements of Section 10 and Section 404 into one permitting process.

- **Coastal Zone Management Act (CZMA):** This Act, administered by the National Oceanic and Atmospheric Administration (NOAA), provides for the management of the nation's coastal resources, to preserve, protect, develop and where possible, to restore or enhance the resources of the nation's coastal zone. The CZMA is administered in California through three designated coastal management agencies: The California Coastal Commission; the California Coastal Conservancy, which is not a regulatory agency; and the Bay Conservation and Development Commission (BCDC).

- **Fish and Wildlife Coordination Act**: Any federal project where the waters of any stream or other body of water are modified. Requires consultation with USFWS and appropriate state wildlife agency. Agencies prepare reports and recommendations that document project effects on wildlife (animals and plants) and identify measures that may be adopted to prevent loss or damage. Provisions of the Act are implemented through the NEPA process and Section 404 permit process.

- **Federal Endangered Species Act (ESA) Section 7**: Federal agencies are directed to consult on any activities that may affect endangered and threatened species and designated critical habitat. For terrestrial species and non-anadromous/marine fish, consultation is required with USFWS; for anadromous and marine species, consultation is required with the NOAA's National Marine Fisheries Service (NOAA-NMFS). http://www.fws.gov/endangered/species/us-species.html.

- **Federal Endangered Species Act (ESA) Section 10:** Provides a means whereby a non-federal action with a potential to result in the "take" of a listed species could be allowed under an incidental take permit. Similar to Section 7, the USFWS is the consulting agency for terrestrial and non-anadromous/marine fish and NOAA-NMFS consults on anadromous and marine species.

- **Marine Mammal Protection Act (MMPA):** Prohibits the "take" of marine mammals in US waters (NOAA can authorize take for certain activities, issuing either an Incidental Harassment Authorization or a Letter of Authorization, as appropriate). http://www.nmfs.noaa.gov/pr/laws/mmpa/.

- **Magnuson-Stevens Fishery Conservation and Management Act**: promotes the conservation and management of marine fishery resources and anadromous fish and requires federal agencies to consult with NOAA-NMFS on activities that may adversely affect Essential Fish Habitat (EFH). Essential Fish Habitat is defined as those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity. The federal agency must provide NOAA-NMFS with an assessment of the proposed action's impacts to EFH, and NOAA-NMFS provides the federal agency with EFH Conservation Recommendations to avoid, minimize, mitigate or otherwise offset those adverse effects. Although a separate consultation than the Endangered Species Act Section 7, the EFH assessment under the Magnusson-Stevenson Act is usually administered simultaneously and issued with the Biological Opinion. An EFH consultation can be combined with other existing environmental review procedures, such as those under the NEPA, the CWA, and the Fish and Wildlife Coordination Act to streamline the requirements and avoid duplication with other environmental reviews. http://www.nmfs.noaa.gov/msa2007/docs/list_of_protected_lmr_act_022610.pdf.

- **Migratory Bird Treaty Act (MBTA)**: The USFWS has statutory authority and responsibility for enforcing the MBTA, which makes it illegal to take, possess, export, transport, sell, purchase, barter (or offer to do those things) any migratory birds, or the parts, nests, or eggs of such a bird except under the terms of a permit. This mainly affects avoidance and minimization parts of mitigation. http://www.fws.gov/migratorybirds/regulationspolicies/mbta/MBTANDX.HTML.

- **2008 Final Rule on Compensatory Mitigation for Losses of Aquatic Resources**: The EPA and USACE issued revised regulations to improve the planning, implementation and management of compensatory mitigation by creating higher standards for compensatory mitigation, and requiring that mitigation decisions be made within the context of a watershed approach. There were also regulations designed to expand public participation in compensatory mitigation decision-making and to increase the efficiency and predictability of the mitigation project review process. These regulations follow the recommendations of the National Research Council by establishing equivalent, effective standards for compensatory wetland mitigation under the Clean Water Act. These regulations need to be followed in order to receive permits from USACE under Section 401 and Section 404 of the Clean Water Act. For impacts to wetlands, streams and other aquatic resources authorized by Clean Water Act section 404 permits;

- **Bald and Golden Eagle Protection Act**: Prohibits anyone from "taking" bald or golden eagles, including their parts, nests or eggs without a permit issued by the Secretary of the Interior (USFWS). "Take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." This mainly affects avoidance and minimization parts of mitigation.

State

In addition to federal laws, there are California-specific laws and regulations. As some federal and state regulations have similar goals, there is some flexibility in consolidating and avoiding duplication within the review process, provided that each regulation's requirements are sufficiently met. See the Standard Environmental Reference (SER) Volume 1, Chapter 2 for state requirements for compensatory environmental mitigation http://www.dot.ca.gov/ser/vol1/sec1/ch2statelaw/chap2.htm. The descriptions below account for the relevant clauses to environmental mitigation for the entire state, including some that may not be pertinent within the pilot project area, but that included here for the sake of completion.

- **California Environmental Quality Act (CEQA)**: Seeks to protect environmental factors including aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils, greenhouse gases, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, and noise, population and housing, public services, recreation, transportation and traffic, utilities and service systems or a combination of these factors, by regulating activities which may adversely affect the those factors. This is a public disclosure law for the State to disclose the environmental impact of a discretionary state action, and to allow public review and comment on the action and its potential impacts. The Lead Agency determines the appropriate level of environmental document for its discretionary action, or whether an action is categorically exempt from CEQA. http://www.dot.ca.gov/ser/vol1/sec1/ch2statelaw/chap2.htm#CEQA

- **Porter-Cologne Water Quality Act:** Protects and oversees water quality on a day-to-day basis at the local and regional level. The Porter-Cologne Act establishes nine Regional Water Quality Control Boards which prepare and update Basin Plans for each region, and issue permits to control pollution. Under the auspices of the EPA, the State Water Resource Control Board and nine Regional Boards have the responsibility of granting Clean Water Act Section 402 NPDES permits, for point-source discharges and waste discharge requirements or conditioned water quality certifications.

- **California Native Plant Protection Act (California Fish and Game (CFG) Code Sections 1900-1913)**: Protects endangered and rare native plants by allowing the California Department of Fish and Wildlife (CDFW) to designate plants as rare or endangered, prohibit take of endangered or rare native plants, and issue permits for some exceptions; See here for list of species: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEPlants.pdf.

- **California Fish and Wildlife (CFG Code Section 1600) Lake and Streambed Alteration (LSA)**: Requires an entity to notify CDFW of any activity that could divert, obstruct or change the natural flow of any river, stream or lake; substantially change or

use any material from the bed, channel, or bank of any river, stream, or lake; or deposit debris, waste or other materials that could pass into any river, stream or lake. “any river, stream or lake” includes those that are episodic as well as those that are perennial, including ephemeral streams, desert washes and watercourses with a subsurface flow, or work undertaken within the flood plain of a body of water. Before issuing an LSA Agreement, CDFW must comply with the California Environmental Quality Act (CEQA).

- **California Endangered Species Act (CESA) CFG Code**: Protects threatened and endangered species that are listed by both the federal Endangered Species Act and the California Endangered Species Act, by requiring consultation with CDFW in the event that an otherwise lawful activity may result in the “take” of any listed species. If there is already a federal incidental take statement (Section 7) or an incidental take permit (Section 10) issued under the federal ESA, then no additional take authorization is needed from the state provided that the federal authorization is consistent with state code. This is referred to as a “Consistency Determination”. If CDFW determines that the federal authorization is not consistent, then a 2081 (b) incidental take permit is required (even if it is a dual listed species).
https://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEAnimals.pdf.

- **CFG Code Sections 3503, 3513, and 3800**: Provides protection against take of nongame birds (3503), migratory birds (3513), and defines when take can occur (3800). This mainly affects avoidance and minimization, but not compensatory mitigation.

- **California Wild and Scenic Rivers Act:** Preserves certain designated rivers in their free-flowing state. These rivers must possess extraordinary scenic, recreational, fishery or wildlife values.

- California State Bill 857, Streets and Highways Code 156, California Fish and Game Code 5901. Fish passage

- **Senate Concurrent Resolution No. 17 Oak Woodlands:** Requests State agencies to preserve and protect native oak woodlands and to provide replacement plantings whenever Blue, Engelmann, Valley or **C**oast Live Oak are removed from native woodlands. “Oak Woodlands” are defined as 5-acre circular areas with 5 or more oak trees/per acre.

THE PILOT PROJECT AREA

The pilot project area (Figure 1) was identified by the RAMP working group as a useful area in which to conduct a test of methods for regional accounting of expected impacts from multiple transportation projects. The pilot project area was selected to encompass enough projects to justify conducting the impact assessment part of a RAMP effort, and because it has enough potential mitigation supply to meet the needs. The pilot project area is meant to both represent a logical ecological extent (from the Sacramento River to the Sierra Nevada foothills) and to adhere to county political boundaries, to the extent possible. The area was created in a GIS by combining ecoregional boundaries, county boundaries, and a buffer around the Sacramento River to capture riparian ecosystems.

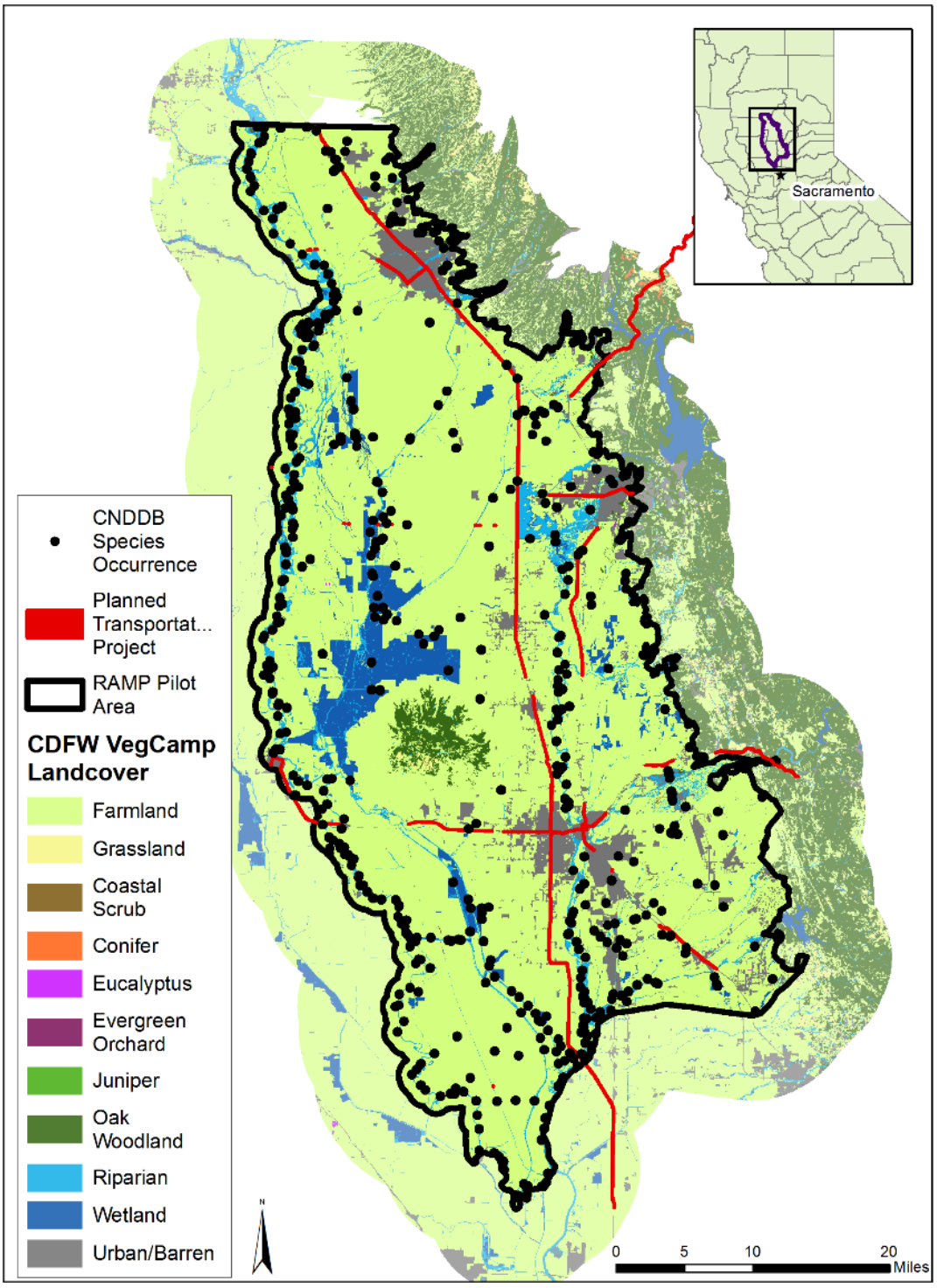

Figure 1. The pilot project area's planned transportation projects, occurrences of species typically requiring mitigation, and general landcover types.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

The methods presented in this report were developed with input from the resource agencies, but they are the product of the UC Davis research team, which is solely responsible for the results produced by these methods. They are not intended to represent the final impact findings or any obligations of either Caltrans or of the resource agencies. The methods need to be tested, and possibly revised, prior to the resource agencies giving their official approval. This statement applies to all the methods presented in this document.

ESTIMATING TRANSPORTATION PROJECT FOOTPRINTS

Through a contract with Caltrans, researchers at the UC Davis Information Center for the Environment (UCD) used a Geographic Information System (GIS) analysis to estimate the direct construction impact area (footprint) of Caltrans projects in a pilot project area located in the Sacramento River Valley between Sacramento and Chico (Figure 1). Caltrans provided four tables containing transportation projects from various programs to be considered in the inventory of projects for this report: Statewide CTC projects (2013); 10 year STIP projects (on STIP cycles from 2014-2018); the Ten Year SHOPP projects from 2013; and the Ten Year SHOPP projects from 2015. These spreadsheets described projects in terms of highway post miles, a system used by Caltrans to identify the locations that a project will be located. The post miles were used to render each separate project into a line in the GIS, following the center of each road or other structure. A total of 57 road projects were used as a set to be analyzed for projected impacts.

Using the National Agriculture Imagery Program's 1 meter aerial imagery (NAIP 2013; http://www.fsa.usda.gov/FSA/apfoapp?area=home&subject=prog&topic=nai), existing road widths were measured. We then used the width values to buffer the road center lines and create polygons representative of the spatial extent of each existing road. Results depict the approximate footprint of the existing road beyond which project footprints were estimated. In some cases road projects overlapped, but double counting of extent was removed in the GIS.

Calculation of the spatial extent of each transportation project's footprint was determined through the use of a second buffer, to calculate the potential extent of the completed transportation project. The buffer extents used to portray the area of impact (Table 1) differ by project type, from 220 feet for new interchanges to 0 feet for installation of median barriers. These numbers serve as buffer distances calculated from the edge of the existing road in order to estimate the total area of disturbance (temporary disturbance and permanent conversion of landcover) for each road project. UCD determined buffer distances from a variety of sources, including information provided by Caltrans personnel (Stuart Kirkham, pers. comm. 2014, 2015, Andrea Williams, pers. comm., 2011) and other sources (Baker Engineering 2007, Thorne et al. 2009) on typical impacts associated with each type of road project.

Table 1. Estimated areas of impact for road project types. The estimated footprint is a linear distance from the edge of the roadway outward. This can be applied to only one side, or both sides of a road, depending on the type of project. Only project types named in the pilot project area are included in this table.

Project Type	**Estimated footprint width on each side of existing or proposed roadway (feet)**
New Interchange	220
Interchange Improvement/Reconstruction	220
New Bridge	100
Seismic Retrofit	40
Realignment	40
Widen Road (per Lane)	20
Bridge Rail Replacement/Upgrade	20
Drainage System Restoration (Culvert)	20
Construct Left/Right Turn Lane	15
Widen Shoulder	15
Pedestrian Facility	10
Install New Sign/Traffic Operation System	5
Roadway Rehabilitation	0
Install Median Barrier	0

ESTIMATING IMPACTS ON SPECIAL-STATUS SPECIES AND THEIR HABITATS, AND TO WATERWAYS AND LAND COVER TYPES

To examine the potential impacts from Caltrans projects which may require mitigation, footprints were developed for each of the 57 transportation projects identified by Caltrans. Eleven of these were found to be outside of the pilot project region. An additional 16 projects were considered to have no impact, being repaving or other activities that are within the current road extent. After these screening exercises, the impact analysis was conducted on the remaining 30 transportation projects. The 30 projects were screened for three types of impacts:

1. Listed species and their suitable habitats, which may be protected under state and federal laws and regulations (Federal Endangered Species Act, California Endangered Species Act)

2. Landcover types

    a. Wetlands (Clean Water Act Section 401 and 404, Rivers and Harbors Appropriations Act, Section 10, Executive Order 11990 "Protection of Wetlands", Executive Order 11988 "Floodplain Management, California Endangered Species Act (if endangered species habitats are present), CFG Code Section 1600 Lake and Streambed Alteration (if wetlands occur in or directly adjacent to the "bed and banks" of a stream or lake))

    b. Oak woodlands (Senate Concurrent Resolution No. 17 Oak Woodlands)

3. Stream Crossings (Clean Water Act Section 404, Rivers and Harbors Appropriations Act, Section 10, CFG Code Section 1600 Lake and Streambed Alteration, California Wild and Scenic Rivers Act)

    a. Modification of stream bed, bank and associated riparian vegetation, and to fill of other waters of the US (LSA §1600, CWA §404)

    b. Salmonid fish species (Magnuson-Stevens Fishery Conservation and Management Act, California Wild and Scenic Rivers Act, Federal Endangered Species Act, California Endangered Species Act, SB 857)

Listed Species and Suitable Habitat Types

Special-status species were analyzed because they or their habitat could be affected by proposed projects in the pilot project area, and impacts to them require consultation with state and federal agencies and may include incidental take authorizations under the federal ESA and/or CESA. The unlisted tricolored blackbird is also included because it is currently under an emergency listing that lasts from 12/29/14-6/30/15, and it may be fully listed at some time during the 20-year horizon of the construction of all the

transportation projects in our study (Beedy 2008, Kyle 2011). Burrowing owls were also selected because mitigation is frequently required for this species under CEQA.

To estimate the impacts of the transportation projects to land cover types, UCD overlaid the project footprints on the landcover dataset developed for the assessment area and calculated the impact on each cover type. To estimate impacts on the special-status species, UCD identified likely habitat for each species based on land cover, location species occurrences in the study area as defined by the California Natural Diversity Database (CNDDB; http://www.dfg.ca.gov/biogeodata/cnddb/; Figure 1), and the California Wildlife Habitat Relationship (CWHR) classification models that describe suitable habitat types for each species. For definitions of CWHR codes, see Appendix A. The absence of CNDDB records for specific species cannot be used to conclude absence of that species within the pilot project area. CNDDB is a record of known species' presences, which can be used to determine the areas a species may be more likely to be encountered, when combined with a suitable habitat map. Two CDFW land cover maps (2011 and 2013) were used to identify potential habitat for a target species. Habitats ranked in California Wildlife Habitat Relationships (CWHR; California Department of Fish and Wildlife 2008) as "high" quality habitats for the species being analyzed were selected from the land cover maps (itemized in Table 2). To provide a range of potential impacts using this approach, two distances from a CNDDB occurrence were used: 2 and 4 miles (Figure 2). For example, where transportation project footprints overlapped with Valley Foothill Riparian (VRI) landscape cover type, and it was within a 2- or 4-mile radius of a Valley Elderberry longhorn beetle CNDDB record, the sum of CWHR acres found in the overlapping area was calculated as the potential area of impact on Valley Elderberry longhorn beetle habitat. For vernal pool species, the species occurrence had to overlap with the likely CWHR habitat types (AGS, PGS, FEW, WTM and LAC) and overlap with an additional dataset of vernal pools (Holland, 2005).

Table 2. The CWHR types used to identify suitable habitat for the species considered in the analysis, represented by CWHR codes. The species listing status codes in the table refer to: FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; SE = State Endangered; ST = State Threatened; SC = State Candidate; SSC = State Species of Concern; SFP = State Fully Protected; SR = State Rare; and N = None. See Appendix A for the full name for each of the WHR codes. Some WHR types listed were not present in the pilot project area but are included to show all possible habitat types. Note that Chinook salmon and Steelhead are represented by critical habitat data, not CWHR values, further described in the Stream Crossings section of the report.

Common Name	Scientific Name	Status	WHR Habitat Types used by species
Birds			
Bald eagle	*Haliaeetus leucocephalus*	SE	KMC, LAC, PPN, RIV, SMC
Bank swallow	*Riparia riparia*	ST	VRI
Burrowing owl	*Athene cunicularia*	SSC	ASC, AGS, BAR, CSC, IRH, PAS, PGS, SGB
California black rail	*Laterallus jamaicensis coturniculus*	ST, SFP	EST, FEW, SEW
Greater sandhill crane	*Grus canadensis tabida*	ST	DGR, FEW, IGR, IRH, IRF, LAC, WTM, Cr*, CRP
Swainson's hawk	*Buteo swainsoni*	ST	AGS, BAR, BOP, BOW, COW, IRH, JUN, PAS, PJN, VRI, VOW
Tricolored blackbird	*Agelaius tricolor*	SSC, SE on an emergency listing from 12/29/2014 until 6/30/2015	AGS, FEW, PGS
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	SE, FT	DOR, DRI, VOW
Plants			
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	SE	FEW
Butte County meadowfoam	*Limnanthes floccosa ssp. californica*	SE, FE	AGS, PGS, FEW, WTM and LAC (also had to overlap with Vernal Pools layer)
Greene's tuctoria	*Tuctoria greenei*	SR, FE	AGS, PGS, FEW, WTM and LAC (also had to overlap with Vernal Pools layer)
Hoover's spurge	*Chamaesyce hooveri*	FT	AGS, PGS, FEW, WTM and LAC (also had to overlap with Vernal Pools layer)
Hairy Orcutt grass	*Orcuttia pilosa*	SE, FE	AGS, PGS, FEW, WTM and LAC (also had to overlap with Vernal Pools layer)
Palmate-bracted salty bird's-beak	*Chloropyron palmatum*	SE, FE	FEW

Common Name	Scientific Name	Status	WHR Habitat Types used by species
Slender Orcutt grass	*Orcuttia tenuis*	SE, FT	AGS, PGS, FEW, WTM and LAC (also had to overlap with Vernal Pools layer)
Invertebrates			
Conservancy fairy shrimp	*Branchinecta conservatio*	FE	AGS, PGS, FEW, WTM and LAC (also had to overlap with Vernal Pools layer)
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	VRI
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	AGS, PGS, FEW, WTM and LAC (also had to overlap with Vernal Pools layer)
Vernal pool tadpole shrimp	*Lepidurus packardi*	FE	AGS, PGS, FEW, WTM and LAC (also had to overlap with Vernal Pools layer)
Mammals			
Townsend's big-eared bat	*Corynorhinus townsendii*	SC	BAR, BOP, BOW, COW, CSC, DFR, KMC, MRI, PPN, SGB, SMC, VRI, VOW, WTM
Reptiles			
Giant garter snake	*Thamnophis gigas*	ST, FT	FEW, LAC, RIV, VRI, WTM, CRP (also had to overlap with CAML ag-rice)
Fish			
Chinook Salmon	*Oncorhynchus tshawytscha*	ST, FT	Critical Habitat Map (described in Stream Crossings Section)
Longfin smelt	*Spirinchus thaleichthys*	ST	LAC
Steelhead	*Oncorhynchus mykiss irideus*	ST, FT	Critical Habitat Map (described in Stream Crossings Section)

The use of CNDDB records to create 2- and 4-mile radius areas for selection of suitable habitat was not applied to two colonially nesting bird species, bank swallows and tricolored blackbirds. For bank swallows, UCD used a dataset of documented nesting colonies on the Feather and Sacramento Rivers (Garcia 2008). Since no data or maps were available depicting the location of potential habitat for this species (naturally eroding sandy, vertical bluffs on riverbanks), UCD calculated transportation project impacts where project footprints intersected a 500-foot buffer around known colonies or the colonies themselves. For tricolored blackbirds, UCD used recent survey data of nesting colony locations (Meese 2010) and information from the surveyor to determine that a foraging range of 4 miles from the known nesting colonies was sufficient to estimate potential impacts to tricolored blackbird foraging habitat (R.

Meese, pers. comm., 2011). Therefore a 4 mile buffer around the known locations was used to select potential foraging habitats, as defined in Table 2 above.

For giant garter snake habitat, the landcover crop areas (CWHR types CRP, IGR, IRH and IRF) were intersected with another landcover dataset which specifies crop type, the 2010 California Augmented Multisource Landcover Map (CAML) (Hollander, 2010). The CWHR crop areas that overlapped with the CAML crop areas for rice were selected as the suitable habitat for the giant garter snake for agricultural areas, along with the natural landcover types FEW, LAC, RIV, VRI and WTM. Rice fields provide similar moist habitat features to natural habitats that the species uses, and the CAML map was used because the other maps available did not portray rice fields within the agricultural polygons.

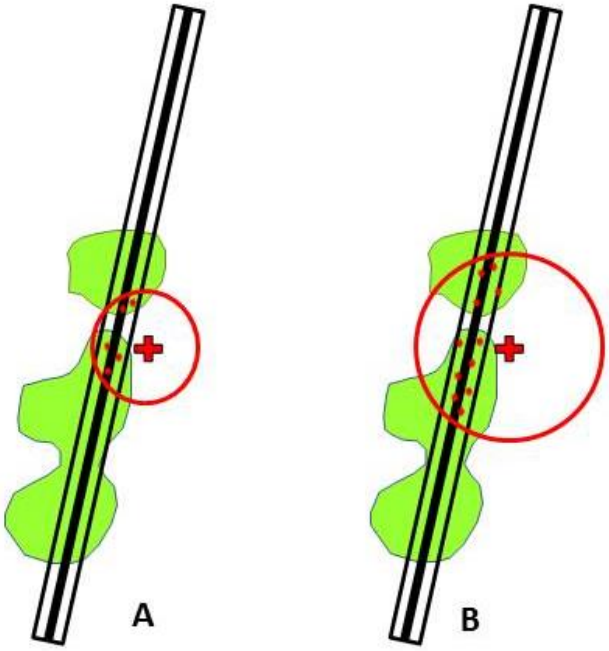

Figure 2. This image (from Thorne et al. 2014) shows the use of CNDDB records with transportation project footprints, to predict the extent of suitable habitat that could be impacted by a project. The green represents suitable habitat for a species. The red cross represents a CNDDB species occurrence record for that species. The black outlines depict a transportation corridor and its estimated impact footprint. The green areas with red dots within the red circles of (A) a 2-mile and (B) a 4-mile buffer from the CNDDB point represent the suitable habitat that falls within the project footprint. The areas of appropriate habitat patches as defined by CWHR within the circles are then summed to provide the impact estimate for that species on that project.

Land Cover Types

A variety of landcover types are of interest in the regulatory environment. The UCD combined two California Department of Fish and Wildlife vegetation maps (2011; 2013) to create a landcover dataset for the pilot project area: Eastern Sacramento Valley Natural Vegetation and Sierra Nevada Foothills-North (https://map.dfg.ca.gov/bios/?bookmark=940). These two datasets represent the newest, high-resolution mapping products from the CDFW Biogeography Data Branch, and are based on the Manual of California Vegetation classification (Sawyer, Keeler-Wolf and Evens, 2009). These datasets can be linked

to the California Wildlife Habitat Relationship (CWHR) classification. This composite dataset includes the following CWHR land cover types (see Appendix A): freshwater emergent wetlands (FEW), open water (WAT), Valley Riparian (VRI), vernal pool complexes, oak woodlands (BOW, COW, VOW, BOP), and agriculture (CRP). These categories are important natural aquatic and plant communities of the central valley as well as being habitats associated with special-status species. We used the land cover maps and transportation project footprints to assess impacts to these habitat types. Impacts to these vegetation types were analyzed because of the need for mitigation that such impacts require, either directly because the habitat type itself is legally protected, or because of the strong association of the habitat to listed species, as defined by CWHR. In addition, many of these categories are also the focus of conservation efforts described in the four Habitat Conservation Plans/Natural Community Conservation Plans (HCPs/NCCPs) currently being prepared within the Assessment Area.

Wetlands

Loss in all types of U.S. waters, including freshwater emergent wetlands (FEW), open water (WAT), Valley Riparian (VRI), vernal pool complexes are of concern under the USACE (i.e., Section 404 permits for impacts to freshwater emergent wetlands) and/or CDFW (the 1602 permits for impacts to streambed, stream bank, and/or adjacent riparian areas), and to USFWS and CDFW for listed species. The areas within the land cover dataset with the CWHR types FEW, WAT and VRI that also overlapped with the transportation project footprints were selected to represent those types of wetlands. For vernal pools, a separate habitat layer was used (Holland, 2005) in combination with the following CWHR types: AGS, PGS, FEW, WTM and LAC. Only areas that were present in both the Holland dataset and the listed CWHR types listed above were considered to be vernal pool areas.

Oak Woodlands

Oak woodlands are important to wildlife (Block et al. 1990). Oak woodlands requested to be protected through CA Senate Resolution No. 17 Oak Woodlands, which requests preservation and protection of 5-acre and larger areas of oak woodlands. To capture the presence of oak woodlands, the following CWHR types were selected: BOW, COW, VOW and BOP.

Agriculture

Impacts to agriculture were analyzed, even though there is currently no statewide mandate protecting all types of agricultural land or requiring special permits for agricultural land. Some agricultural types such as rice, irrigated cropland and non-irrigated pasture are recognized in the Butte County HCP as providing habitat value to some listed species. The Butte County HCP (2015) calls for protection of up to 42,830 acres of agricultural lands. For this reason the overall estimate area impacts to agricultural lands were included in this impacts analysis. However, the impacts to crop types associated with listed species, which are the primary focus of mitigation concerns for Caltrans in this study, are presented in the species impacts section of the report.

Stream Crossings, Salmonid Fish Impacts, and Area Impacts to Waterways

Stream crossing impacts were analyzed in two ways which were used to assess the level of Caltrans' obligation for various water-related regulations: first, to count the number of stream crossings by transportation projects; and second, to determine the area of waterway impacts expected from the transportation projects. For both analyses, the most recent edition of the National Hydrography Database (NHD) geodatabase (http://nhd.usgs.gov/data.html; accessed 10/22/2014) for the state of California was used. NHDFlowline lines, which represent watercourses that have an associated stream order, were selected to represent the pilot project area's streams and rivers. In each analysis, the results are presented in terms of potential impacts to waterways containing anadromous fish, and waterways with no anadromous fish.

For the first analysis, the streams were intersected with the transportation project lines, to get a count of the number of stream crossings. Not all transportation projects that affect streams actually cross streams, and not all crossings will have an area impact to the streams below. Therefore, this simple analysis is useful to understand how many crossings are going to be worked on within the pilot project area.

Crossings were classed as streams with and without anadromous fish. Potential impacts to salmonids were assessed by counting the number of transportation project centerlines that intersected streams listed as critical habitat for steelhead in the California Central Valley Evolutionary Significant Unit (ESU) and Chinook salmon in the Central Valley Spring-run ESU (from the most current USFWS critical habitat GIS datasets; 2005). The fish layers were compiled by the NOAA-NMFS Southwest Regional Office (SWR) and are based on California Department of Fish and Wildlife (CDFW) and Pacific States Marine Fisheries Commission (PSMFC) 1:100,000 stream based routed hydrography. Chinook salmon (*Oncorhynchus tshawytscha*) are listed as threatened under both the state and federal ESA listings. Steelhead (*Oncorhynchus mykiss irideus*) are listed as threatened under the federal ESA listings.

The second analysis was to assess the waterway area impacted by transportation projects. This required converting stream courses to an area basis, which could then be used with transportation project footprints to calculate impact area. Streams were buffered by a distance appropriate to their size and type, to reflect the width of the stream from bank to bank, and allowing a calculation of area of impacts, as described below. The buffered stream areas were intersected with the transportation project footprints to calculate an area of impact to the waterbody.

Using NAIP imagery, an average buffer distance was assigned to each stream order (Table 3) to create a polygon dataset from the NHDFlowline representing the streams in the pilot project area. These distances represent the widths of streams that UCD examined, and while appropriate to the waterways in this study, should not be taken as numbers that could be more generally applied. A unique stream identification field was added to this dataset, to be able to track the impacts identified during analysis back to the proper locations. Finally, the stream polygon dataset was intersected with the transportation project footprint dataset to identify the area of the buffered streams where they were crossed a transportation project footprints.

Table 3. Buffer distances assigned to each stream order using NAIP imagery.

Stream Order	Buffer distance on each side of the line in feet
1	16
2	33
3	49
4	65
5	164
6	246
7	238

To calculate the estimated area of open water and streambed impacts, the area was calculated for each overlapping transportation project footprint and stream footprint. This allows for the area to be summed by project. These area estimates were then calculated and summed to provide an overall estimate for stream impacts. The analysis was done using a version of the transportation project footprints, in which overlapping transportation project areas were counted only once. The results are intended to inform discussions about state (Section CFG Code 1602) and federal regulations (Section 401, 402, 404).

To assess the number of times area impacts occurred, the 'frequency' tool in GIS was used, using the transportation project ID and a unique stream ID as the frequency fields. This count is different from the stream crossing analysis, because it is an inventory of the number of impacts associated with area impacts, whether or not a transportation project crosses a stream, and because some transportation projects do not have a footprint, if the activity occurs within the existing road extent. Wherever the transportation project footprints overlapped the buffered streams (this could be where a road crossed a stream, but also where a road runs along a stream and the project footprint extends into the stream buffer), the overlap was counted as a single occurrence. Therefore a transportation project running along a stream could have several, or many overlap occurrences without actually crossing the stream.

There are three types of impact area overlaps to consider when summing the number of times that a road project generates an area of impact on a waterway. Where streams and transportation projects run parallel the stream is only impacted by one side of the transportation project footprint, and each overlap was were assigned a count value of one. Where streams go under a project, both sides of the transportation project footprint impact the stream, and the frequency tool generates a value of two. Under these conditions the count value was divided by two to prevent double counting. Where a stream has both the above, the count generated is three, and this value was reduced to two.

The stream polygon and transportation project footprint intersect layer was spatially joined to each of the Chinook salmon and steelhead critical habitat layers to identify the overlaps occurring within those critical habitats.

The area of salmonid stream crossings was calculated for each species by project, and aggregated by county and three scales of watershed, called Hydrologic Unit Codes (HUCs; HUC 8, 10, and 12; http://water.usgs.gov/GIS/huc.html). Summarized the results are provided by project ID, by watershed and by county. As impacts to salmonids are often mitigated through the removal of fish passages barriers, barriers within each of the watersheds (at the three scales) were identified from the CDFW Passage Assessment Database (September 2013) as potential mitigation sites. The barriers identified are not classed according to priority for improving salmonid habitat, and are included only for reference.

RESULTS

The analysis determined there were environmental impacts in 23 of the transportation projects, impacts to listed species and associated habitat types in 21 projects, and impacts to landcover types including wetlands and waterways in 21 projects (Table 4). Also, 17 of the projects have stream crossings, and 7 of those projects cross streams where salmonids are present (Table 4).

Table 4. Summary of impact types by transportation project, organized by project identification number. Further descriptions of the transportation projects are in Appendix B.

Project Identification Number	Project Description	Listed Species and Habitat Types	Landcover Types	Stream Crossings	Salmonid Stream Crossings
1	Intersection Modification - Lengthen and improve right turn lane for vehicle storage	N	N	N	N
4	Construct Feather River Expressway	Y	Y	Y	Y
5	Operational Improvements - Eliminate non-signalized left turns at Stafford Way, Cooper Ave	N	N	N	N
6528	Rail Upgrade	Y	Y	Y	N
7160	Seismic retrofit.	N	N	N	N
8143	Replace damaged culverts.	Y	N	N	N
9002	Install left turn pockets and modify signals.	N	N	N	N
9015	Bridge scour	Y	N	Y	N
9101	ADA Access	N	N	N	N
9176	Widen shoulder on structure.	N	Y	Y	N
9196	Rail Upgrade	Y	Y	Y	Y
9227	Rail Upgrade	Y	Y	Y	N
9299	Replace bridge.	N	Y	Y	N
9302	Seismic Retrofit	Y	Y	Y	Y
9801	Widen SR 70 to 4 lanes with continuous two-way left turn lane from 0.1 mile south of Palermo Rd	Y	N	N	N
11122	Construct sidewalks, curb-ramps and crosswalks.	N	Y	Y	Y
11248	Replace bridge.	Y	Y	Y	N
11262	Widen shoulders and realign curves	N	Y	Y	N
11332	Drainage Restoration	N	Y	Y	N
13010	Replace signal poles.	N	N	N	N
13177	Scour Mitigation	N	Y	Y	Y
13599	ADA Access	Y	Y	Y	N
13773	Widen shoulders to 8 feet, improve bicycle access, improve CRZ	Y	N	N	N

13832	ADA Facilities Retrofit, Rehab, Reconstruction	N	N	N	N
Project Identification Number	**Project Description**	**Listed Species and Habitat Types**	**Landcover Types**	**Stream Crossings**	**Salmonid Stream Crossings**
13917	ADA Access	Y	Y	Y	N
15114	Install new ITS systems in the Chico area	Y	Y	Y	Y
15181	Rail Upgrade on 3 Bridges: Butte County 32 at Br # 12-0051 and Br # 12-0053; Yolo County 45 at Br # 22-0041	Y	Y	Y	N
15185	Rail Upgrade on 3 BR: Yuba County 70 Br # 16-0036, 16-0033, 16-0035	N	N	N	N
15268	Widen NB off-ramp to East Ave in Chico to reduce queueing on mainline	N	N	N	N
36690	Shoulder widening	Y	N	N	N

Impacts to Listed Species and Habitat Types

Potential impacts to 16 terrestrial species that require mitigation were found in 21 of the transportation projects (Table 5). Potentially impacted areas to these special-status species range from near-zero to 67.3 acres. The maximum potential impact is for Swainson's hawk, using the 4-mile analysis radius.

Of the 16 terrestrial species identified to be impacted, 11 are estimated to experience less than 10.0 acres of impact at either the 2- or 4-mile radii (Table 5). The two species likely to experience the highest impacts from the transportation projects are Swainson's hawk and giant garter snake. Swainson's hawk uses some types of agricultural lands as foraging habitat, and of its habitat within the buffers from the road projects and the 2 or 4 mile buffers of CNDDB points, 43.7 and 46.9 acres are in agriculture and 19.2 and 20.4 acres are in Valley Riparian vegetation land cover type, respectively. For Giant Garter Snake the majority of the impacts are in rice fields, 21.9-51 acres, while Fresh Water Emergent wetlands carry 2.202.7 acres of impact, Valley Riparian has 1.3-1.8 acres, and Riverine is 0.1-0.4 acres.

Table 5. Estimated impacts to the habitat types of terrestrial species that typically require mitigation, using the 2- and 4-mile CNDDB point and project footprint analysis.

	Species	Estimated Impacts (acres)
Mammals	Townsend's big-eared bat	0.1-0.1
Birds	Tricolored blackbird	17.1
	Burrowing owl	0.4-2.4
	Swainson's hawk	62.9-67.3
	Bank Swallow	0.0
Reptiles	Giant garter snake	25.5-55.8
Invertebrates	Conservancy fairy shrimp	2.7
	Vernal pool fairy shrimp	3.6-4.7
	Valley elderberry longhorn beetle	0.1-1.7
	Vernal pool tadpole shrimp	1.4-3.4
Plants	Hoover's spurge	0.2-1.8
	Palmate-bracted salty bird's-beak	0.0-1.5
	Butte County meadowfoam	0.0-0.7
	Hairy Orcutt grass	0.0-2.0
	Slender Orcutt grass	0.0-0.3
	Greene's tuctoria	0.3-2.7

For an example of how the species-level impacts appear on a map, see Figure 3; for an example of the overlay of the map of tricolor blackbird habitat in the project study area with the transportation projects, see Figure 4.

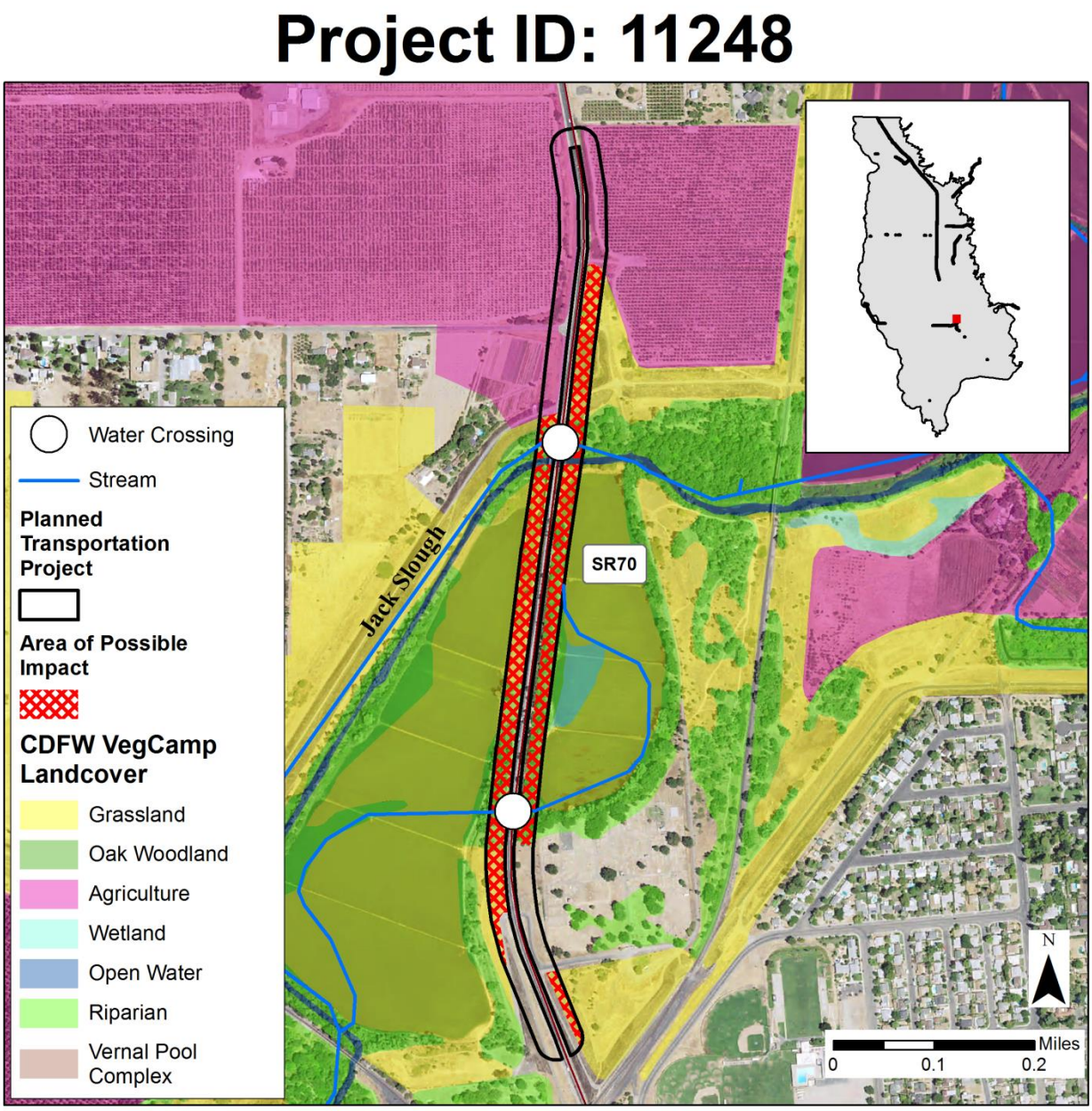

Figure 3. Example of an estimated project impact. Depicted is project 11248, a bridge replacement on the Feather River. The project is 0.9 miles in length with a buffer of 100 feet, for an estimated project footprint of 22.7 acres. The footprint overlaps with 6.0 acres of riparian forest, 0.2 acres of open water, and 4.5 acres of agriculture. Within the estimated footprint, there are 12.5 acres of Swainson's hawk (6.5 acres of AGS acres of and 6.0 VRI) potential foraging and nesting habitat. There is one stream crossing. Similar maps for each project are in Appendix B.

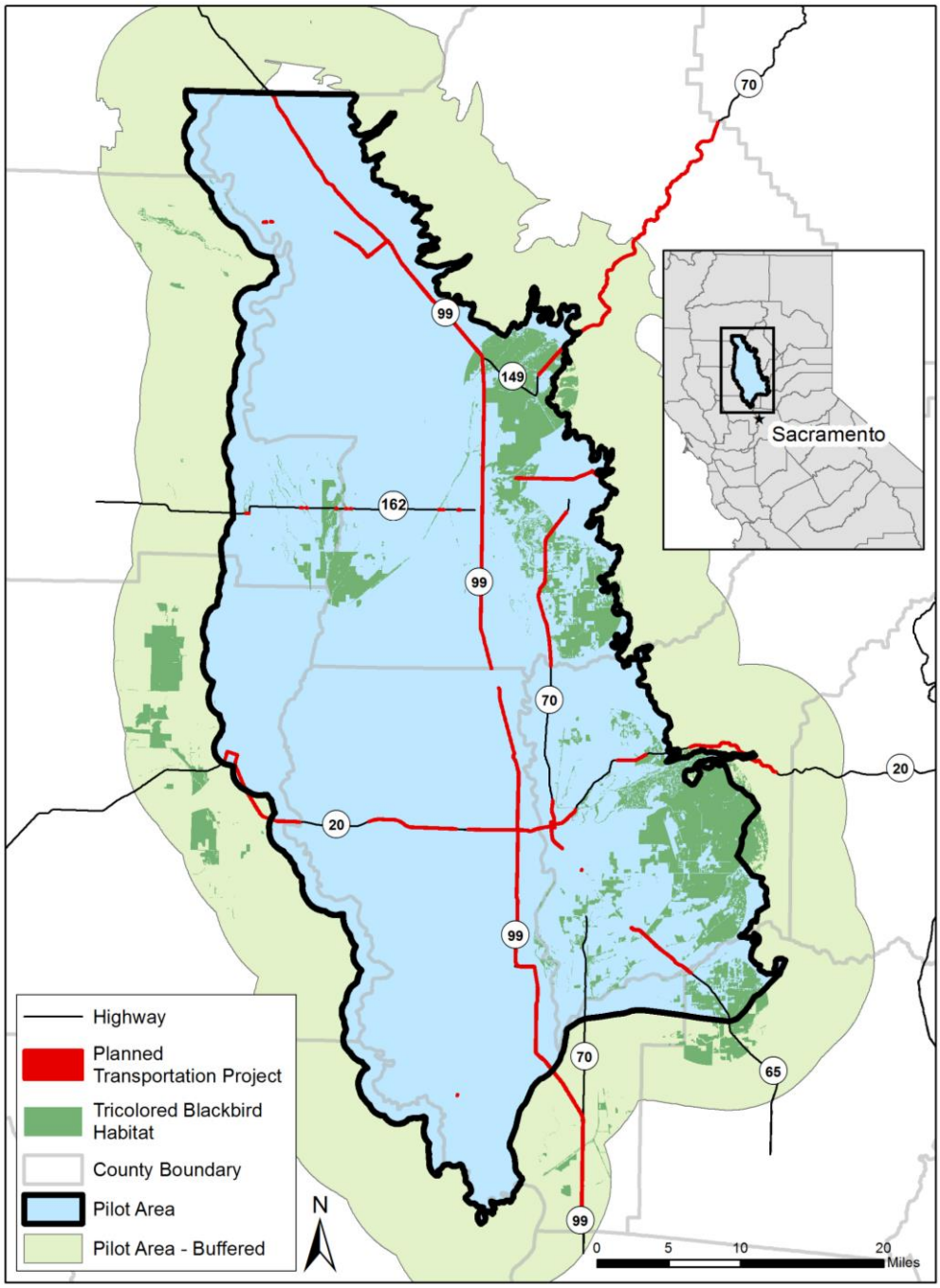

Figure 4. Tricolored blackbird Habitat and Caltrans projects in the pilot project area.

Impacts to Landcover Types

Six landcover types; riparian forest, oak woodlands, wetlands, open water, agriculture and vernal pools, were found to be impacted by 21 transportation projects (Table 6). Impacts to landcover types range from 3.4 acres (wetlands) to 95.2 acres (agriculture).

Table 5. Estimated impacts to landcover types that typically require mitigation. *Agriculture includes known habitat for threatened and endangered species, such as rice fields and alfalfa farms, but also includes some farmland for which there is no statutory authority for mitigation. The mitigation-sensitive types are covered in more detail in the terrestrial species section of the report. The overall extent of agricultural impacts is included to provide an example of how regional assessments can provide more context for planners in the RAMP process.

Habitats Types	Estimated Impact (acres)
Wetlands	3.4
Open Water	11.9
Riparian	22.8
Vernal Pools	5.0
Agriculture	95.2*
Oak Woodland	8.0

Stream Crossings

Of the 30 transportation projects with environmental impacts, 17 projects had impacts to surface water in streams and rivers, with some projects impacting multiple streams or the same stream in multiple locations (Table 6). The 17 projects have 26 crossings of streams bearing Chinook salmon, and 31 streams bearing Steelhead. Of those crossings, transportation projects that extend beyond the current road account for 18 Chinook stream crossings and 16 Steelhead crossings. The remainder (8 Chinook salmon and 15 Steelhead) are on crossings from transportation projects that are not expected to have an increase in spatial extent, and may perhaps not be expected to impact the streams.

Table 6. The number of transportation projects with stream crossings, with and without salmonid fish. The transportation projects are grouped into those with a spatial footprint beyond the existing roadway, and those whose activity is anticipated to occur entirely within the existing extent of roads.

Project ID	Stream Crossings	Chinook	Steelhead
Projects With Footprints			
1	0	0	0
4	3	1	1
5	0	0	0
6528	1	0	0
7160	0	0	0
8143	0	0	0
9002	0	0	0
9015	1	0	0
9101	0	0	0
9176	1	1	0
9196	33	5	5
9227	3	0	0
9299	1	0	0
9302	1	1	1
9801	0	0	0
11122	2	2	2
11248	2	0	0
11262	1	0	0
11332	7	0	0
13010	0	0	0
13177	1	1	1
13599	5	1	1
13773	0	0	0
13832	0	0	0
13917	0	0	0
15114	34	5	5
15181	1	1	
15181	1	0	0
15185	0	0	0
15268	0	0	0
36690	0	0	0
Projects Inside Existing Road Extents			
6483	5	2	2
7694	4	1	4
11251	1	0	0

Project ID	Stream Crossings	Chinook	Steelhead
Projects Inside Existing Road Extents (continued)			
11322	5	3	3
13174	0	0	0
13283	1	1	1
13398	5	0	0
13440	4	0	1
13718	0	0	0
13905	7	1	4
15202	0	0	0
15206	1	0	0
15224	0	0	0
300020469	0	0	0

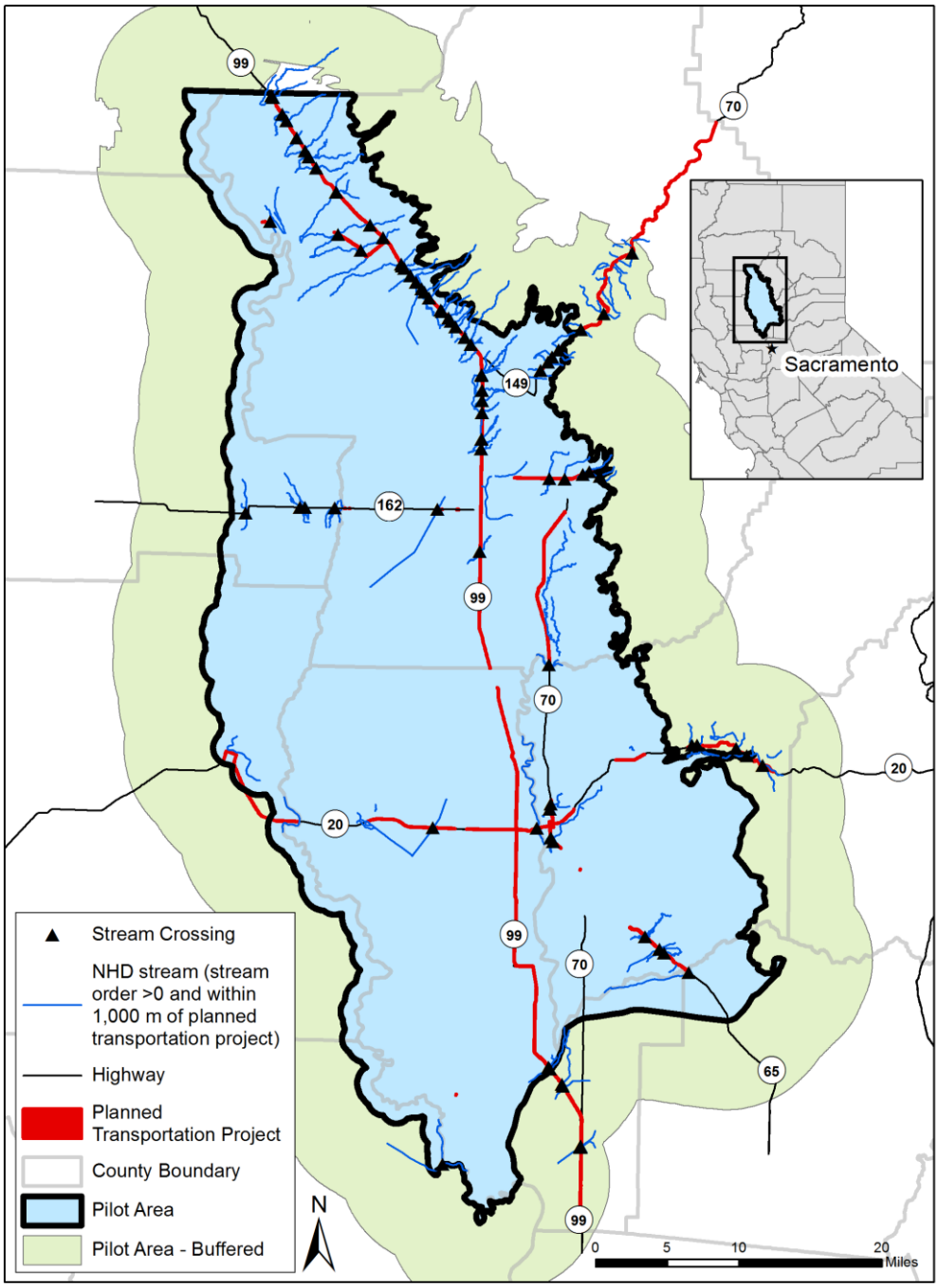

Figure 5. Stream crossing intersections with transportation projects analyzed in this report.

Area Impacts to Waterways and Area Impacts to Salmonid Fish Species

In addition, 25 transportation project footprints overlap with buffered streams at 102 locations, to create expected area impacts of 15.7 acres. Of these, 13 transportation project footprints overlap streams at 83 locations for a total 7.4 acres of impact on streams with no known anadromous

fish. Twelve transportation project footprints overlaps stream areas designated as Chinook salmon and/or Steelhead habitat at 19 locations, totaling 8.3 acres of estimated impact. Of these, six projects overlap streams with both Chinook salmon and Steelhead for 7.8 acres of estimated impact; four projects overlap streams with only Chinook salmon (0.4 acres) and two projects overlap streams with only Steelhead (0.1 acres) (Table 7).

The Brooks Creek-Yuba River HUC 12, located on the upper Yuba is the watershed with the most area impacted by a single transportation project footprint, at 3.5 acres (Table 8). Additionally, the Ellis Lake-Feather River HUC 12 unit on the Lower Feather River is expected to have 2.5 acres of impact on designated salmonid fish habitat from a transportation project footprint. Six other transportation project footprints nearby, in the Jack Slough HUC 12 are expected to have 2.5 acres of impact in a non-salmonid fish bearing stream (Table 8).

Butte County had the highest number (84) of overlaps between transportation project footprints and stream areas. Of those, 16 overlaps are on designated salmonid critical habitat, totaling 1.1 acres (Table 9). Yuba County has ll overlaps between transportation project footprints and stream areas with only one a designated salmonid fish habitat, but that project is expected to impact 3.5 acres (Table 9).

Table 7. The area of overlapping transportation project footprints with salmonid critical habitat by project Identification number. The area by transportation project with and without Chinook salmon and Steelhead critical habitat is presented. Streams with one or both of the fish habitats present are shown with a '1' in the Chinook or Steelhead columns. The 'Number of Overlaps' column shows how many times the transportation project footprints intersect the buffered streams for that project.

Transportation Project ID	Acres of Impact From Transportation Project Footprints	Number of Overlaps	Designated Chinook Critical Habitat	Designated Steelhead Critical Habitat
4	2.1	4	0	0
4	3.4	1	1	1
6528	0.1	1	0	0
9015	0.6	1	0	0
9176	0.1	1	1	0
9196	1.8	27	0	0
9196	0.1	1	1	0
9196	0.1	1	0	1
9196	0.4	4	1	1
9227	0.1	3	0	0
9299	0.3	1	0	0
9302	1.2	1	1	1
11122	0.1	2	1	1
11248	0.7	3	0	0
11262	0.1	2	0	0
11332	0.4	7	0	0
13177	2.5	1	1	1
13599	0.1	4	0	0
13917	0.1	1	0	0
15114	0.5	28	0	0
15114	0	1	1	0
15114	0	1	0	1
15114	0.1	4	1	1
15181	0.5	1	0	0
15181	0.1	1	1	0

Table 8. . The area of overlapping transportation project footprints with salmonid critical habitat aggregated by three levels of watershed. The area by transportation project with and without Chinook salmon and Steelhead critical habitat is presented. Streams with one or both of the fish habitats present are shown with a '1' in the Chinook or Steelhead columns. The 'Number of Overlaps' column shows how many times the transportation project footprints intersect the buffered streams for that project.

HUC8	HUC10	HUC12	Designated Chinook Critical Habitat	Designated Steelhead Critical Habitat	Acres of Impact From Transportation Project Footprints	Number of Overlaps
Sacramento-Stone Corral	Colusa Basin Drainage Canal	Smith Creek-Colusa Basin Drainage Canal	0	0	0.5	1
Sacramento-Stone Corral	Sacramento R iver	Packer Lake-Sacramento River	0	0	0.1	1
Sacramento-Stone Corral	Sacramento R iver	Packer Lake-Sacramento River	1	1	1.2	1
North Fork Feather	West Branch Feather River	Dark Canyon-West Branch Feather River	0	0	0.2	2
Upper Yuba	Yuba River	Woods Creek-Yuba River	0	0	0.1	2
Upper Yuba	Yuba River	Brooks Creek-Yuba River	1	1	3.4	1
Upper Bear	Dry Creek	Grasshopper Slough-Dry Creek	0	0	0.6	1

Big Chico Creek-Sacramento River	Pine Creek	Campbell Creek-Pine Creek	0	0	0.2	4
Big Chico Creek-Sacramento River	Pine Creek	Harbean Slough-Pine Creek	0	0	0.2	8
Big Chico Creek-Sacramento River	Pine Creek	Harbean Slough-Pine Creek	1	0	0.1	1
Big Chico Creek-Sacramento River	Big Chico Creek	Lower Big Chico Creek	1	1	0.3	6
Big Chico Creek-Sacramento River	Mud Creek	Rock Creek	0	0	0	2
Big Chico Creek-Sacramento River	Mud Creek	Rock Creek	1	0	0.2	3
Big Chico Creek-Sacramento River	Mud Creek	Kusal Slough-Mud Creek	1	1	0.2	2
Butte Creek	Middle Butte Creek	Hamlin Slough	0	0	0.8	18
Butte Creek	Middle Butte Creek	Dubock Slough-Little Butte Creek	0	0	0.1	2
Butte Creek	Middle Butte Creek	Durham Slough-Butte Creek	1	1	0.2	2
Butte Creek	Middle Butte Creek	Campbell Slough-Butte Creek	0	0	0.1	3

HUC8	HUC10	HUC12	Designated Chinook Critical Habitat	Designated Steelhead Critical Habitat	Acres of Impact From Transportation Project Footprints	Number of Overlaps
Butte Creek	Angel Slough	Comanche Creek	0	0	0.3	6
Butte Creek	Lower Butte Creek	Dry Creek	0	0	1	12
Butte Creek	Lower Butte Creek	Cottonwood Creek	0	0	0.3	8
Butte Creek	Lower Butte Creek	Little Dry Creek	0	1	0.1	2
Butte Creek	Lower Butte Creek	Drumheller Slough-Butte Creek	0	0	0.1	2
Honcut Headwaters-Lower Feather	Upper Feather River	Thermalito Afterbay	0	0	0	1
Honcut Headwaters-Lower Feather	Upper Feather River	Oregon Gulch-Feather River	0	0	0.1	3
Honcut Headwaters-Lower Feather	Lower Feather River	Jack Slough	0	0	2.5	6
Honcut Headwaters-Lower Feather	Lower Feather River	Ellis Lake-Feather River	1	1	2.5	1
Honcut Headwaters-Lower Feather	Lower Feather River	Clark Slough-Feather River	0	0	0.3	1

Table 9. The area of overlapping transportation project footprints with salmonid critical habitat aggregated by county. The area by transportation project with and without Chinook salmon and Steelhead critical habitat is presented. Streams with one or both of the fish habitats present are shown with a '1' in the Chinook or Steelhead columns. The 'Number of Overlaps' column shows how many times the transportation project footprints intersect the buffered streams for that project.

County Name	Acres of Impact From Transportation Project Footprints	Number of Overlaps	Designated Chinook Critical Habitat	Designated Steelhead Critical Habitat
Butte	3.2	68	0	0
Butte	0.4	4	1	0
Butte	0.1	2	0	1
Butte	0.6	10	1	1
Colusa	0.1	1	0	0
Glenn	0.1	3	0	0
Glenn	1.2	1	1	1
Sutter/Yuba	2.5	1	1	1
Yolo	0.5	1	0	0
Yuba	3.5	10	0	0
Yuba	3.4	1	1	1

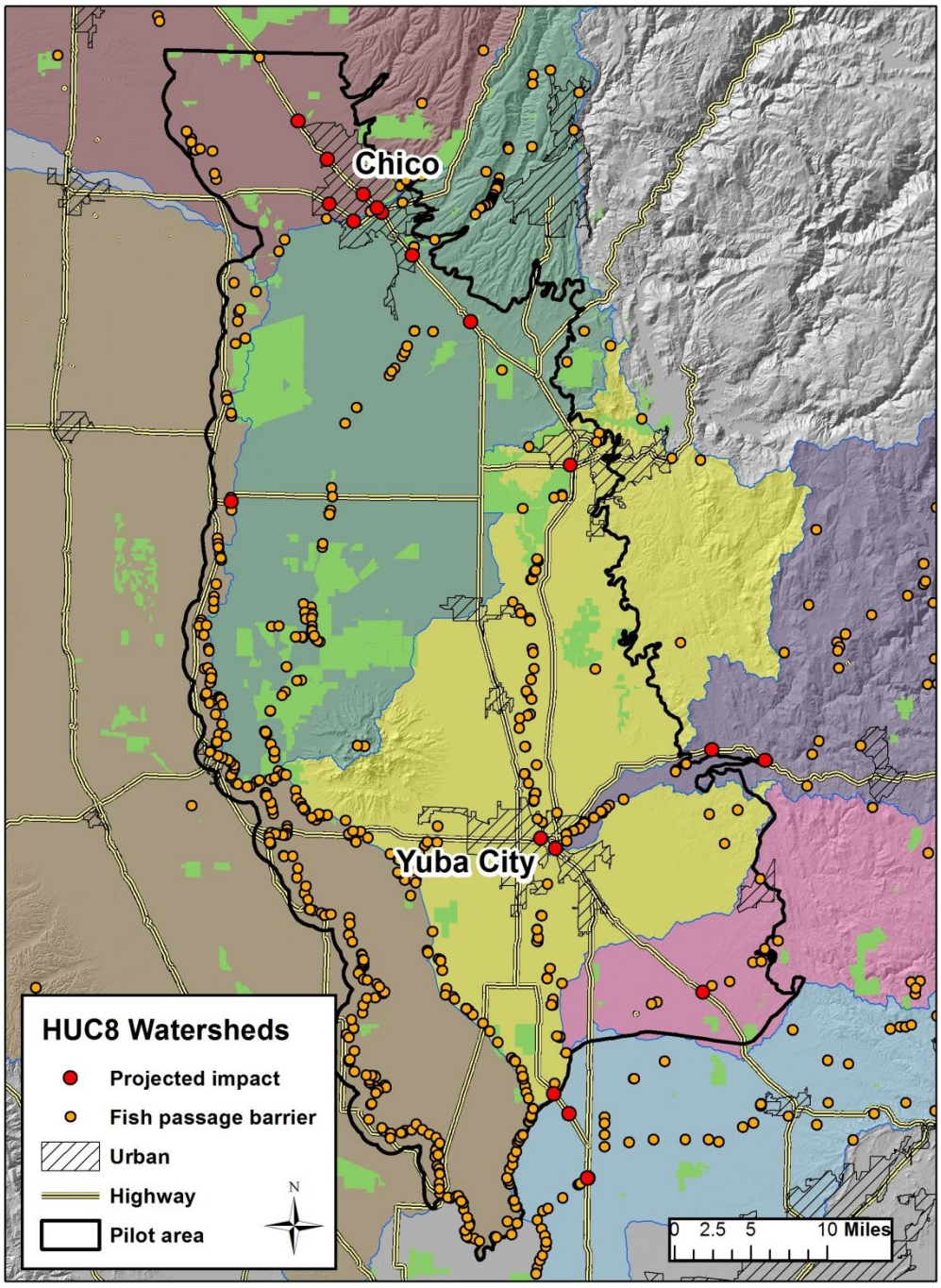

Figure 6. HUC8 watersheds (colored areas) and potential salmonid impacts from Caltrans projects. Intersections of transportation projects with salmonid-bearing streams are shown in red. Fish passage barriers that could serve as mitigation sites within the watersheds are also shown, in tan. Green areas are public/conservation lands.

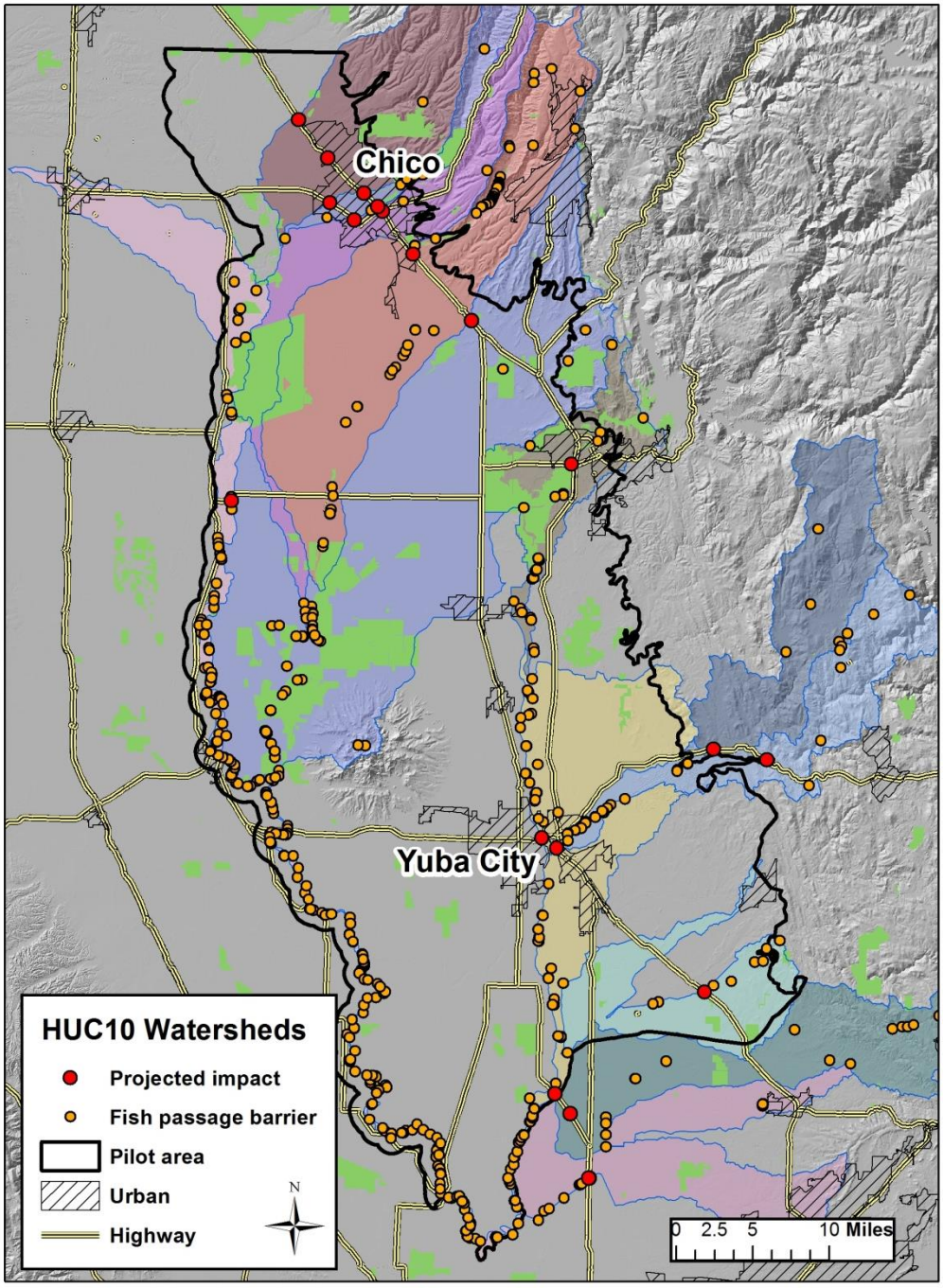

Figure 7. HUC10 watersheds (colored areas) and potential salmonid impacts from Caltrans projects. Project and salmonid intersections are shown in red. Fish passage barriers that could serve as mitigation sites within the watersheds are also shown, in tan. Green areas are public/conservation lands.

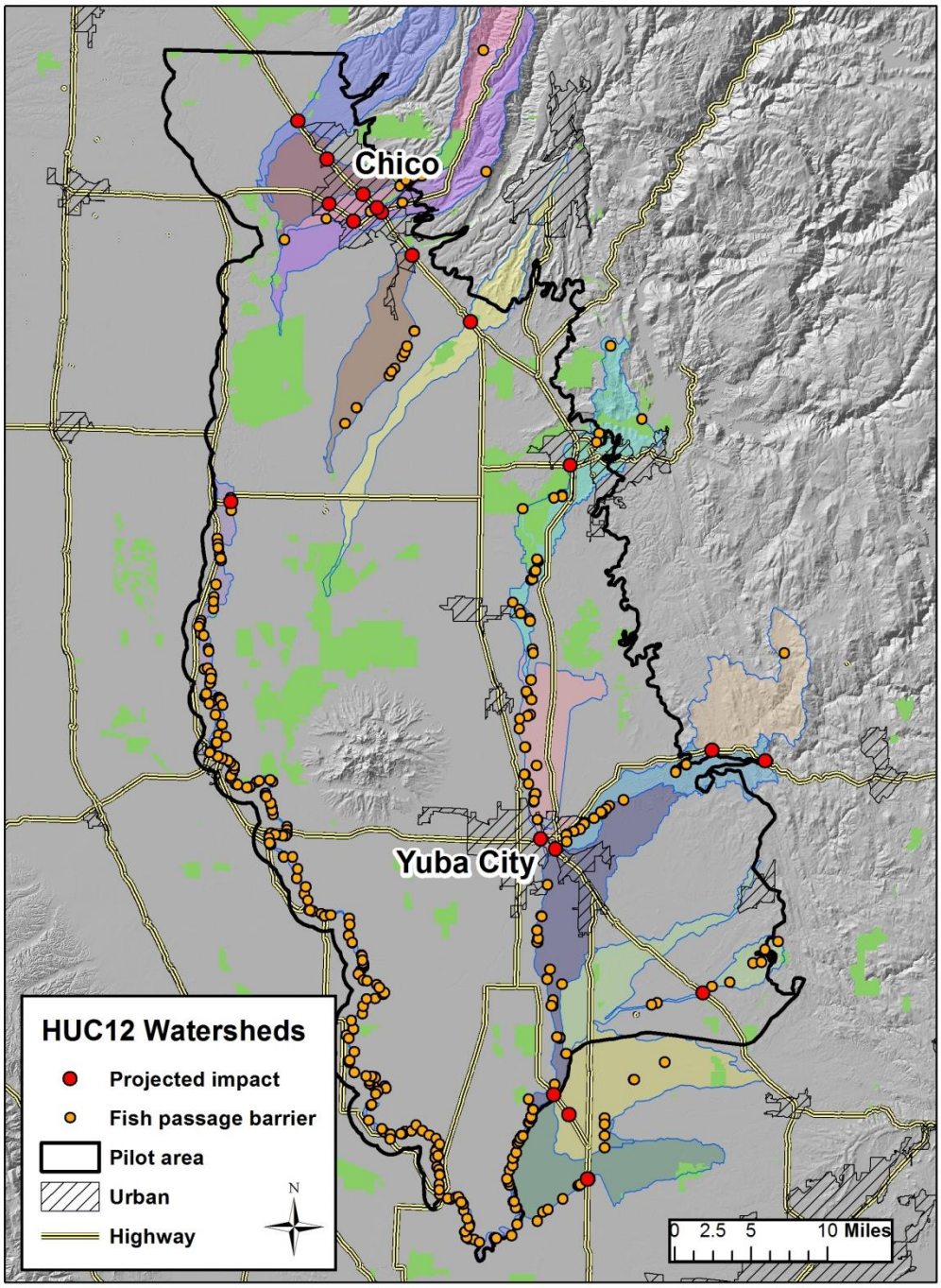

Figure 8. HUC12 watersheds (colored areas) and potential salmonid impacts from Caltrans projects. Intersections of transportation projects with salmonid-bearing streams are shown in red. Fish passage barriers that could serve as mitigation sites within the watersheds are also shown, in tan. Green areas are public/conservation lands.

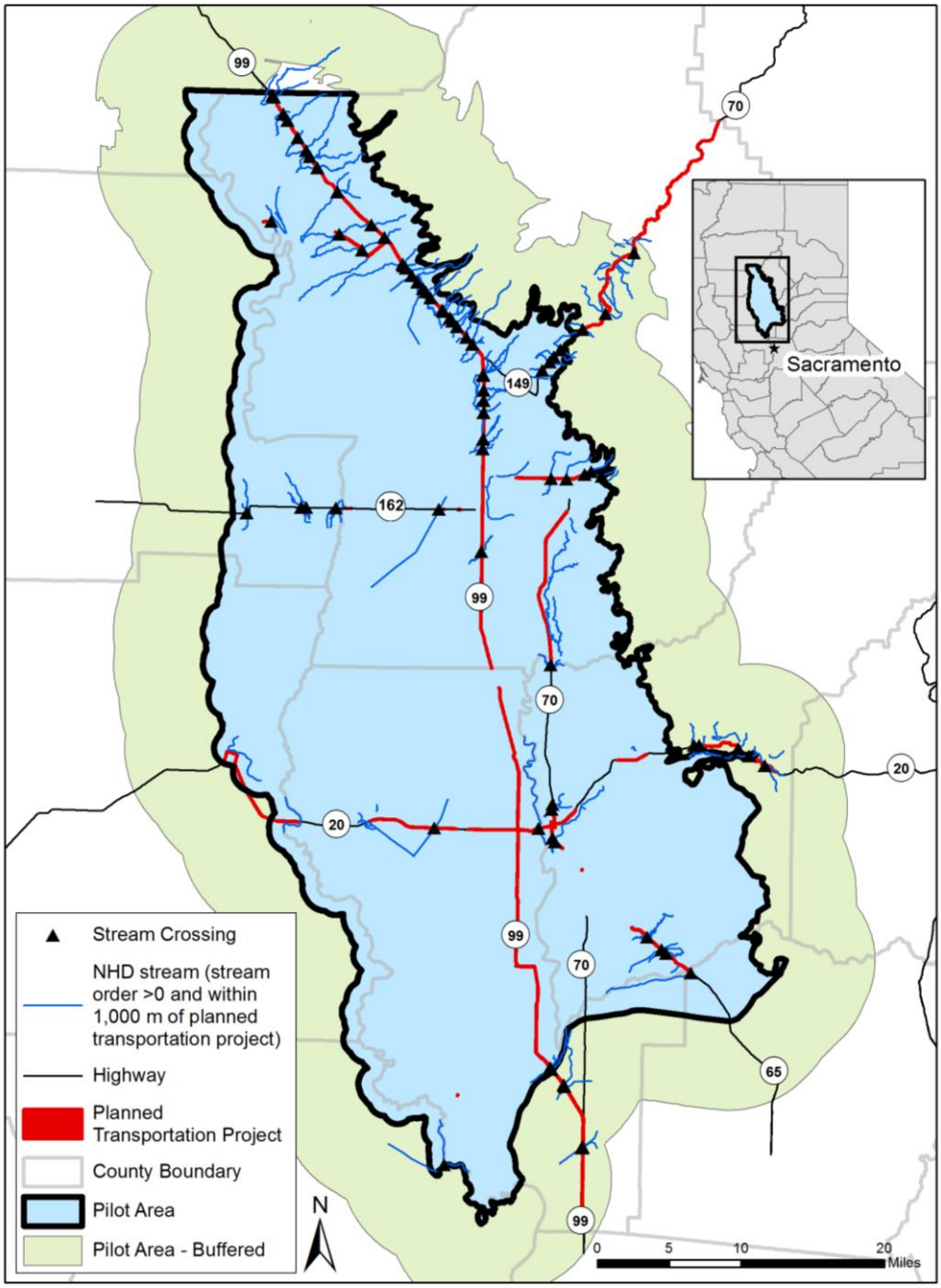

Figure 9. This map shows the locations of stream and water body crossings with the transportation projects analyzed.

NEXT STEPS

This report presented a series projected of impact assessments using spatial GIS analyses for multiple road projects in a pilot project area. The methods used have under development for various lengths of time, ranging from developed for this project (the spatial assessment of stream areas impacted) to several years (impacts to terrestrial species' habitats). However, the methods used to project the impacts need to be tested, and revisions applied as appropriate. Specifically, the opportunity will arise as various transportation projects which were included in this report are brought to completion. The environmental impacts from those projects will then be available for comparison with the impacts projected using the GIS methods. Further adjustment and refinement of the GIS methods to accurately capture actual field-based findings, will permit the GIS approach to be used to its full potential in future work.

To prepare for this methods assessment, it is recommended that digital copies of all the environmental documents for the projects included in this report be compiled by Caltrans. These copies can then be kept in preparation for their use in the evaluation process.

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APPENDIX A

CWHR TYPE	CWHR NAME
ADS	Alpine-Dwarf Shrub
AGR	Agriculture
AGS	Annual Grassland
ASC	Alkali Desert Scrub
ASP	Aspen
BAR	Barren
BBR	Bitterbrush
BOP	Blue Oak-Foothill Pine
BOW	Blue Oak Woodland
CHP	Unknown Shrub Type
CON	Unknown Conifer Type
COW	Coastal Oak Woodland
CPC	Closed-Cone Pine-Cypress
CRC	Chamise-Redshank Chaparral
CRP	Cropland
CSC	Coastal Scrub
DFR	Douglas-Fir
DGR	Dryland Grain Crops
DOR	Deciduous Orchard
DRI	Desert Riparian
DRY	Dry Lake Bed
DSC	Desert Scrub
DSS	Desert Succulent Shrub
DSW	Desert Wash
EOR	Evergreen Orchard
EPN	Eastside Pine
EST	Estuarine
EUC	Eucalyptus
FEW	Freshwater Emergent Wetland
FWT	Forested Wetland
GRS	Unknown Grass Type
HDW	Hardwood
IGR	Irrigated Grain Crops
IRF	Irrigated Row and Field Crops
IRH	Irrigated Hayfield
JPN	Jeffrey Pine

CWHR TYPE	CWHR NAME
JUN	Juniper
KMC	Klamath Mixed Conifer
LAC	Lacustrine
LPN	Lodgepole Pine
LSG	Low Sage
MAR	Marine
MCH	Mixed Chaparral
MCN	Mixed Conifer
MCP	Montane Chaparral
MHC	Montane Hardwood-Conifer
MHW	Montane Hardwood
MRI	Montane Riparian
NWT	Nonforested Wetland
OVN	Orchard and Vineyard
PAS	Pasture
PGS	Perennial Grassland
PJN	Pinyon-Juniper
POS	Palm Oasis
PPN	Ponderosa Pine
RDW	Redwood
RFR	Red Fir
RIV	Riverine
ROG	Redwood Oldgrowth
RSP	Residential-Park
RYG	Redwood Secondgrowth
SCN	Subalpine Conifer
SEW	Saline Emergent Wetland
SGB	Sagebrush
SMC	Sierran Mixed Conifer
UAG	Urban-Agricluture
URB	Urban
VFH	Valley-Foothill Woodland
VHC	Valley-Foothill Hardwood-Conifer
VIN	Vineyard
VOW	Valley Oak Woodland
VRI	Valley Foothill Riparian
WAT	Water
WFR	White Fir
WTM	Wet Meadow

APPENDIX B

This appendix presents the results of individual analyses for the transportation projects analyzed in this study. There is a page for each project that was projected to have impacts in at least one of the four categories analyzed. The captions provide the type of project, its expected length, and the buffer distance used. The impacts are listed in the same order as in the report: landcover types that are potentially of mitigation concern; listed species (whose suitable habitat in the 2-mile CNDDB buffer, and inside the road footprints are shown in red cross hatching); stream crossings in white circles, and salmonid stream crossings in triangles. The projects are presented in order of the ID codes listed in this report.