

# CALIFORNIA HIGH-SPEED TRAIN

## DRAFT

### Fresno to Bakersfield Section

## Appendix E

Summary Presentation of Environmental  
Resources and Constraints  
for the BNSF, UPRR, and BNSF Avoidance  
Alternative Alignments

March 2011





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**Summary Presentation of Environmental**  
**Resources and Constraints**  
**for the BNSF, UPRR, and BNSF Avoidance**  
**Alternative Alignments**

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**Acronyms**

AAA	Avoidance Alternative Alignment
AGS	Annual grasslands
ASC	Alkali scrubland
ASWM	Association of State Wetland Managers
Authority	California High-Speed Rail Authority
BNSF	BNSF Railway
CDFG	California Department of Fish and Game
CNDDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRAM	California Rapid Assessment Method
CRP	Cropland
CSC	California Species of Special Concern
CVFPB	Central Valley Flood Protection Board
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationship System
DWR	Department of Water Resources
ECOS	Environmental Conservation Online System
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESRP	Endangered Species Recovery Program
FP	California Fully Protected Species
FRA	Federal Railroad Administration
GIS	Geographic Information System
HGM	Hydrogeomorphic Method
HST	High-speed train
IRF	Irrigated row and field crops
KRCD	Kings River Conservation District
LAC	Lacustrine

MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
NAIP	National Agricultural Imagery Program
NAT	Natural areas
NEPA	National Environmental Policy Act
NL	Not listed (Wetland Indicator Status)
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OBL	Obligate (Wetland Indicator Status)
OVN	Orchard/vineyard
PCA	Principal components analysis
PCE	Primary Constituent Element
PGS	Perennial grassland
Pixley NWR	Pixley National Wildlife Refuge
RIV	Riverine
ROD	Record of Decision
RSA	Resource Study Area
RWQCB	Regional Water Quality Control Board
SARs	Special Aquatic Resources
SHTAC	Swainson's Hawk Technical Advisory Committee
SR	State Route
Statewide Program EIR/EIS	Final Program Environmental Impact Report and Environmental Impact Statement for Proposed California High-Speed Train System
UPRR	Union Pacific Railroad
URB	Urban
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
VIN	Vineyard
VRI	Valley riparian
WEA	Wetland Ecological Assessment
WET	Wetland Evaluation Technique
WRAP	Wetland Rapid Assessment Procedure

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# **Chapter 1**

## **Introduction**



## 1.0 Introduction

The purpose of this document is to present a preliminary summary of environmental resources (namely, impacts on wetlands and waters of the United States, and sensitive species) and constraints for a BNSF Alternative Alignment, UPRR Alternative Alignment, and a BNSF Avoidance Alternative Alignment of the Fresno to Bakersfield Section of the California High Speed Train (HST) statewide program. It also provides a description of federally authorized projects that would be affected by the Fresno to Bakersfield HST.

The California High-Speed Rail Authority (Authority) and Federal Rail Administration (FRA) have entered into a Memorandum of Understanding (MOU) with the U.S. Environmental Protection Agency (U.S. EPA) and U.S. Army Corps of Engineers (USACE) intended to facilitate project-level compliance with the National Environmental Policy Act (NEPA), Clean Water Act Section 404 (CWA), and Rivers and Harbors Act Section 14. The MOU established processes to integrate the development of project-level (Tier 2) environmental impact statements for each of the nine HST sections. This integration is intended to expedite decisionmaking and improve decision quality on NEPA Records of Decision (ROD), Section 404 permit decisions, real estate permissions or instruments, and Section 408 permit decisions.

The MOU establishes three coordination procedures and checkpoints for each Tier 2 HST project: (1) definition of purpose and need; (2) identification of the range of alternatives to be studied in the draft EIS; and (3) preliminary identification of the least environmentally damaging practicable alternative, the USACE Section 408 draft response, and the draft mitigation plan.

This appendix addresses the environmental resources and constraints component of Checkpoint B for the Fresno to Bakersfield Section, and has been prepared for three HST alternative alignments:

1. **BNSF:** This alternative alignment most closely follows the preferred alignment identified in the Record of Decision for the Statewide Program EIR/EIS. The BNSF Alternative Alignment generally follows the BNSF rail line and Highway 43 between Fresno and Bakersfield.
2. **UPRR:** This alternative alignment is the B-2 alignment that was evaluated in the Visalia-Tulare-Hanford Station Feasibility Study. The UPRR Alternative Alignment roughly parallels both the UPRR rail line and Highway 99 between Fresno and Bakersfield.
3. **BNSF Avoidance:** This alternative is the same as the BNSF Alignment except it incorporates the Kaweah Bypass and the Allensworth Bypass alternatives. The Kaweah Bypass swings west to the west immediately south of the Kings/Tulare Regional Station, rejoining the BNSF Alignment just north the Corcoran. The Allensworth Bypass swings west of the BNSF Railway between Avenue 84 and the Elmo Highway.

This appendix presents a summary of the environmental resources and constraints and provides a limited resource inventory and impact analysis comparison for the BNSF, UPRR, and BNSF Avoidance alternative alignments. Resource and impact estimates are based on a desktop analysis utilizing a variety of available imagery, databases, and similar tools. Two major topics are covered: 1) wetlands and non-wetland waters (hereafter referred to as special aquatic resources [SARs]), and 2) special-status plant and wildlife species. This report also provides a description of federally authorized projects that would be affected by the proposed HST.

This appendix first discusses the methodologies utilized to estimate impacts on SARs and special-status species (Chapter 2, Environmental Resources Impacts Estimation Methods), then presents the data gathered on environmental resources and constraints analysis (Chapter 3,

Environmental Resources Results), and discusses the results of all estimated environmental resources and constraints (Chapter 4, Discussion). The MOU also required information on federally-authorized projects (i.e., dams and levees) that would be affected by the proposed HST. The final report section provides a description of federal projects that would be affected (Chapter 5, Modification to Federally Authorized Projects).

# **Chapter 2**

## **Environmental Resources Impacts Estimation Methods**



## 2.0 Environmental Resources Impacts Estimation Methods

This section presents methods used to estimate impacts on SARs and special-status species. The methods were developed to provide technical information as required by NEPA/404 MOU Checkpoint B, adapting accepted practices for remote sensing, photo interpretation, wetlands function and service value assessment, and habitat-based species assessment.

For the purposes of this estimate, the project footprint included a corridor surrounding and corresponding to the BNSF, UPRR, and BNSF Avoidance alternative alignments. Where the project would be at-grade, a 100-foot wide project footprint was analyzed. Where the project would be elevated on a viaduct structure, a 50-foot-wide project footprint was analyzed. SAR features were mapped, and then evaluated to ascertain hydrology, water quality and habitat integrity functions and service values. Scores for these values are assigned to each feature using scoring criteria described in Section 2.1.3 and presented in Table 2.1-1. Potential total impacts on SAR features are evaluated based on their values.

Potential impacts on special-status species are evaluated based on several criteria. These include: (1) potential species presence in the region based on known range, critical habitat, or historic records, and (2) the presence of appropriate habitat for each species within the alternative project footprints. Impacts on identified critical habitat, recovery areas, and movement corridors are also evaluated.

**Table 2.1-1**  
 Scoring for Functions and Services of Special Aquatic Resources

Total Functions and Services Score	Overall Rating for Feature
0	Low
1	Medium/Low
2-4	Medium
5	Medium/High
6	High

## 2.1 Methods for Special Aquatic Resources

The discussion below presents the mapping approach, the definitions of each of the SAR feature types in the alternative alignment areas, and a description of the rating system that was applied to each individual feature to determine its hydrology, water quality, and habitat integrity value.

### 2.1.1 Special Aquatic Resource Mapping

GIS specialists incorporated remote sensing and geospatial data integration techniques to map SAR features in the alternative alignment area. This mapping effort was performed using geographic information system (GIS) analysis and aerial photo interpretation.

First, GIS specialists used semi-automated digital image processing techniques to extract SAR features from color-infrared imagery available from the U.S. Department of Agriculture's (USDA) National Agricultural Imagery Program (NAIP) [photo date of June 2005]. Thirty-three NAIP imagery tiles based on USGS 7.5-minute quadrangles and in JPEG 2000 file format were needed to cover the study areas. Each imagery tile has a one-square-meter cell size and three RGB color bands. GIS specialists implemented the following steps to process the images using ESRI ArcGIS version 10 software:

- Performed principal components analysis (PCA) on each of the 33 imagery tiles to remove redundant data and to emphasize spectral variation.
- Manually collected spectral signatures of known SAR features located within the alternative alignment area from each PCA image.
- Performed a maximum likelihood classification using the spectral signatures to extract SAR features from each PCA image.
- Performed a focal spatial-statistics analysis with a six-cell neighborhood radius to reduce noise and to better represent feature boundaries in each classified image.
- Converted each raster (cell-based) classified image to vector data layers.
- Combined 33 vector data layers into a single vector layer.
- Clipped the vector layers to the 100-foot study area corridor extents.
- Removed upland features from the vector layers.

Four types of SAR features were extracted from the color-infrared NAIP imagery: canal/ditch, retention/detention basin, riverine, and riparian. To supplement this classified data, GIS specialists incorporated publicly available data sources. These included seasonal wetlands from the National Wetlands Inventory (NWI) dataset and the USGS National Hydrography Dataset. In addition, GIS specialists incorporated vector data representing vernal pool habitat from the CDFG Central Valley Vernal Pool Habitat Dataset (Holland 2009). The Holland 2009 vernal pool polygons represent vernal pool complexes (areas where vernal pools occur in varying concentrations), rather than precise delineations of individual pools (vernal SAR features). These polygons represent large areas in the landscape that contain both vernal pools and uplands. GIS specialists worked with wetland scientists to analyze aerial images and determine whether the added features from the Holland dataset and NWI were accurate and/or still present. Features that did not appear to be present on current aerial imagery were removed.

Because the 2009 Holland vernal pool data includes complexes where vernal pools may occur, these data are likely to overestimate the presence of federal or state jurisdictional vernal pools. To more accurately represent acreages of vernal pool SAR features, wetland scientists performed a supplemental analysis of the vernal pool complexes consisting of two steps. The first step was a review of existing field data from vernal pool delineations performed in the spring of 2010 near the Allensworth Ecological Reserve (Authority and FRA 2011).

The second step was additional digital image processing along with review of wet-season aerial images, where available. These two steps yielded an approximate percentage (22%) of jurisdictional vernal pools that occurred in vernal pool complexes in the region. The total area of the Holland data in the BNSF, UPRR, and BNSF Avoidance alternative alignments was multiplied by this coefficient to produce an estimate of the total vernal pool area.

The next step was to manually (i.e., visually) review all SAR feature polygons and to modify these features as appropriate. Modifications to the feature included adding, deleting, and editing polygons based on examination of 2005 color-infrared and natural-color NAIP imagery as well as other more recent imagery sources (e.g., GoogleEarth). After the review, a total of 295 SAR feature polygons were included in the alternative alignment area.

Although it was not possible to conduct a special statistical accuracy assessment of the final SAR layer because ground-truth data were not available, accuracy of the final layer can be described relative to the methods used to derive the layer. The systematic manual review and modification process conducted for the final layer provides essentially the same qualitative accuracy as a traditional pure photo interpretation effort, which is typically very high.

### 2.1.2 Types of Special Aquatic Resources

SARs in the alternative alignment areas were divided into seven types:

- Canal/ditch—Features are linear and appear to be highly engineered. They connect upland agricultural or urban areas. Compared to riverine features, the canal/ditch features are relatively narrow and often exhibit a raised berm on either bank. These are also features that do not correspond to a known river system.
- Retention/detention basin—Features are rectangular or square polygons that are found in agricultural areas, often disconnected from riverine systems and connected to canals and ditches.
- Reservoir/lacustrine—No reservoir/lacustrine features were detected during the analysis.
- Riparian—Features that are exclusively found around the edges of riverine, reservoir/lacustrine, and, less commonly, retention/detention basin features. Riparian features occur in bands and are identified based upon the photo signature of the dense vegetation that characterizes them.
- Riverine—Features that are identified as named rivers or named river systems on the aerial imagery, and all other linear aquatic features that are wide and sinuous.
- Vernal pool—All features identified as vernal pool SARs.
- Seasonal wetland—Any additional wetland features identified on the NWI layer. In cases where NWI wetlands overlapped Holland vernal pool complexes, the latter took precedence.

### 2.1.3 Functions and Services Criteria

Along with estimates of the potential SAR features in the BNSF, UPRR, and BNSF Avoidance alternative alignments, the MOU required an assessment of the functions and services of each SAR feature. Functions are the physical, chemical, and biological processes or attributes of a wetland without regard to their importance to society (Adamus et al. 1987). Services, or beneficial uses, are defined as “the benefits to society that are afforded by the conditions and functions of a wetland. Key ecological services for many types of wetlands in California include flood control, shoreline and stream bank protection, groundwater recharge, water filtration, conservation of cultural and aesthetic values, and support of endemic biological diversity” (Collins et al. 2010). Functions and services were evaluated with regard to three categories: 1) hydrology, 2) water quality, and 3) habitat integrity.

Each SAR feature was given a score between 0 and 2 for each of the three functions and service categories: 0 was low, 1 was medium, and 2 was high (see criteria, below). The total of the scores for all three criteria was calculated, and an overall rating assigned to each feature, as shown in Table 2.1-1.

#### A. HYDROLOGY AND WATER QUALITY CRITERIA

The functions and services of each SAR feature, with respect to hydrology and water quality, were assigned based on an adaptation of several established wetland assessment methods:

- The Wetland Evaluation Technique (WET) developed by the USACE (Adamus et al. 1987, Adamus et al. 1991, Novitzki et al. 1997).

- The Hydrogeomorphic Method for Wetland Assessment (HGM) developed by the Natural Resources Conservation Service (NRCS 2008, Hruby 2001).
- The Wetland Rapid Assessment Procedure (WRAP) developed by the South Florida Water Management District (Miller and Gunsalus 1997).
- The Wetland Ecological Assessment (WEA) developed by the San Francisco Bay Region of the California Regional Water Quality Control Board (RWQCB) and the San Francisco District of the USACE (Breux et al. 2004).
- The California Rapid Assessment Method (CRAM) developed by a consortium of federal, state and local agencies (Ambrose and Lee 2004a, 2004b; Collins et al. 2008; Sutula et al. 2006).
- Other available guidance (e.g., ASWM 2006, Brinson 1993, Thiesing 2001).

Each SAR feature was assigned a high, medium, or low score for their hydrologic and water quality integrity according to the criteria described in Table 2.1-2. These criteria are based on a combination of the wetland assessment methods listed above. The hydrology score for each SAR feature was determined based on its potential for flood storage capacity, peak flow attenuation, and ground water recharge. The water quality score for each feature was determined based upon its potential for pollutant, toxicant, and sediment retention and/or detention.

**Table 2.1-2**  
 Scoring Criteria for Special Aquatic Features

	Hydrology		Water Quality		Habitat Integrity	
Canal / Ditch	low	Hydrology is severely altered. Feature is manmade and is lined with concrete or otherwise hardened. Lateral movement of water in floodplain is limited. Hydrology is controlled by engineered or mechanical means.	low	Water quality is significantly degraded. Buffer around this feature is characterized by barren ground, highly compacted or highly disturbed soils, and evidence of intensive human disturbance, including agriculture land use practices that may contribute pollutants to the aquatic system. Substrate and vegetation are insufficient for nutrient or contaminant uptake.	low	No or minimal evidence of wildlife utilization. Limited adjacent upland food sources. Limited aquatic or riparian vegetation. Open water may provide habitat for wading birds or waterfowl. Located in area of frequent human disturbances.
	med	Hydrology is somewhat altered. Feature is earthen; soils may be compacted. Hydrology may be engineered to resemble natural conditions. Lateral movement of floodplain water provides some inputs to the feature.	med	n/a	med	n/a
	high	n/a	high	n/a	high	n/a

**Table 2.1-2**  
 Scoring Criteria for Special Aquatic Features

	Hydrology		Water Quality		Habitat Integrity	
Reservoir / Lacustrine	low	Hydrology is severely altered. Feature is manmade and is lined with concrete or otherwise hardened. Lateral movement of water in floodplain is limited. Hydrology is controlled by engineered or mechanical means.	low	Water quality services are significantly degraded. Buffer around feature is characterized by barren ground, highly compacted or highly disturbed soils and evidence of intensive human disturbance, including agriculture land use practices that may contribute pollutants to the aquatic system. Substrate and vegetation are insufficient for nutrient or contaminant uptake.	low	No or minimal evidence of wildlife utilization. Limited adjacent upland food sources. Limited aquatic or riparian vegetation. Open water may provide habitat for wading birds or waterfowl. Located in area of frequent human disturbances.
	med	Hydrology is somewhat altered. Feature retains/detains water following natural patterns, but provides higher or lower hydrologic drawdown, magnitude, and period of inundation than a natural system. Hydrology may be altered or controlled by engineering or by a mechanical means in a manner that resembles natural hydrologic conditions. Lateral movement of floodplain water provides some inputs to the feature.	med	Water quality services are altered. Feature allows nutrients or contaminants to settle to bottom, where infiltration may occur. Feature does not support vegetation and does not contribute to primary productivity, nutrient cycles, or contaminant uptake.	med	n/a
	high	Hydrology closely resembles natural conditions. Feature exhibits natural patterns of filling or inundation and drawdown. Feature is located on a stream or river, is created by a dam or dyke, or is a natural lake and retains/detains flows to reduce peak flows and provide flood storage. Hydrology of the feature may be controlled or altered by engineered or mechanical means in a manner that closely resembles natural hydrologic conditions.	high	Water quality services resemble natural conditions. Buffer around feature is characterized by natural vegetation with little evidence of human disturbance. Feature supports vegetation and appropriate substrate that contributes to primary productivity, nutrient cycles, and/or contaminant uptake.	high	n/a

**Table 2.1-2**  
 Scoring Criteria for Special Aquatic Features

	Hydrology		Water Quality		Habitat Integrity	
<b>Retention/ Detention basin</b>	low	Hydrology is severely altered. Feature is manmade. Lateral movement of water in floodplain is limited. Hydrology is controlled by engineered or mechanical means.	low	Water quality is significantly degraded. Buffer around this feature is characterized by barren ground and highly compacted or highly disturbed soils. There is evidence of intensive human disturbance, including agriculture land use practices that contribute pollutants to the aquatic system. Substrate and vegetation are insufficient to process nutrients or contaminants. Feature may have impervious bottom that restricts nutrient or contaminant uptake.	low	No or minimal evidence of wildlife utilization. Limited adjacent upland food sources. Limited aquatic or riparian vegetation. Open water may provide habitat for wading birds and waterfowl. Located in area of frequent human disturbances.
	med	Hydrology is somewhat altered. Feature retains/detains water following natural patterns, but provides a higher or lower hydrologic drawdown, magnitude, and period of inundation than a natural system. Hydrology may be altered or controlled by engineered or mechanical means in a manner that resembles natural hydrologic conditions. Lateral movement of floodplain water provides some inputs to the feature.	med	Water quality services are altered. Buffer around feature is characterized by barren ground, highly compacted or highly disturbed soils, and evidence of intensive human disturbance, including agriculture land use practices that may contribute pollutants to the aquatic system. Feature allows nutrients or contaminants to settle to bottom where infiltration may occur. Feature supports vegetation that contributes to primary productivity, nutrient cycles and/or contaminant uptake.	med	n/a
	high	Hydrology closely resembles natural conditions. Feature exhibits natural patterns of filling or inundation and drawdown. Hydrology of the feature may be controlled or altered by engineered or mechanical means in a manner that closely resembles natural hydrologic conditions.	high	Water quality services resemble natural conditions. Buffer around feature is characterized by natural vegetation with little evidence of human disturbance. Feature supports vegetation and appropriate substrate that contributes to primary productivity, nutrient cycles, and/or contaminant uptake.	high	n/a

**Table 2.1-2**  
 Scoring Criteria for Special Aquatic Features

	Hydrology		Water Quality		Habitat Integrity	
<b>Riparian</b>	low	Hydrology is severely altered. Feature has some trees, however coverage is fragmented. Feature is present along man-made SAR.	low	Water quality is significantly degraded. Buffer around this feature is characterized by barren ground or highly compacted or highly disturbed soils. Evidence of intensive human disturbance, including agriculture land use practices that contribute to a reduction in the riparian feature.	low	No or minimal evidence of wildlife utilization. Limited adjacent upland food sources. Limited aquatic or riparian vegetation. Open water abundant. Located in area of frequent human disturbances.
	med	Hydrology is somewhat altered. Feature has established riparian vegetation consisting of native and non-native species that is mostly continuous along manmade or altered features such as a retention/detention basin, reservoir/lacustrine, or canal/ditch; or contains fragmented riparian vegetation along riverine features.	med	Water quality services are altered. Riparian vegetation may be significantly reduced and/or fragmented. Feature provides water quality services by buffering adjacent non-point source nutrients and contaminants from the aquatic system. Adjacent land uses are characterized by intensive human disturbance, including agriculture land use practices that may contribute pollutants to the aquatic system. Feature supports vegetation that contributes to primary productivity, nutrient cycles.	med	Evidence of wildlife utilization, part of movement/migration corridor. Sparse adjacent upland food sources. Adequate protective cover for wildlife. Common birds, mammals, reptiles, and amphibians may be present.
	high	Hydrology closely resembles natural conditions. Feature has a well-developed native riparian vegetation corridor extending beyond the banks of riverine features.	high	Water quality services resemble natural conditions. Riparian vegetation is well-developed. Feature is adjacent to natural areas or undisturbed areas that buffer aquatic system from non point source contaminants. Feature contributes to primary productivity, nutrient cycles.	high	Strong evidence of wildlife utilization based on CNDDB occurrence or is part of a wildlife movement/migration corridor. Abundant upland food sources. Abundant cover and habitat for wildlife. Common birds, mammals, reptiles, and amphibians may be present. Feature may provide habitat for federally or state listed species, or occurs in federally designated critical habitat or a core recovery area.

**Table 2.1-2**  
 Scoring Criteria for Special Aquatic Features

	Hydrology		Water Quality		Habitat Integrity	
<b>Riverine</b>	low	Hydrology is severely altered. Feature is controlled through channelization, upstream impoundments, water diversion, or otherwise controlled by engineered or mechanical means. Floodplain has been significantly altered or reduced. Lateral movement of water in the floodplain is limited. Riparian vegetation may be absent or much reduced.	low	Water quality is significantly degraded. Buffer around this feature is characterized by barren ground, highly compacted or highly disturbed soils, and evidence of intensive human disturbance, including agriculture land use practices that contribute pollutants to the aquatic system. Substrate and vegetation are insufficient for nutrients or contaminant uptake.	low	No or minimal evidence of wildlife utilization. Limited adjacent upland food sources. Limited aquatic or riparian vegetation. Open water abundant. Located in area of frequent human disturbances.
	med	Hydrology is somewhat altered. Feature may be controlled through channelization, upstream impoundments, water diversion or otherwise controlled by engineered or mechanical means. Floodplain is altered or reduced but lateral movement of water is the may exceed existing obstructions. Riparian vegetation is present but limited.	med	Water quality services are altered. Feature is adjacent to riparian vegetation that buffers the aquatic system from non-point source nutrients and contaminants. Riparian vegetation may be reduced and/or fragmented. Feature lacks aquatic vegetation but substrate is sufficient for nutrients and contaminants uptake.	med	Evidence of wildlife utilization, based on CNDDDB occurrence or is part of a wildlife movement/migration corridor. Sparse adjacent upland food sources. Adequate protective cover for wildlife. Common birds, mammals, reptiles, and amphibians may be present.
	high	Hydrology closely resembles natural conditions. Feature is not altered by upstream or downstream engineered or mechanical means. Water has unrestricted access to adjacent floodplain.	high	Water quality services resemble natural conditions. Feature is adjacent to natural areas or to undisturbed areas that buffer the aquatic system from non point source contaminants and contaminants from the SAR. Riparian vegetation is present. Substrate is sufficient for nutrients and contaminant uptake.	high	Strong evidence of wildlife utilization based on CNDDDB occurrence or is part of a wildlife movement/migration corridor. Abundant upland food sources. Abundant cover and habitat for wildlife. Common birds, mammals, reptiles, and amphibians may be present. Feature may provide habitat for federally or state listed species, or occurs in a federally designated critical habitat or core recovery area.

**Table 2.1-2**  
 Scoring Criteria for Special Aquatic Features

	Hydrology		Water Quality		Habitat Integrity	
	low	n/a	low	n/a	low	n/a
<b>Vernal Pool</b>	med	Hydrology is somewhat altered. Feature is characterized by natural patterns of filling, inundation, or saturation, but dry season conditions are subject to one or more of the following: <ul style="list-style-type: none"> <li>• Greater magnitude or duration than would be expected under natural conditions.</li> <li>• More rapid or extreme drawdown or drying.</li> <li>• Substantially lower magnitude or duration than would be expected under natural conditions.</li> </ul> Freshwater sources that affect the dry season condition are primarily artificial or substantially controlled. Feature is highly disturbed and discontinuous, and is broken up by ditches, urban development, or agricultural development. Unnatural features such as levees or roads limit the amount of lateral movement of flood waters.	med	Water quality services are altered. Feature may be isolated, is not connected to a natural habitat, or is located close to land uses that contribute to water quality degradation. Feature is vegetated sufficiently to contribute to primary productivity and nutrient cycling.	med	n/a
	high	Hydrology closely resembles natural conditions. Feature naturally lacks water in the dry season. There is no indication that dry season conditions are substantially controlled by artificial water sources. Hydroperiod is characterized by natural patterns of filling or inundation and drying or drawdown. Water has unrestricted access to adjacent areas, without obstruction to the lateral movement of flood waters.	high	Water quality services resemble natural conditions. Feature is part of a larger complex of SAR and/or is surrounded by natural, undeveloped habitat areas. Feature receives little in the way of contaminants and is vegetated sufficiently to contribute to primary productivity and nutrient cycling.	high	Strong evidence of wildlife utilization based on known CNDDB occurrences. Abundant upland food sources. Abundant cover and habitat for wildlife. Common birds, mammals, reptiles, and amphibians may be present. Feature may provide habitat for federally or state listed species, or occurs in a federally designated critical habitat or core recovery area.

**Table 2.1-2**  
 Scoring Criteria for Special Aquatic Features

	Hydrology		Water Quality		Habitat Integrity	
<b>Seasonal Wetland</b>	low	n/a	low	n/a	low	n/a
	Med	Hydrology is somewhat altered. Feature is characterized by natural patterns of filling, inundation, or saturation, but dry season conditions are subject to one or more of the following: <ul style="list-style-type: none"> <li>• Greater magnitude or duration than would be expected under natural conditions.</li> <li>• More rapid or extreme drawdown or drying.</li> <li>• Substantially lower magnitude or duration than would be expected under natural conditions.</li> </ul> Freshwater sources that affect the dry season condition are primarily artificial or substantially controlled. Feature is highly disturbed and discontinuous, broken up by ditches, urban development, or agricultural development. Unnatural features such as levees or roads limit the amount of lateral movement of flood waters.	med	Water quality services are altered. Feature may be isolated, is not connected to a natural habitat, or is located in close proximity to land uses that contribute to water quality degradation. Feature is vegetated sufficiently to contribute to primary productivity and nutrient cycling.	med	Evidence of wildlife utilization, based on CNDDDB occurrence or is part of a wildlife movement/migration corridor. Sparse adjacent upland food sources. Adequate protective cover for wildlife. Common birds, mammals, reptiles, and amphibians may be present.
	high	Hydrology closely resembles natural conditions. Feature naturally lacks water in the dry season. There is no indication that dry season conditions are substantially controlled by artificial water sources. Hydroperiod is characterized by natural patterns of filling or inundation and drying or drawdown. Water has unrestricted access to adjacent areas, without obstruction to the lateral movement of flood waters.	high	Water quality services resemble natural conditions. Feature is part of a larger complex of SAR and/or is surrounded by natural, undeveloped habitat areas. Feature receives little in the way of contaminants and is vegetated sufficiently to contribute to primary productivity and nutrient cycling.	high	n/a
Acronyms: CNDDDB = California Natural Diversity Database n/a = Not applicable. Used where a score does not apply to a SAR type or function or service category. For example, all vernal pools support high habitat integrity, therefore low and medium scores are not applicable. SAR = special aquatic resource						

**B. HABITAT INTEGRITY**

The method developed to assess the habitat integrity functions and services of the SAR features in the alternative alignment areas was based on the potential distribution of special-special-status species and their habitat within each feature. Table 2.1-2 lists the scoring criteria that were applied to assign habitat integrity scores to each of the SAR features. The location and abundance of special-status species were determined using species occurrence data from the California Natural Diversity Database (CNDDDB) RareFind dataset (CDFG 2010). Wildlife biologists determined appropriate buffer distances for each species that had the potential to occur in the alternative alignment areas based upon accepted agency-approved and industry-standard migratory and dispersal distances. Table 2.1-3 presents the buffers and the listing status of each species with potential to occur in the alternative alignment areas. In addition, all vernal pool habitat was automatically given a high habitat integrity value, based on its regional rarity.

**Table 2.1–3**  
 Special-Status Species Occurring Near the BNSF, UPRR, and/or BNSF Avoidance Alternative Alignments

Species	Buffer	Habitat Utilized	Special Aquatic Resource types that may contain that habitat	Listing Status
Vernal pool fairy shrimp	250 feet <sup>a</sup>	vernal pool habitat*	vernal pool	Threatened (Federal)
Vernal pool tadpole shrimp	250 feet <sup>a</sup>	vernal pool habitat*	vernal pool	Endangered (Federal)
California tiger salamander	1.24 miles <sup>b</sup>	vernal pool habitat*	vernal pool	Threatened (Federal and State)
Valley elderberry longhorn beetle	100 feet <sup>c</sup>	Riparian	riverine, riparian, seasonal wetland	Threatened (Federal)
White-tailed kite	0.25 mile <sup>d</sup>	riparian	riverine, riparian, seasonal wetland	Protected (State)
Swainson's hawk	0.5 mile <sup>e</sup>	riparian	riverine, riparian, seasonal wetland	Threatened (State)
Hoover's spurge	100 feet <sup>d</sup>	vernal pool habitat*	vernal pool	Threatened (Federal)
San Joaquin Orcutt grass	100 feet <sup>d</sup>	vernal pool habitat*	vernal pool	Threatened (Federal) and Endangered (State)

Notes:

\*Vernal pool habitat includes vernal pools, vernal swales and associated uplands

Sources:

<sup>a</sup> USFWS (U.S. Fish and Wildlife Service). 1996. Programmatic Formal Endangered Species Act Consultation on Issuance of 404 Permits for Projects with Relatively Small Effects on Listed Vernal Pool Crustaceans Within the Jurisdiction of the Sacramento Field Office, California. Reference Number 1-1-96-F-1; Letter to Mr. Art Champ, U.S. Army Corps of Engineers, Sacramento, CA. 17 pgs.

<sup>b</sup> USFWS and CDFG (U.S. Fish and Wildlife Service and California Department of Fish and Game). 2003. Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander. October.

<sup>c</sup> USFWS (U.S. Fish and Wildlife Service). 1999. *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*. U.S. Fish and Wildlife Service, Sacramento, California: USFWS. July 9.

<sup>d</sup> Typical agency required buffers defined through agency consultation.

<sup>e</sup> Swainson's Hawk Technical Advisory Committee (SHTAC). 2000. Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley. May 31.

## 2.2 Methods for Special-Status Species

To determine which special-status plant and wildlife species have potential to occur within each alternative alignment area, a standard desktop review was performed. Species potential to occur was evaluated within 5 miles of each of the alternative alignment footprints, designated as the “wildlife study areas.” A list of special-status species was prepared through a two-fold inquiry of the CNDDDB via a search using the RareFind program, and through a GIS mapping exercise of all CNDDDB records within the wildlife study area. This two-fold inquiry was performed to capture all relevant special-status species in the query, especially those listed by the CDFG as “Sensitive” and whose geographic location data has been suppressed (CDFG 2010). Although fish species are reported to the CNDDDB less frequently than wildlife species, no special-status fish species, or water bodies known to support such species, have been reported or are known to inhabit this portion of the San Joaquin Valley. Special-status wildlife are considered “special-status” if they are listed as any of the following:

- Federally threatened or endangered.
- Candidates for federal threatened or endangered status.
- Proposed for federal threatened or endangered status.
- State threatened or endangered.
- State fully protected species.

A list of federally designated critical habitats within each wildlife study area was identified through a review of the USFWS Environmental Conservation Online System (ECOS) database (USFWS 2010a). Where designated critical habitat for a species occurs within 5 miles of the potential alignments, that species was considered to have potential to occur even if CNDDDB queries did not return records of that species within the wildlife study area.

Potentially suitable habitat for each listed species within the alternative alignment footprints was determined and then mapped using the California Wildlife Habitat Relationships (CWHR) Information System (CDFG 2008). Only primary CWHR designations were used, which resulted in a very rough, broad-scale map of potential habitat features.

To augment the broad-scale CWHR habitat layers with finer habitat detail, the biologists visually examined aerial imagery of both alignments in order to identify potential natural areas where special-status species might occur. Potential natural areas were reclassified from their original CWHR habitat type to the habitat type “natural area” (NAT) if they were not already mapped as natural CWHR habitat types (i.e., as alkali desert scrub, annual grassland, or perennial grassland) or if they met all of the following criteria in aerial imagery taken on at least two different dates:

- Little to no evidence of linear features indicative of plowing or discing.
- Absence of structures and obvious parking areas.
- Evidence of natural features, such as random patterns of rock, vegetation, ponding water, or dry washes.

Natural areas were limited to areas with sparse vegetation or trees, and would likely be classified as the habitat types alkali desert scrub, annual grassland, and perennial grassland during field surveys.

Acres of habitat impacts were determined on a per species basis by overlaying the project footprints with wildlife habitat types and species range maps. Range maps for each species are as provided by the CWHR system, with the exception of the Fresno and Tipton kangaroo rats and all invertebrate species. Recent genetic studies have shown that the Tipton kangaroo rat occurs primarily south of the Kings River within the project vicinity, and the Fresno kangaroo rat

occurs primarily north of the Kings River (Cypher. 2010). This distinction was used as the range of the two kangaroo rat subspecies for this analysis. For invertebrate species, CWHR species range maps were unavailable; however, the ranges of these species—both vernal pool invertebrates and the valley elderberry longhorn beetle—are widespread throughout the San Joaquin Valley. Therefore, acreages of habitat impacts were determined wherever suitable wildlife habitat types were present. The suitable vernal pool invertebrate species wildlife habitat type was limited to vernal pools, while the suitable valley elderberry longhorn beetle wildlife habitat type was limited to valley riparian habitat along rivers and streams.

The broad CWHR categories used in this study have not been field verified. Actual suitable habitat for listed plant and wildlife species may be different from the acreage compared here. For instance, anything designated cropland was determined “suitable” for Swainson’s hawks, white-tailed kites, and mountain plover. However, the actual suitability of any parcel of cropland for these species varies according to crop type and height, availability of adjacent features such as perch sites, irrigation, pesticide use or lack thereof, other agricultural practices, and time of year. These distinctions were not considered in this analysis.

Recovery plans were identified using the ECOS species profiles for all listed species to identify core recovery areas, satellite recovery areas, and linkage recovery areas in the project footprint.

A preliminary review of important wildlife movement corridors was based on the findings of the report, *Missing Linkages: Restoring Connectivity to the California Landscape* (Penrod et al. 2001), which was prepared in response to the 2000 Missing Linkages conference, and the subsequent 2003 *South Coast Missing Linkages Project* report (Penrod et al. 2003). Additionally, a preliminary review of movement corridors was based on habitat and linkage corridor data made available by the San Joaquin Valley Endangered Species Recovery Program (ESRP 2009).

**Chapter 3**  
**Environmental Resources Impacts**  
**Estimation Results**



## 3.0 Environmental Resources Results

This chapter presents the data gathered on environmental resources and constraints analysis. Estimates of SAR feature presence and functions and services values are presented first and are followed by estimates of special-status species occurrences.

### 3.1 Results for Special Aquatic Resources

SAR mapping is summarized by alternative and presented in Tables 3.1-1, 3.1-2, and 3.1-3. Maps of these features are provided in Appendix E-1. According to the scoring method described in Section 2.1 and Table 2.1-2, the functions and services value of each feature was assigned a score of low, medium, or high for hydrology, water quality, and habitat integrity. The SAR mapping of the BNSF Alternative Alignment identified 88 SAR features covering 24.06 acres. SAR mapping in the UPRR Alternative Alignment identified 103 SAR features, covering 21.75 acres. SAR mapping in the BNSF Avoidance Alternative Alignment identified 104 SAR features, covering 30.14 acres. Maps of these features are provided in Appendix E-1.

**Table 3.1-1**  
 Functions and Services Summary for All Special Aquatic Resources Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

				Feature Value		
Alignment	Number of Special Aquatic Resources	Special Aquatic Resource Type	Acreage	Average Rating: Hydrology	Average Rating: Water Quality	Average Rating: Habitat Integrity
BNSF	50	Canal/Ditch	10.09	0	0	0
	7	Retention/Detention basin	0.39	0	0	0
	12	Riparian	0.99	1.25	1.33	0.17
	8	Riverine	1.81	0.5	0.5	0
	3	Seasonal Wetland	0.35	1	1	1
	8	Vernal Pool	10.43	1.75	1.75	2
	<b>88</b>	<b>Total Acreage BNSF</b>	<b>24.06</b>	--	--	--
UPRR	58	Canal/Ditch	14.68	0	0	0
	16	Retention/Detention basin	2.26	0	0	0
	12	Riparian	0.83	1.17	1.25	0.67
	11	Riverine	2.67	0.36	0.18	0.55
	4	Seasonal Wetland	0.07	1	1	1
	2	Vernal Pool	1.24	2	2	2
	<b>103</b>	<b>Total Acreage UPRR</b>	<b>21.75</b>	--	--	--
BNSF Avoidance	65	Canal/Ditch	17.28	0	0	0
	13	Retention/Detention basin	7.65	0.23	0.15	0
	13	Riparian	1.05	1.15	1.15	0.15
	9	Riverine	2.32	0.44	0.33	0.11
	2	Seasonal Wetland	0.35	1	1	1
	2	Vernal Pool	1.49	1	1	2
	<b>104</b>	<b>Total Acreage BNSF Avoidance</b>	<b>30.14</b>	--	--	--

Feature value averages are based on a three-point feature rating scale: 0 (low value), 1 (medium value) and 2 (high value)

**Table 3.1-2**  
 Special Aquatic Resources Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments Differentiated by  
 Functions and Services Value

		Number of Features		
Functions and Services Value	Feature Type	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment
<b>Low</b>	Canal/Ditch	50	58	65
	Retention/Detention Basins	7	16	10
	Riparian	1	1	3
	Riverine	3	5	4
	<b>Total features/acreage:</b>	<b>61 / 11.83 acres</b>	<b>80 / 18.61 acres</b>	<b>82 / 19.88 acres</b>
<b>Low/Med</b>	Retention/Detention Basins	0	0	1
	Riparian	1	1	0
	Riverine	2	2	2
	<b>Total features/acreage:</b>	<b>3 / 0.30 acres</b>	<b>3 / 0.38 acres</b>	<b>3 / 1.22 acres</b>
<b>Med</b>	Retention/Detention Basins	0	0	2
	Riparian	10	8	10
	Riverine	3	4	3
	Seasonal Wetland	3	4	2
	Vernal Pool Habitat	2	0	2
	<b>Total features/acreage:</b>	<b>18 / 2.63 acres</b>	<b>16 / 1.2 acres</b>	<b>19 / 9.04 acres</b>

**Table 3.1-2**  
 Special Aquatic Resources Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments Differentiated by  
 Functions and Services Value

		Number of Features		
Functions and Services Value	Feature Type	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment
Med/High		0	0	0
	<b>Total features/acreage:</b>	<b>0 / 0 acre</b>	<b>0 / 0 acre</b>	<b>0 / 0 acre</b>
High	Vernal Pool Habitat	6	2	0
	Riparian	0	2	0
	<b>Total features/acreage:</b>	<b>6 / 9.30 acres</b>	<b>4 / 1.56 acres</b>	<b>0 / 0 acres</b>
<b>Total features:</b>		<b>88</b>	<b>103</b>	<b>104</b>
<b>Total acres:</b>		<b>24.06</b>	<b>21.75</b>	<b>30.14</b>

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
<b>BNSF ALTERNATIVE ALIGNMENT</b>							
2	BNSF	Canal/Ditch	0.03	0	0	0	0
5	BNSF	Canal/Ditch	0.03	0	0	0	0
6	BNSF	Canal/Ditch	0.03	0	0	0	0
12	BNSF	Canal/Ditch	0.05	0	0	0	0
13	BNSF	Canal/Ditch	0.04	0	0	0	0
14	BNSF	Canal/Ditch	0.07	0	0	0	0
50	BNSF	Canal/Ditch	0.02	0	0	0	0
57	BNSF	Canal/Ditch	0.07	0	0	0	0
59	BNSF	Canal/Ditch	0.04	0	0	0	0
61	BNSF	Canal/Ditch	0	0	0	0	0
62	BNSF	Canal/Ditch	0.04	0	0	0	0
63	BNSF	Canal/Ditch	0.03	0	0	0	0
72	BNSF	Canal/Ditch	0.06	0	0	0	0
75	BNSF	Canal/Ditch	0.02	0	0	0	0
80	BNSF	Canal/Ditch	0.03	0	0	0	0
81	BNSF	Canal/Ditch	0.04	0	0	0	0
82	BNSF	Canal/Ditch	0.01	0	0	0	0
84	BNSF	Canal/Ditch	0.02	0	0	0	0
98	BNSF	Canal/Ditch	0.02	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
119	BNSF	Canal/Ditch	0.11	0	0	0	0
121	BNSF	Canal/Ditch	0.05	0	0	0	0
124	BNSF	Canal/Ditch	0.07	0	0	0	0
130	BNSF	Canal/Ditch	0.07	0	0	0	0
131	BNSF	Canal/Ditch	0.02	0	0	0	0
139	BNSF	Canal/Ditch	0.39	0	0	0	0
142	BNSF	Canal/Ditch	0.5	0	0	0	0
150	BNSF	Canal/Ditch	1.58	0	0	0	0
152	BNSF	Canal/Ditch	0.05	0	0	0	0
154	BNSF	Canal/Ditch	0.03	0	0	0	0
156	BNSF	Canal/Ditch	0.12	0	0	0	0
160	BNSF	Canal/Ditch	0.08	0	0	0	0
171	BNSF	Canal/Ditch	0.54	0	0	0	0
182	BNSF	Canal/Ditch	0.19	0	0	0	0
188	BNSF	Canal/Ditch	0	0	0	0	0
190	BNSF	Canal/Ditch	0.01	0	0	0	0
191	BNSF	Canal/Ditch	0.72	0	0	0	0
205	BNSF	Canal/Ditch	2.62	0	0	0	0
207	BNSF	Canal/Ditch	0.01	0	0	0	0
213	BNSF	Canal/Ditch	0.01	0	0	0	0
1	BNSF	Retention/Detention basin	0.12	0	0	0	0
3	BNSF	Retention/Detention basin	0.14	0	0	0	0
187	BNSF	Retention/Detention basin	0.06	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
193	BNSF	Retention/Detention basin	0.03	0	0	0	0
203	BNSF	Retention/Detention basin	0	0	0	0	0
208	BNSF	Retention/Detention basin	0.04	0	0	0	0
209	BNSF	Retention/Detention basin	0	0	0	0	0
39	BNSF	Riparian	0.01	1	1	0	2
42	BNSF	Riparian	0.07	2	2	0	4
44	BNSF	Riparian	0.08	2	2	0	4
46	BNSF	Riparian	0.18	2	2	0	4
47	BNSF	Riparian	0.06	2	2	0	4
49	BNSF	Riparian	0.13	2	2	0	4
159	BNSF	Riparian	0.1	0	0	0	0
161	BNSF	Riparian	0.02	0	1	0	1
173	BNSF	Riparian	0.12	1	1	0	2
175	BNSF	Riparian	0.09	1	1	0	2
41	BNSF	Riverine	0.06	1	1	0	2
45	BNSF	Riverine	0.13	1	1	0	2
48	BNSF	Riverine	0.02	0	0	0	0
87	BNSF	Riverine	0.13	1	0	0	1
174	BNSF	Riverine	0.15	0	1	0	1
143	BNSF	Seasonal wetland	0	1	1	1	3
200	BNSF	Seasonal wetland	0.17	1	1	1	3

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
201	BNSF	Seasonal wetland	0.18	1	1	1	3
83	BNSF	Vernal pool	0.01	1	1	2	4
85	BNSF	Vernal pool	0.43	2	2	2	6
108	BNSF	Vernal pool	0.86	2	2	2	6
109	BNSF	Vernal pool	0.86	2	2	2	6
120	BNSF	Vernal pool	0.54	2	2	2	6
122	BNSF	Vernal pool	1.08	2	2	2	6
155	BNSF	Vernal pool	1.12	1	1	2	4
167	BNSF	Vernal pool	5.53	2	2	2	6
216**	BNSF	Canal/Ditch	0.02	0	0	0	0
217**	BNSF	Canal/Ditch	0.13	0	0	0	0
219**	BNSF	Canal/Ditch	0.04	0	0	0	0
220**	BNSF	Canal/Ditch	0.07	0	0	0	0
221**	BNSF	Canal/Ditch	0.05	0	0	0	0
223**	BNSF	Canal/Ditch	0.08	0	0	0	0
224**	BNSF	Canal/Ditch	0.05	0	0	0	0
225**	BNSF	Canal/Ditch	0.14	0	0	0	0
218**	BNSF	Riverine	1.16	0	0	0	0
222**	BNSF	Riverine	0.07	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
RC1_17**	BNSF	Riparian	0.02	1	1	1	3
RC1_11**	BNSF	Riverine	0.09	1	1	0	2
RC1_16**	BNSF	Riparian	0.11	1	1	1	3
RC1_10**	BNSF	Canal/Ditch	0.13	0	0	0	0
RC1_23**	BNSF	Canal/Ditch	0.04	0	0	0	0
AB_46**	BNSF	Canal/Ditch	1.52	0	0	0	0
<b>UPRR ALTERNATIVE ALIGNMENT</b>							
7	UPRR	Canal/Ditch	0.04	0	0	0	0
8	UPRR	Canal/Ditch	0.02	0	0	0	0
9	UPRR	Canal/Ditch	0.03	0	0	0	0
10	UPRR	Canal/Ditch	0.13	0	0	0	0
11	UPRR	Canal/Ditch	0.09	0	0	0	0
15	UPRR	Canal/Ditch	0.02	0	0	0	0
16	UPRR	Canal/Ditch	0.02	0	0	0	0
18	UPRR	Canal/Ditch	0.02	0	0	0	0
20	UPRR	Canal/Ditch	0.02	0	0	0	0
21	UPRR	Canal/Ditch	0.04	0	0	0	0
22	UPRR	Canal/Ditch	0.01	0	0	0	0
23	UPRR	Canal/Ditch	0.03	0	0	0	0
24	UPRR	Canal/Ditch	0.04	0	0	0	0
34	UPRR	Canal/Ditch	0.14	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
35	UPRR	Canal/Ditch	0.19	0	0	0	0
36	UPRR	Canal/Ditch	0.04	0	0	0	0
37	UPRR	Canal/Ditch	0.1	0	0	0	0
38	UPRR	Canal/Ditch	0.02	0	0	0	0
43	UPRR	Canal/Ditch	0.1	0	0	0	0
58	UPRR	Canal/Ditch	0.01	0	0	0	0
64	UPRR	Canal/Ditch	0.03	0	0	0	0
65	UPRR	Canal/Ditch	0.03	0	0	0	0
66	UPRR	Canal/Ditch	0.01	0	0	0	0
67	UPRR	Canal/Ditch	0.06	0	0	0	0
68	UPRR	Canal/Ditch	0.4	0	0	0	0
69	UPRR	Canal/Ditch	0.02	0	0	0	0
70	UPRR	Canal/Ditch	0.07	0	0	0	0
71	UPRR	Canal/Ditch	0.03	0	0	0	0
73	UPRR	Canal/Ditch	0.06	0	0	0	0
74	UPRR	Canal/Ditch	0.04	0	0	0	0
76	UPRR	Canal/Ditch	0.33	0	0	0	0
86	UPRR	Canal/Ditch	0.07	0	0	0	0
123	UPRR	Canal/Ditch	0.1	0	0	0	0
137	UPRR	Canal/Ditch	0.04	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
140	UPRR	Canal/Ditch	0.98	0	0	0	0
149	UPRR	Canal/Ditch	0.03	0	0	0	0
151	UPRR	Canal/Ditch	0.04	0	0	0	0
157	UPRR	Canal/Ditch	0.11	0	0	0	0
158	UPRR	Canal/Ditch	8.86	0	0	0	0
164	UPRR	Canal/Ditch	0.02	0	0	0	0
186	UPRR	Canal/Ditch	0.02	0	0	0	0
194	UPRR	Canal/Ditch	0.07	0	0	0	0
195	UPRR	Canal/Ditch	1.1	0	0	0	0
197	UPRR	Canal/Ditch	0.11	0	0	0	0
198	UPRR	Canal/Ditch	0.16	0	0	0	0
199	UPRR	Canal/Ditch	0.03	0	0	0	0
202	UPRR	Canal/Ditch	0.03	0	0	0	0
206	UPRR	Canal/Ditch	0.05	0	0	0	0
214	UPRR	Canal/Ditch	0.05	0	0	0	0
227	UPRR	Canal/Ditch	0.04	0	0	0	0
60	UPRR	Retention/Detention basin	0.47	0	0	0	0
147	UPRR	Retention/Detention basin	0.14	0	0	0	0
148	UPRR	Retention/Detention basin	0.07	0	0	0	0
153	UPRR	Retention/Detention basin	0.05	0	0	0	0
166	UPRR	Retention/Detention basin	0.48	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
170	UPRR	Retention/Detention basin	0	0	0	0	0
172	UPRR	Retention/Detention basin	0.14	0	0	0	0
176	UPRR	Retention/Detention basin	0.12	0	0	0	0
177	UPRR	Retention/Detention basin	0.13	0	0	0	0
178	UPRR	Retention/Detention basin	0.28	0	0	0	0
179	UPRR	Retention/Detention basin	0.15	0	0	0	0
180	UPRR	Retention/Detention basin	0.02	0	0	0	0
181	UPRR	Retention/Detention basin	0.02	0	0	0	0
196	UPRR	Retention/Detention basin	0.02	0	0	0	0
210	UPRR	Retention/Detention basin	0	0	0	0	0
226	UPRR	Retention/Detention basin	0.17	0	0	0	0
25	UPRR	Riparian	0.17	2	2	2	6
27	UPRR	Riparian	0.15	2	2	2	6
51	UPRR	Riparian	0.02	0	0	0	0
53	UPRR	Riparian	0.05	0	1	0	1
125	UPRR	Riparian	0.03	2	2	0	4
126	UPRR	Riparian	0.02	2	2	0	4
128	UPRR	Riparian	0.02	2	2	0	4
129	UPRR	Riparian	0.04	2	2	0	4

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
134	UPRR	Riparian	0.03	0	0	2	2
136	UPRR	Riparian	0.04	0	0	2	2
183	UPRR	Riparian	0.16	1	1	0	2
185	UPRR	Riparian	0.1	1	1	0	2
26	UPRR	Riverine	0.27	1	1	2	4
33	UPRR	Riverine	0.36	0	0	2	2
52	UPRR	Riverine	0.06	0	0	0	0
55	UPRR	Riverine	0.12	1	0	0	1
127	UPRR	Riverine	0.02	1	1	0	2
133	UPRR	Riverine	0.15	0	0	0	0
135	UPRR	Riverine	0.04	0	0	2	2
162	UPRR	Riverine	0.21	1	0	0	1
184	UPRR	Riverine	0.21	0	0	0	0
28	UPRR	Seasonal wetland	0.01	1	1	1	3
29	UPRR	Seasonal wetland	0	1	1	1	3
30	UPRR	Seasonal wetland	0.06	1	1	1	3
31	UPRR	Seasonal wetland	0	1	1	1	3
54	UPRR	Vernal pool	0.25	2	2	2	6
56	UPRR	Vernal pool	0.99	2	2	2	6
216**	UPRR	Canal/Ditch	0.02	0	0	0	0
217**	UPRR	Canal/Ditch	0.13	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
219**	UPRR	Canal/Ditch	0.04	0	0	0	0
220**	UPRR	Canal/Ditch	0.07	0	0	0	0
221**	UPRR	Canal/Ditch	0.05	0	0	0	0
223**	UPRR	Canal/Ditch	0.08	0	0	0	0
224**	UPRR	Canal/Ditch	0.05	0	0	0	0
225**	UPRR	Canal/Ditch	0.14	0	0	0	0
218**	UPRR	Riverine	1.16	0	0	0	0
222**	UPRR	Riverine	0.07	0	0	0	0
<b>BNSF AVOIDANCE ALTERNATIVE ALIGNMENT</b>							
225**	BNSF AAA	Canal/Ditch	0.13	0	0	0	0
224**	BNSF AAA	Canal/Ditch	0.05	0	0	0	0
223**	BNSF AAA	Canal/Ditch	0.07	0	0	0	0
221**	BNSF AAA	Canal/Ditch	0.05	0	0	0	0
220**	BNSF AAA	Canal/Ditch	0.06	0	0	0	0
219**	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
216**	BNSF AAA	Canal/Ditch	0.01	0	0	0	0
217**	BNSF AAA	Canal/Ditch	0.12	0	0	0	0
213**	BNSF AAA	Canal/Ditch	0.01	0	0	0	0
207**	BNSF AAA	Canal/Ditch	0.01	0	0	0	0
205**	BNSF AAA	Canal/Ditch	2.62	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
191**	BNSF AAA	Canal/Ditch	0.72	0	0	0	0
190**	BNSF AAA	Canal/Ditch	0.01	0	0	0	0
188**	BNSF AAA	Canal/Ditch	0	0	0	0	0
182**	BNSF AAA	Canal/Ditch	0.19	0	0	0	0
156**	BNSF AAA	Canal/Ditch	0.12	0	0	0	0
154**	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
152**	BNSF AAA	Canal/Ditch	0.05	0	0	0	0
150**	BNSF AAA	Canal/Ditch	1.58	0	0	0	0
63**	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
62**	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
61**	BNSF AAA	Canal/Ditch	0	0	0	0	0
59**	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
57**	BNSF AAA	Canal/Ditch	0.07	0	0	0	0
50**	BNSF AAA	Canal/Ditch	0.02	0	0	0	0
14**	BNSF AAA	Canal/Ditch	0.07	0	0	0	0
13**	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
12**	BNSF AAA	Canal/Ditch	0.05	0	0	0	0
6**	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
5**	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
2**	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
209**	BNSF AAA	Retention/Detention basin	0	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
208**	BNSF AAA	Retention/Detention basin	0.04	0	0	0	0
203**	BNSF AAA	Retention/Detention basin	0	0	0	0	0
193**	BNSF AAA	Retention/Detention basin	0.03	0	0	0	0
187**	BNSF AAA	Retention/Detention basin	0.06	0	0	0	0
3**	BNSF AAA	Retention/Detention basin	0.14	0	0	0	0
1**	BNSF AAA	Retention/Detention basin	0.12	0	0	0	0
49**	BNSF AAA	Riparian	0.13	2	2	0	4
47**	BNSF AAA	Riparian	0.06	2	2	0	4
46**	BNSF AAA	Riparian	0.18	2	2	0	4
44**	BNSF AAA	Riparian	0.08	2	2	0	4
42**	BNSF AAA	Riparian	0.07	2	2	0	4
39**	BNSF AAA	Riparian	0.01	1	1	0	2
222**	BNSF AAA	Riverine	0.07	0	0	0	0
218**	BNSF AAA	Riverine	1.11	0	0	0	0
48**	BNSF AAA	Riverine	0.02	0	0	0	0
45**	BNSF AAA	Riverine	0.13	1	1	0	2
41**	BNSF AAA	Riverine	0.06	1	1	0	2
201**	BNSF AAA	Seasonal wetland	0.18	1	1	1	3
200**	BNSF AAA	Seasonal wetland	0.17	1	1	1	3
155**	BNSF AAA	Vernal pool	1.12	1	1	2	4

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
RC1_23**	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
RC1_0	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
RC1_1	BNSF AAA	Retention/Detention basin	0.96	1	0	0	1
RC1_2	BNSF AAA	Riverine	0.49	0	0	0	0
RC1_3	BNSF AAA	Canal/Ditch	0.05	0	0	0	0
RC1_4	BNSF AAA	Canal/Ditch	0.06	0	0	0	0
RC1_5	BNSF AAA	Canal/Ditch	0.1	0	0	0	0
RC1_6	BNSF AAA	Canal/Ditch	0.1	0	0	0	0
RC1_7	BNSF AAA	Canal/Ditch	3.24	0	0	0	0
RC1_8	BNSF AAA	Canal/Ditch	1.66	0	0	0	0
RC1_9	BNSF AAA	Canal/Ditch	0.58	0	0	0	0
RC1_10**	BNSF AAA	Canal/Ditch	0.82	0	0	0	0
RC1_11**	BNSF AAA	Riverine	0.18	1	1	0	2
RC1_12	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
RC1_13	BNSF AAA	Canal/Ditch	0.05	0	0	0	0
RC1_14	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
RC1_15	BNSF AAA	Riverine	0.09	0	0	1	1
RC1_16**	BNSF AAA	Riparian	0.21	1	1	1	3
RC1_17	BNSF AAA	Riparian	0.04	1	1	1	3
RC1_18	BNSF AAA	Canal/Ditch	0.16	0	0	0	0
RC1_19	BNSF AAA	Canal/Ditch	0.06	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
RC1_20	BNSF AAA	Canal/Ditch	0.07	0	0	0	0
RC1_21	BNSF AAA	Canal/Ditch	0.16	0	0	0	0
RC1_22	BNSF AAA	Canal/Ditch	0.87	0	0	0	0
AB_26	BNSF AAA	Retention/Detention basin	0.07	0	0	0	0
AB_28	BNSF AAA	Vernal pool	0.37	1	1	2	4
AB_29	BNSF AAA	Retention/Detention basin	0.08	0	0	0	0
AB_30	BNSF AAA	Riparian	0.12	1	1	0	2
AB_31	BNSF AAA	Riparian	0.12	1	1	0	2
AB_32	BNSF AAA	Riverine	0.17	1	0	0	1
AB_33	BNSF AAA	Canal/Ditch	0.05	0	0	0	0
AB_34	BNSF AAA	Retention/Detention basin	3	1	1	0	2
AB_35	BNSF AAA	Retention/Detention basin	2.81	1	1	0	2
AB_37	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
AB_38	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
AB_40	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
AB_41	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
AB_42	BNSF AAA	Canal/Ditch	0.86	0	0	0	0
AB_43	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
AB_45	BNSF AAA	Canal/Ditch	0.08	0	0	0	0
AB_46**	BNSF AAA	Canal/Ditch	1.31	0	0	0	0

**Table 3.1-3**  
 Functions and Services for All Special Aquatic Resources Features Within the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Special Aquatic Resource Feature Number	Alternative Alignments	Special Aquatic Resource Type	Acreage*	Hydrology Score	Water Quality Score	Habitat Integrity Score	Total Functions and Services Score
AB_47	BNSF AAA	Riparian	0.02	0	0	0	0
AB_48	BNSF AAA	Riparian	0	0	0	0	0
AB_49	BNSF AAA	Riparian	0.01	0	0	0	0
AB_50	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
AB_53	BNSF AAA	Canal/Ditch	0.04	0	0	0	0
AB_54	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
AB_55	BNSF AAA	Canal/Ditch	0.03	0	0	0	0
AB_56	BNSF AAA	Canal/Ditch	0.07	0	0	0	0
AB_27	BNSF AAA	Retention/Detention basin	0.34	0	0	0	0
AB_51	BNSF AAA	Canal/Ditch	0.02	0	0	0	0
AB_39	BNSF AAA	Canal/Ditch	0.13	0	0	0	0

Notes:  
 Hydrology, Water Quality and Habitat Integrity scores are assigned to individual features as follows: 0 = low value, 1 = medium value, 2 = high value.  
 Features numbers that begin with "AB" are associated with the Allensworth Bypass; feature numbers that begin with "RC" are associated with the revised Corcoran Bypass.  
 \*Due to rounding, acreage for each feature may not add to the total acreage presented in the table.  
 \*\* These features are associated with more than one alignment alternative.

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### 3.2 Results for Special-Status Species

Eleven CWHR wildlife habitat vegetation communities (Figure 3.2-1) and one natural vegetation community were identified within the project footprint (Table 3.2-1).

The majority of land in the wildlife study areas is active agricultural land (i.e., croplands, orchard/vineyards, irrigated fields). Urban areas, including large cities such as Fresno and Bakersfield as well as multiple smaller cities, including Corcoran, Tulare, Selma, Wasco, Delano, and Shafter, are the second greatest land use. In these areas, native vegetation is absent or highly disturbed, and typical vegetation consists of a variety of planted trees, such as eucalyptus (*Eucalyptus* spp.) and mulberry (*Morus* spp.), and other nonnative or ornamental vegetation.

Aquatic areas include lacustrine (e.g., detention basins, stock ponds) and riverine (e.g., Kings River, Cross Creek, Tule River, Poso Creek, Kern River, and various canals), which are typically bounded by narrow bands of valley riparian areas. The remaining land in the wildlife study area consists of a mix of previously disturbed, marginal natural lands (e.g., alkali desert scrub, perennial grassland, annual grassland, natural areas) and California protected lands. Table 3.2-1 presents the total acreages of CWHR and NAT habitat types.

The areas identified as California protected land (Figure 3.2-2) represent publicly protected open space lands in the state of California. Lands identified in this report are defined by their ownership, not by their management, and may be maintained for a wide range of open space uses, from national forests and wildlife areas to urban parks. Lands identified as open space are held by federal, state, city, county, special district, and non-governmental agencies.

The BNSF Alternative Alignment lies within 500 feet of six California protected lands. These include two city parks, one special district area, one state-owned wildlife reserve, one state park of historical significance, and one national wildlife refuge. The two environmentally significant protected lands, Allensworth Ecological Reserve and Pixley National Wildlife Refuge, have a combined total of 4,947.3 acres and are home to several federally protected and state-protected species.

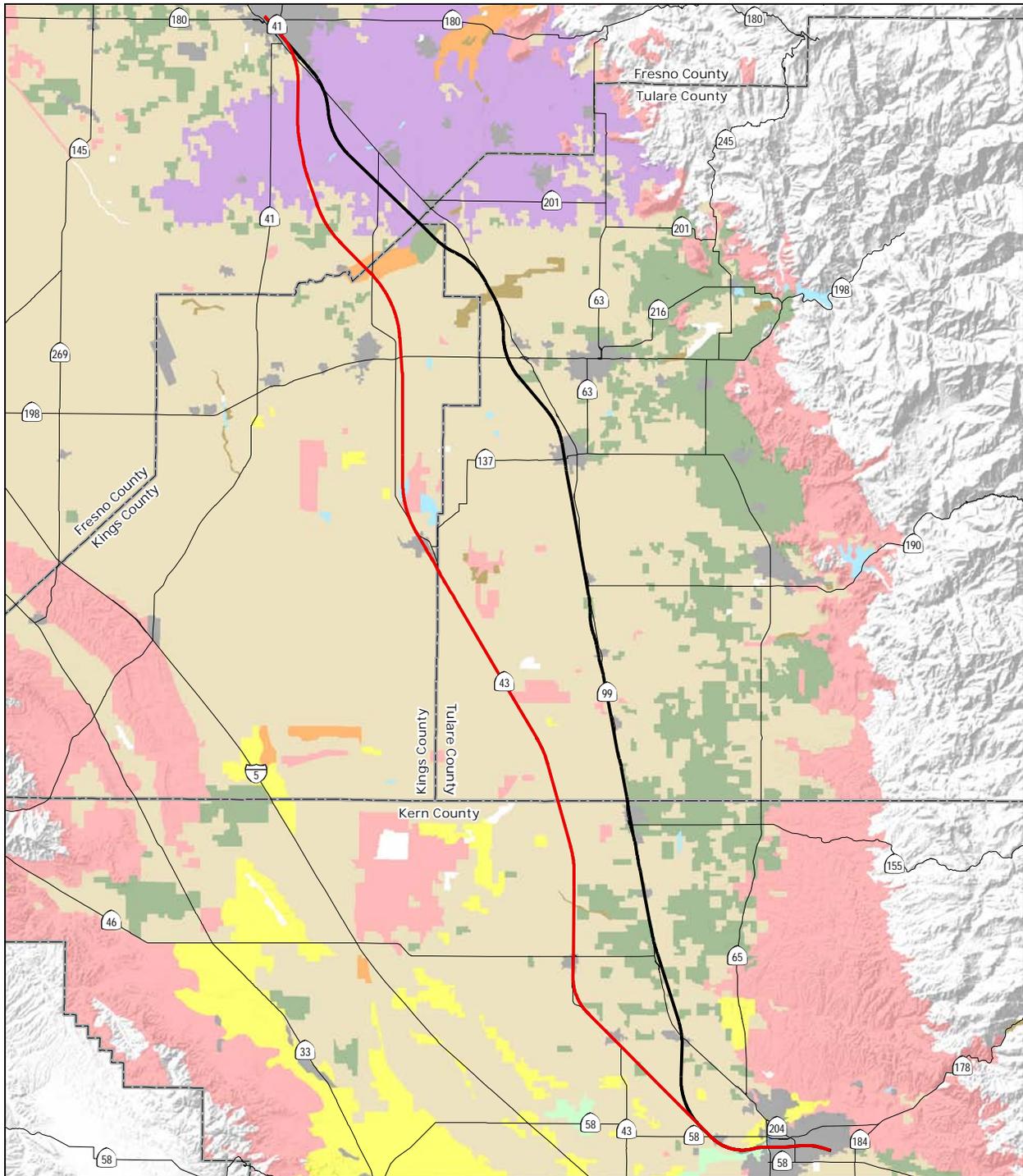
The UPRR Alternative Alignment lies within 500 feet of five California protected lands. These include four city parks, three of which are owned by the City of Tulare and one that is owned by the City of Bakersfield. The remaining park is a regional park owned by the McFarland Recreation and Park District in McFarland, California.

The BNSF Avoidance Alternative Alignment lies within 500 feet of six California protected lands. These include two city parks, one special district area, one state-owned wildlife reserve, one state historical park, and one National Wildlife Refuge. The two environmentally significant protected lands include the Allensworth Ecological Reserve and the Pixley National Wildlife Refuge.

The availability of potential CWHR wildlife habitat vegetation communities was used to determine the potential for special-status species to be present within the project footprint. Appendix E-2a, Appendix E-2b, and Appendix E-2c show all CNDDDB records within 5 miles of each alignment. Figure 3.2-1 illustrates habitat types over the project footprint, and Figure 3.2-2 illustrates wildlife recovery areas, linkage areas, and California protected lands.

**Table 3.2-1**  
 Habitat Areas Within the Project Footprint

CWHR Habitat Types	BNSF Alternative Alignment (acres)	% of total	UPRR Alternative Alignment (acres)	% of total	BNSF Avoidance Alternative Alignment (acres)	% of total
Valley Riparian (VRI)	2.15	0.20	13.73	1.21	2.69	0.24
Riverine (RIV)	4.04	0.38	4.04	0.36	4.04	0.36
Alkali scrubland (ASC)	4.71	0.44	4.71	0.42	18.86	1.66
Perennial grassland (PGS)	6.66	0.62	6.67	0.59	6.66	0.59
Irrigated row/field crops (IRF)	7.73	0.72	-	-	7.73	0.68
Lacustrine (LAC)	8.38	0.78	-	-	-	-
Annual grasslands (AGS)	11.37	1.06	-	-	7.44	0.66
Orchard/vineyard (OVN)	12.26	1.15	80.42	7.10	12.26	1.08
Urban (URB)	83.82	7.83	114.43	10.11	87.83	7.73
Vineyard (VIN)	112.29	10.49	172.54	15.24	112.29	9.89
Natural Areas (NAT)	126.22	11.79	32.36	2.86	128.05	11.27
Cropland (CRP)	690.92	64.54	703.14	62.11	747.84	65.85
<b>Total Acres</b>	<b>1,070.55</b>	<b>100.00</b>	<b>1,132.04</b>	<b>100.00</b>	<b>1,135.70</b>	<b>100.00</b>



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

Source: California Gap Analysis, 1998

Note: Only habitat types that intersect the BNSF and UPRR corridor are being displayed.

November 19, 2010

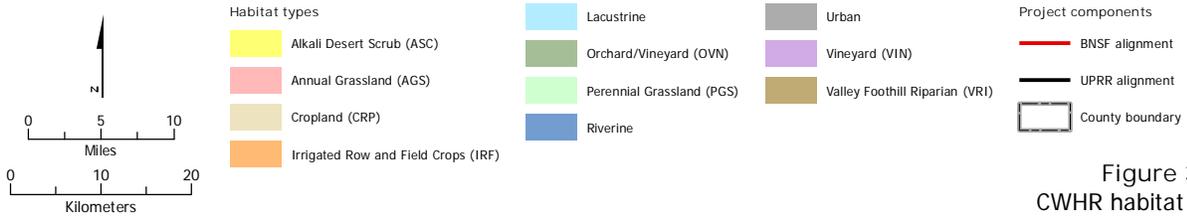
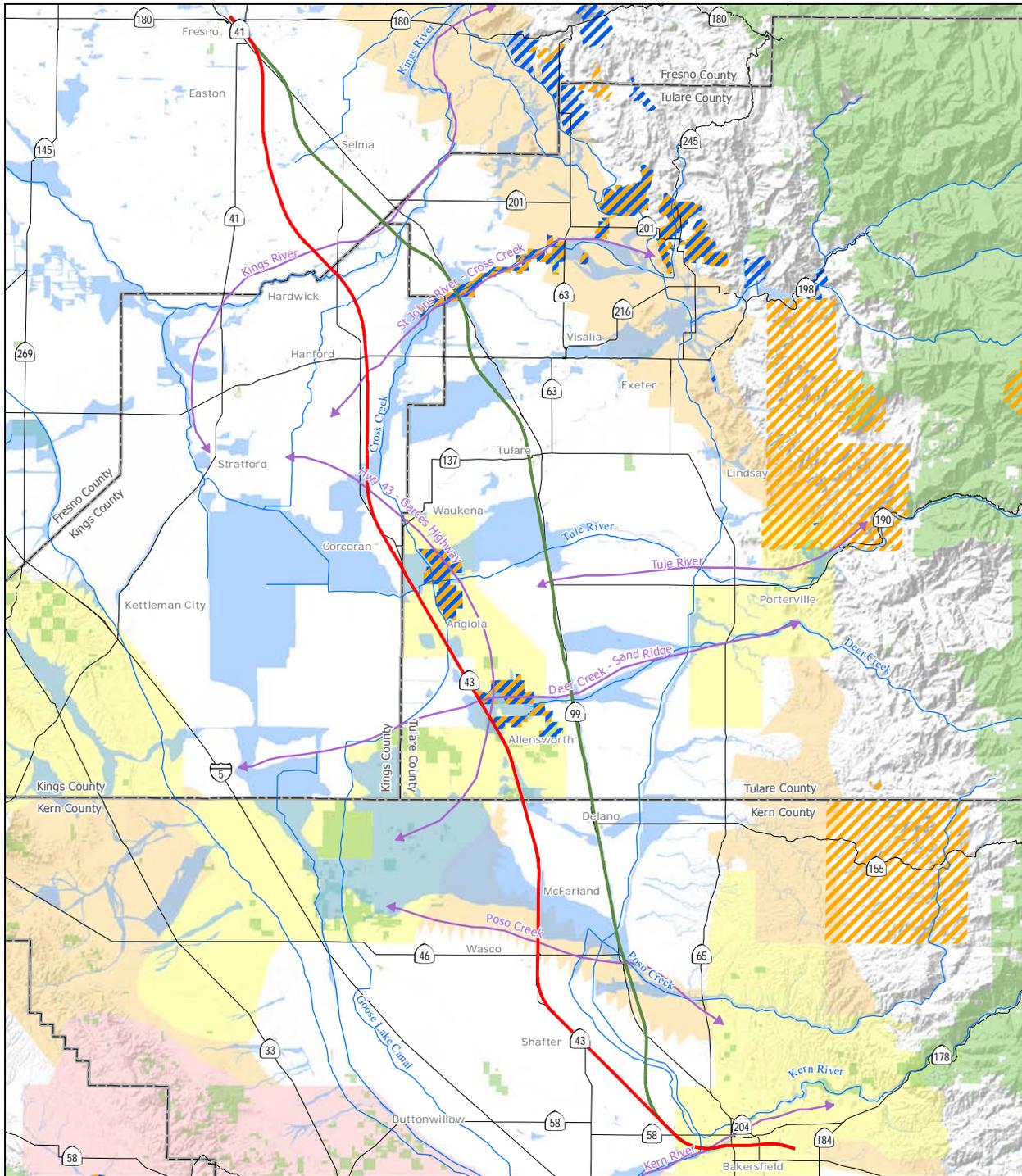
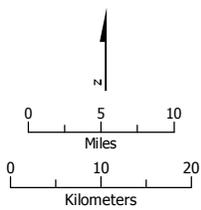


Figure 3.2-1  
CWHR habitat types



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED  
 Data source: URS, 2010  
 Base map source: USGS National Elevation Dataset, 90-m hillshade

November 19, 2010



- |   |                                |                            |
|---|--------------------------------|----------------------------|
| <b>Project components</b>                           | <b>County boundary</b>         | <b>Recovery areas</b>      |
| <span style="color: red;">—</span> BNSF alignment   | Critical habitat - all species | Upland species - core      |
| <span style="color: green;">—</span> UPRR alignment | Vernal pool recovery area      | Upland species - satellite |
| California linkage                                  | California protected land      | Upland species - link      |
| Stream/River  | 100-year floodplain            |                            |

Figure 3.2-2  
 Natural lands, protected areas,  
 and wildlife movement corridors

### 3.2.1 Plants

Seven special-status plant species (see A 3.2-2, Appendix E-2a, Appendix E-2b, and Appendix E-2c) have potential to occur within the BNSF, UPRR, and BNSF Avoidance alternative alignments (CDFG 2010). All seven species are listed as threatened or endangered under federal or state regulations. The listed plants inhabit a variety of vegetation communities throughout the San Joaquin Valley floor, as presented in Table 3.2-3. Bakersfield cactus, California jewel-flower, San Joaquin woolly threads, and Kern mallow all inhabit chenopod scrub and valley and foothill grasslands in areas with low hills, well-drained granitic sands, and alkaline to sub-alkaline sandy loams and soils. San Joaquin adobe sunburst inhabits valley and foothill grasslands in valley floors and rolling foothills. Both Hoover's spurge and San Joaquin Orcutt grass inhabit vernal pools, often in valley and foothill grasslands. If present, these special-status plant species would be limited in distribution to natural lands where disturbances are minimal and where adult plants, seedlings, and/or a seed bank exists (i.e., alkali desert scrub, perennial grassland, annual grassland, natural areas).

### 3.2.2 Wildlife

Twelve special-status wildlife species (see Table 3.2-4, Appendix E-2a, Appendix E-2b, and Appendix E-2c) have potential to occur within the BNSF, UPRR, and BNSF Avoidance alternative alignments (CNDDDB 2010). Ten are listed as threatened or endangered under federal or state regulations, one has been proposed for a federally threatened listing status, and one is a California fully protected species. Table 3.2-4 presents these species and the preferred habitat types for each species.

These 12 species inhabit a variety of vegetation community-based wildlife habitat types. Both fairy shrimp and the California tiger salamander inhabit vernal pools and other seasonal wetlands in habitat types such as alkali desert scrub, annual and perennial grasslands, and natural areas. These habitat types typically provide native or residual hardpan or claypan soils that support ponding water during the winter and spring for durations long enough to allow these species to complete their reproductive life cycles, which range from 3 weeks to 4 months. The uplands surrounding vernal pools and seasonal wetlands also provide suitable refugia habitat for California tiger salamanders during the dry summer months.

Both kangaroo rat subspecies, the blunt-nosed leopard lizard, Nelson's antelope squirrel, and San Joaquin kit fox inhabit upland habitats: alkali desert scrub, annual and perennial grasslands, and natural areas. The valley elderberry longhorn beetle, Swainson's hawk, and white-tailed kite inhabit and nest in riparian habitat. In addition, Swainson's hawks and white-tailed kites forage in both natural (alkali desert scrub, annual and perennial grasslands, natural areas) and developed (urban, vineyard, irrigated fields, orchard/vineyard) habitat types. Mountain plovers may be present during the winter months, foraging in annual and perennial grasslands and in cropland. Table 3.2-5 presents impacts on potential habitat for each species.

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**Table 3.2-2**  
Special-Status Plant Species with Potential to Occur in the Fresno to Bakersfield Alternative Alignment Area

Common Name (Scientific Name)	Federal Status <sup>A</sup>	State/ CNPS Status <sup>B</sup>	Found within a 5-mile radius			Found within the 100-foot-wide project footprint			General Habitat / Microhabitat (Wetland Indicator Status)	Bloom Period <sup>B</sup>
			BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment		
California jewel-flower ( <i>Caulanthus californicus</i> )	FE	SE/1B.1	✓	✓	✓	✓	✓	✓	Chenopod scrub, valley and foothill grassland, pinyon-juniper woodland (NL). Historically from Central Valley and Carrizo plain. Occurs with <i>Vulpia microstachys</i> , <i>Trifolium</i> spp., <i>Calandrinia ciliata</i> , and <i>Lasthenia californica</i> . Usually on subalkaline sandy loams. Elevation 70-900M.	Feb. – May
Hoover's spurge ( <i>Chamaesyce hooveri</i> )	FT	1B.2	--	--	--	--	--	--	Valley and foothill grassland, vernal pools (OBL). Vernal pools on volcanic mudflow or clay substrate. Elevation 25-130M.	Jul. – Sept. [Oct.]
Hoover's spurge ( <i>Chamaesyce hooveri</i> ) *CRITICAL HABITAT*	D	--	--	✓	--	--	--	--	Originally designated in the Federal Register, section 68:46683; August 6, 2003. Designation revised, section 70:46923; August 11, 2005. Species by unit designations were published in 71:7117 (PDF) February 10, 2006.	NA
Kern mallow ( <i>Eremalche kernensis</i> )	FE	1B.1	✓	--	✓	--	--	--	Chenopod scrub, valley and foothill grassland (NL). Dry, open sandy to clay soils, usually within valley saltbush scrub, edge of balds. Elevation 70-515M.	Mar. – May
San Joaquin woolly threads ( <i>Monolopia congdonii</i> )	FE	1B.2	✓	✓	✓	✓	✓	✓	Chenopod scrub, valley and foothill grassland (NL). Alkaline or loamy plains, sandy soils, with grasses and within chenopod scrub. Elevation 60-800M.	Feb. – May
Bakersfield cactus ( <i>Opuntia basilaris</i> var. <i>treleasei</i> )	FE/ 1B.1	1B.1	✓	✓	✓	--	--	--	Chenopod scrub, valley and foothill grassland, cismontane woodland. Coarse or cobbly well-drained granitic sand on bluffs, low hills, and flats in grassland (NL). Coarse or cobbly well-drained granitic sand on bluffs, low hills, and flats in grassland. Elevation 90-550M.	Apr. – May
San Joaquin Valley Orcutt grass ( <i>Orcuttia inaequalis</i> )	FT	1B.1	--	--	--	--	--	--	Vernal pool (OBL). Vernal pools averaging 1.5 acres. Acidic soils with clay to sandy loam texture. Elevation 10-755M.	Apr. – Sept.

**Table 3.2-2**  
 Special-Status Plant Species with Potential to Occur in the Fresno to Bakersfield Alternative Alignment Area

Common Name (Scientific Name)	Federal Status <sup>A</sup>	State/ CNPS Status <sup>B</sup>	Found within a 5-mile radius			Found within the 100-foot-wide project footprint			General Habitat / Microhabitat (Wetland Indicator Status)	Bloom Period <sup>B</sup>
			BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment		
San Joaquin Valley Orcutt grass ( <i>Orcuttia inaequalis</i> ) *CRITICAL HABITAT*	D	--	--	✓	--	--	--	--	Originally designated in the Federal Register, section 68:46683; August 6, 2003. Designation revised, section 70:46923; August 11, 2005. Species by unit designations were published in 71:7117 February 10, 2006.	
San Joaquin adobe sunburst ( <i>Pseudobahia peirsonii</i> )	FT	SE/1B.1	--	✓	--	--	--	--	Cismontane woodland, valley and foothill grassland (NL). Grassy valley floors and rolling foothills in heavy clay soil. Elevation 85-800M.	Mar. – Apr.
Acronyms: BNSF = BNSF Railway HST = high-speed train M = Meters NA = Not applicable			NL = Not Listed (Wetland Indicator Status) OBL = Obligate (Wetland Indicator Status) PDF = Personal Document File UPRR = Union Pacific Railroad USFWS – U.S. Fish and Wildlife Service							
<sup>A</sup> Federal  FD = Delisted. Status to be monitored for 5 years. D = Designated critical habitat FE = Listed as endangered under the federal Endangered Species Act. FT = Listed as threatened under the federal Endangered Species Act. -- = No status designation.		<sup>B</sup> State  SE = Listed as endangered under the California Endangered Species Act. ST = Listed as threatened under the California Endangered Species Act. SR = Listed as rare under the California Endangered Species Act. SSC = Species of special concern in California. -- = No status designation.			<sup>C</sup> (see Reed 1988, Reed 1997, CDFG 2010, CNPS 2010, Hickman 1993, USFWS 2005, and USFWS 1998).					

**Table 3.2-3**  
 Potential Habitat for Special-Status Plants in the Project Footprint

Species	Habitat Types	Range <sup>1</sup>	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment
Bakersfield cactus	ASC, PGS, AGS, NAT	Entire Project Area	148.96	43.74	161.01
California jewel-flower	ASC, PGS, AGS, NAT	Entire Project Area	148.96	43.74	161.01
San Joaquin woolly threads	ASC, PGS, AGS, NAT	Entire Project Area	148.96	43.74	161.01
Kern mallow	ASC, PGS, AGS, NAT	Limited	148.96	0	161.01
San Joaquin adobe sunburst	PGS, AGS, NAT	Limited	0	39.03	0
Hoover's spurge	vernal pools	Limited	0	1.24	0
San Joaquin Orcutt grass	vernal pools	Limited	0	1.24	0
Acronyms: AGS = annual grassland ASC = alkali scrubland NAT = natural areas PGS = perennial grassland					

<sup>1</sup> The range of special-status plant species may be widespread throughout the San Joaquin Valley, but is otherwise limited to locations where suitable habitat is present.

**Table 3.2-4**  
 Special-Status Wildlife Species with Potential to Occur in the Fresno to Bakersfield Alternative Alignment Area

COMMON NAME  (Scientific Name)	Federal/State Status <sup>1</sup>	Found within a 5-mile radius			Found within the 100-foot-wide project footprint			Preferred Habitat
		BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	
<b>Federal and State Listed Species</b>								
<b>Invertebrates</b>								
VERNAL POOL FAIRY SHRIMP ( <i>Branchinecta lynchi</i> )	FT / --	✓	✓	✓	--	--	--	Vernal pools, particularly small, clear-water sandstone depression pools and grassy swale, earth slump, or basalt-flow depression pools.
VERNAL POOL FAIRY SHRIMP ( <i>Branchinecta lynchi</i> )  *CRITICAL HABITAT*	D / --	✓	✓	✓	--	✓	--	PCEs include complexes of swales and pools with intermittently or continuous flowing surface water, depressions that continuously hold water for at least 18 days, and appropriate food and habitat within pools.
VALLEY ELDERBERRY LONGHORN BEETLE ( <i>Desmocerus californicus dimorphus</i> )	FT / --	✓	✓	✓	--	--	--	Elderberry shrubs with stem diameters of 2 to 8 inches.
VERNAL POOL TADPOLE SHRIMP ( <i>Lepidurus packardii</i> )	FE / --	✓	✓	✓	--	--	--	Vernal pools in unplowed grassland, old alluvial soils underlain by hardpan or in sandstone depressions; water in the vernal pools has very low alkalinity and conductivity.

**Table 3.2-4**  
 Special-Status Wildlife Species with Potential to Occur in the Fresno to Bakersfield Alternative Alignment Area

COMMON NAME  (Scientific Name)	Federal/State Status <sup>1</sup>	Found within a 5-mile radius			Found within the 100-foot-wide project footprint			Preferred Habitat
		BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	
VERNAL POOL TADPOLE SHRIMP ( <i>Lepidurus packardii</i> )  *CRITICAL HABITAT*	D / --	✓	✓	✓	--	✓	--	PCEs include complexes of swales and pools with intermittently or continuous flowing surface water, depressions that continuously hold water for at least 41 days, and appropriate food and habitat within pools.
<b>Amphibians</b>								
CALIFORNIA TIGER SALAMANDER ( <i>Ambystoma californiense</i> )	FT / CSC / C(E)	✓	✓	✓	✓	✓	✓	Annual grasslands and grassy understory of valley-foothill hardwood habitats (i.e., oak-savannah). Require vernal pools or other seasonal water sources for breeding. Require mammal burrows or other underground refuges.
CALIFORNIA TIGER SALAMANDER ( <i>Ambystoma californiense</i> )  *CRITICAL HABITAT*	D / P / --	✓	✓	✓	--	✓	--	PCEs include standing bodies of fresh water inundated during winter rains for at least 12 weeks; uplands habitats with small mammal burrows or other underground refugia; upland dispersal habitat between occupied habitats.

**Table 3.2-4**  
 Special-Status Wildlife Species with Potential to Occur in the Fresno to Bakersfield Alternative Alignment Area

COMMON NAME  (Scientific Name)	Federal/State Status <sup>1</sup>	Found within a 5-mile radius			Found within the 100-foot-wide project footprint			Preferred Habitat
		BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	
<b>Reptiles</b>								
BLUNT-NOSED LEOPARD LIZARD ( <i>Gambelia (=Crotaphytus) sila</i> )	FE / SE / FP	✓	✓	✓	✓	✓	✓	Sparsely vegetated alkali and desert scrub habitats with low topographic relief. Cover such as mammal burrows, shrubs or structures such as fence posts.
<b>Birds</b>								
SWAINSON'S HAWK ( <i>Buteo swainsoni</i> )	-- / ST	✓	✓	✓	✓	--	✓	Breeds, does not winter in California; open grassland, shrubland, and agriculture. Nests in riparian areas and oak woodlands, isolated and roadside trees near foraging habitat.
MOUNTAIN PLOVER ( <i>Charadrius montanus</i> )	FPT* / --	✓	--	✓	--	--	--	Winter resident. Short grasslands and plowed fields, open plains with low, herbaceous or scattered shrubs
WHITE-TAILED KITE ( <i>Elanus leucurus</i> )	-- / FP	✓	✓	✓	--	--	--	Year-round resident in grasslands, agricultural fields, oak woodlands, savannah, and riparian habitats in rural and urban areas. Nests in trees.

**Table 3.2-4**  
 Special-Status Wildlife Species with Potential to Occur in the Fresno to Bakersfield Alternative Alignment Area

COMMON NAME  (Scientific Name)	Federal/State Status <sup>1</sup>	Found within a 5-mile radius			Found within the 100-foot-wide project footprint			Preferred Habitat
		BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	
<b>Mammals</b>								
NELSON'S (SAN JOAQUIN) ANTELOPE SQUIRREL <i>(Ammospermophilus nelsoni)</i>	-- / ST	✓	--	✓	--	--	--	Limited range within San Joaquin Valley at 200 to 1,200 feet; found on dry sparsely vegetated loam soils with widely scattered shrubs, forbs, and grasses in broken terrain with gullies and washes.
FRESNO KANGAROO RAT <i>(Dipodomys nitratoides exilis)</i>	FE / SE	✓	✓	✓	--	--	--	Restricted to native grasslands in Fresno County within the San Joaquin Valley; nearly level, light, friable soils in chenopod scrub and grassland communities.
FRESNO KANGAROO RAT <i>(Dipodomys nitratoides exilis)</i>  *CRITICAL HABITAT*	D / --	--	--	--	--	--	--	PCEs for designated critical habitat were not defined at the time of designation. The area contains sufficient escape cover vegetation, and appropriate food and terrain to permit burrow construction.

**Table 3.2-4**  
 Special-Status Wildlife Species with Potential to Occur in the Fresno to Bakersfield Alternative Alignment Area

COMMON NAME  (Scientific Name)	Federal/State Status <sup>1</sup>	Found within a 5-mile radius			Found within the 100-foot-wide project footprint			Preferred Habitat
		BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment	
TIPTON KANGAROO RAT ( <i>Dipodomys nitratoides nitratoides</i> )	FE / SE	✓	✓	✓	✓	✓	✓	Tulare Lake basin of the San Joaquin Valley; saltbrush scrub and sink scrub communities with soft friable soils unaffected by seasonal flooding. Digs burrows in elevated soil mounds at bases of shrubs.
SAN JOAQUIN KIT FOX ( <i>Vulpes macrotis mutica</i> )	FE / ST	✓	✓	✓	✓	✓	✓	San Joaquin Valley in wide variety of habitats; requires loose-textured sandy soils for burrowing; suitable prey base of small rodents.
Acronyms: BNSF = BNSF Railway PCE = Primary Constituent Element HST = high-speed train UPRR = Union Pacific Railroad Notes: <b><sup>1</sup> Federal Status</b> FE – Endangered FT – Threatened D – Critical habitat designated by the U.S. Fish and Wildlife Service. FPT – Proposed for Federal Threatened status  <b>State Status</b> C(E) – Candidate for Endangered listing status SE – Endangered  ST – Threatened  CSC – California Species of Special Concern FP – California Fully Protected species								

**Table 3.2-5**  
 Potential Habitat for Special-Status Wildlife Species in the Project Footprint

Species	Habitat Types	Species Range	Potential Habitat in the Project Footprint (acres)		
			BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment
Vernal Pool Fairy Shrimp	Vernal pools	Entire Project Area	10.43	1.24	1.49
Vernal Pool Tadpole Shrimp	Vernal pools	Entire Project Area	10.43	1.24	1.49
Valley Elderberry Longhorn Beetle	VRI	Entire Project Area	2.15	13.73	2.69
California Tiger Salamander	UPLAND: AGS, ASC, NAT, PGS,	Limited	5.67	5.46	1.63
	AQUATIC: vernal pools	Limited	2.68	1.24	-
Blunt-Nosed Leopard Lizard	AGS, ASC, NAT, PGS	Limited	58.62	-	46.30
Mountain Plover	AGS, CRP, IRF, NAT, PGS	Limited	182.65	-	234.09
White-Tailed Kite	AGS, ASC, CRP, IRF, NAT, OVN, PGS, VIN, VRI	Entire Project Area	974.31	1,013.57	1,043.82
Swainson's Hawk	AGS, ASC, CRP, IRF, NAT, OVN, PGS, VIN, VRI	Entire Project Area	974.31	1,013.57	1,043.82
Nelson's Antelope Squirrel	AGS, ASC, NAT, PGS	Limited	98.87	19.72	101.37
Fresno Kangaroo Rat	AGS, ASC, NAT, PGS	Limited	0.52	4.71	0.52
Tipton Kangaroo Rat	AGS, ASC, NAT, PGS	Limited	148.44	39.39	160.49
San Joaquin Kit Fox	AGS, ASC, CRP, IRF, NAT, OVN, PGS, URB, VIN, VRI	Entire Project Area	1,058.13	1,127.99	1,131.65
Acronyms: AGS = annual grassland ASC = alkali scrubland CRP = cropland IRF = irrigated row and field crops NAT = natural areas OVN = orchard/vineyard PGS = perennial grassland URB = URB VIN = vineyard VRI = valley riparian					

### 3.2.3 Critical Habitat

Designated critical habitat for two federally listed plant species and three federally listed wildlife species occurs within the wildlife study area, as presented in Tables 3.2-2 (plants) and 3.2-4 (wildlife). These species are the San Joaquin Valley Orcutt grass, Hoover’s spurge, vernal pool fairy shrimp, vernal pool tadpole shrimp, and California tiger salamander.

The footprint of the UPRR Alternative Alignment would cross approximately 1.5 linear miles (17.67 acres) of combined designated critical habitat for vernal pool fairy shrimp (Critical Habitat Unit 26A) and vernal pool tadpole shrimp (Critical Habitat Unit 18A), and California tiger salamander (Critical Habitat Unit 5). This includes impacts on 17.67 acres of critical habitat for vernal pool tadpole shrimp and vernal pool fairy shrimp, and impacts on 7.63 acres of critical habitat for the California tiger salamander.

Both the BNSF Alternative Alignment and the BNSF Avoidance Alternative Alignment would not overlap or impact designated critical habitat of these three species.

The BNSF, the UPRR, and the BNSF Avoidance alternative alignment footprints would not impact designated critical habitat for San Joaquin Valley Orcutt grass or Hoover’s spurge.

Species recovery areas are identified for both upland and vernal pool listed species within the San Joaquin Valley in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998), and *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005). These plans identify core, satellite, and linkage recovery areas for upland species, and recovery areas for vernal pool species (Figure 3.2-2). Table 3.2-6 provides details on those recovery areas that may be affected by each alignment.

**Table 3.2-6**

Recovery Areas in the Project Footprints of the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Recovery Area	Specific Area	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment
San Joaquin Upland Species Linkage Areas	Highway 43	✓	--	✓
	Garces Highway	✓	--	✓
	Poso Creek	✓	✓	✓
	Kern River Alluvial Fan Element	✓	✓	✓
San Joaquin Upland Species Satellite Areas	Southwestern Tulare County (Pixley/Allensworth)	✓	--	✓
	Metropolitan Bakersfield	✓	✓	✓
Vernal Pool Recovery Areas	Cross Creek Core Area	--	✓	--

The *Recovery Plan for Upland Species of the San Joaquin Valley, California* covers the California jewel-flower, Kern mallow, San Joaquin woolly threads, Bakersfield cactus, Fresno kangaroo rat, Tipton kangaroo rat, blunt-nosed leopard lizard, San Joaquin kit fox, and Nelson's antelope squirrel. Satellite and core recovery areas were developed and identified specifically for the San Joaquin kit fox in both the *Recovery Plan for Upland Species of the San Joaquin Valley, California* and the *San Joaquin Kit Fox (Vulpes macrotis mutica) 5-Year Review: Summary and Evaluation* (USFWS 2010b).

While a full discussion of the disparate recovery actions is outside the scope of this document, Figure 3.2-2 presents an overview of areas identified as important to species recovery within the project vicinity. The BNSF Alternative Alignment and the BNSF Avoidance Alternative Alignment could infringe upon four linkage and two satellite upland recovery areas, while the UPRR Alternative Alignment could infringe upon two linkage areas and one satellite upland recovery area.

The *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* covers San Joaquin Orcutt grass, Hoover's spurge, vernal pool fairy shrimp and vernal pool tadpole shrimp. The UPRR Alternative Alignment would affect 17.67 acres of the Cross Creek vernal pool core recovery area for vernal pool tadpole shrimp and vernal pool fairy shrimp. The BNSF Alternative Alignment and the BNSF Avoidance Alternative Alignment would not affect vernal pool core recovery areas.

Recovery areas for the valley elderberry longhorn beetle are presented in the *Valley Elderberry Longhorn Beetle Recovery Plan* (USFWS 1984). The BNSF, the UPRR, and the BNSF Avoidance alignments will not affect identified valley elderberry longhorn beetle recovery areas.

Recovery areas have not been identified for Swainson's hawk, white-tailed kite, mountain plover, or the Central California population of California tiger salamander.

### 3.2.4 Movement Corridors

Wildlife movement corridors may or may not provide appropriate habitat for wildlife residence, but do provide appropriate habitat for wildlife foraging and movement. They are important to species survival in that they connect isolated populations and allow for interbreeding, dispersal, and retreat/refugia. Previous studies (Penrod et al. 2001, Penrod et al. 2003, ESRP 2009) identified several regional wildlife movement corridors that intersect the project footprint (Figure 3.2-2).

The BNSF, UPRR, and BNSF Avoidance alternative alignments intersect six general wildlife linkages, of seven within the project vicinity (Penrod et al. 2001). Furthermore, the linkage recovery areas identified in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* described above also provide high-priority wildlife movement areas for the Fresno kangaroo rat, Tipton kangaroo rat, blunt-nosed leopard lizard, San Joaquin kit fox, and Nelson's antelope squirrel. Table 3.2-7 provides a comparison of general movement corridors by alignment.

**Table 3.2-7**

Movement Corridors in the Project Footprints of the BNSF, UPRR, and BNSF Avoidance Alternative Alignments

Movement Corridor Type	Specific Linkages	BNSF Alternative Alignment	UPRR Alternative Alignment	BNSF Avoidance Alternative Alignment
General Wildlife Linkages	Kings River	✓	✓	✓
	St. John's River–Cross Creek	✓	✓	✓
	Highway 43–Garces Highway	✓	--	✓
	Tule River	--	✓	--
	Deer Creek–Sand Ridge	✓	✓	✓
	Poso Creek	✓	✓	✓
	Kern River	✓	✓	✓

# **Chapter 4**

## **Discussion**



## 4.0 Discussion

This chapter presents a comparison of the environmental resource impacts on the BNSF, UPRR, and BNSF Avoidance alternative alignments. Sensitive aquatic resources are discussed based on low, low-medium, medium, medium-high, and high functions and services values. Sensitive species are also discussed.

### 4.1 Estimates of Special Aquatic Sites

The BNSF, UPRR, and BNSF Avoidance alternative alignments contain 24.06, 21.75, and 30.14 acres of potential SARs, respectively. The BNSF Avoidance Alternative Alignment contained the greatest area of canal/ditch, retention/detention basin, and riparian SAR types. The BNSF Alignment contained the least area of canal/ditch, retention/detention basin, and riverine SAR types. The BNSF Alignment and the BNSF Avoidance Alternative Alignment contained equal area of seasonal wetland SARs. The potential vernal pool area was 10.43 acres in the BNSF Alignment, 1.49 acres in the BNSF Avoidance Alternative Alignment and 1.24 acres in the UPRR Alignment.

#### 4.1.1 Function and Services Comparison

Within the BNSF Alignment, 61 SAR features are likely to exhibit low functions and services, 3 features are likely to exhibit low/medium functions and services, 18 features are likely to exhibit medium functions and services, and 6 features are likely to exhibit high functions and services.

Within the UPRR Alignment, 80 SAR features are likely to exhibit low functions and services, 3 features are likely to exhibit low/medium functions and services, 16 features are likely to exhibit medium functions and services, and 4 features are likely to exhibit high functions and services.

Within the BNSF Avoidance Alternative Alignment, 82 SAR features are likely to exhibit low functions and services, 3 features are likely to exhibit low/medium functions and services, 19 features are likely to exhibit medium functions and services, and no features are likely to exhibit high functions and services.

The BNSF Alternative Alignment has 61 low functions and services features totaling 11.83 acres, the UPRR Alternative Alignment has 80 features totaling 18.61 acres, and the BNSF Avoidance Alternative Alignment includes 82 low features totaling 19.88 acres. All three alternative alignments have three low to medium value features, totaling 0.30 acre in the BNSF Alternative Alignment, 0.38 acre in the UPRR Alternative Alignment, and 1.22 acres in the BNSF Avoidance Alternative Alignment (Table 3.1-2). The UPRR alignment has 16 medium value features, totaling 1.2 acres. The BNSF Alternative Alignment has 18 medium features totaling 2.63 acres. The BNSF Avoidance Alternative Alignment has 19 medium features totaling 9.04 acres. There are no medium to high value features in any of the three alternative alignments. There are no high value features in the BNSF Avoidance Alternative Alignment; however, there are four features totaling 1.56 acres in the UPRR alignment and six features totaling 9.30 acres in the BNSF Alternative Alignment that have high value. ***Low Functions and Services:***

The BNSF Avoidance Alternative Alignment has a greater number and area of features with low functions and services than the BNSF Alternative Alignment and UPRR Alternative Alignment. The low-scoring canal/ditch and retention/detention basin SAR features are manmade and designed to transport or store water for irrigation and drinking water purposes. They are not designed to provide flood control, to improve water quality, or to support wildlife and plant habitat; therefore, their value is low. The low-scoring riparian areas are very small (few trees) and regionally patchy. Therefore, these features are limited in terms of value. The low-value riverine areas are heavily channelized and lack natural vegetation, limiting their functions and services values.

**Low to Medium Functions and Services:** The BNSF and UPRR alternative alignments contain the same number and similar area of low to medium SAR features; however, the BNSF Avoidance Alternative alignment contains greater area of low to medium SAR features. These include riparian areas with non-contiguous or reduced tree cover and moderately channelized riverine features.

**Medium Functions and Services:** The BNSF Avoidance Alternative Alignment contains the greatest number and area of features with medium functions and services, and the UPRR Alternative Alignment the lowest number of features and least area. These include riparian, riverine, seasonal wetland and vernal pool SAR types.

Medium value riverine and riparian areas along the BNSF, UPRR, and BNSF Avoidance alternative alignments were associated primarily with the Kings River. Riparian SARs with medium value had tree cover that was either moderately reduced or not contiguous. Riverine SARs with medium value had moderate flow, and were partly, but not entirely, channelized. They exhibit some features associated with natural channels, such as meanders and in-stream vegetation.

All nine seasonal wetland SAR features occurring within the three alternative alignments had medium value. The two seasonal wetland features present in the BNSF Avoidance Alternative Alignment are common to the three SAR seasonal wetland features present within the BNSF Alternative Alignment. These three features occurred in between an agricultural field and the current BNSF railroad tracks, which marginalizes their values. However, since this feature type is regionally rare, the lowest value possible is medium. All four seasonal wetland SAR features in the UPRR Alternative Alignment occurred interspersed within a riparian area of Cole Slough. These SAR features are hydrologically connected with the river, making them similar in terms of hydrology and water quality to the riverine SAR. All seasonal wetlands automatically received a medium habitat integrity value due to their rare regional occurrence. Two vernal pool SAR features with medium functions and services occur within the BNSF Alternative Alignment. One of those features (feature number 155) also occurs in the BNSF Avoidance Alternative Alignment (Figure 4.1-1). One vernal pool (feature number 83), which is 0.06 acre in size, is located near the town of Corcoran. It is too small and isolated to support high-value functions and services. The other vernal pool SAR feature (feature number 155) covers 1.12 acres further south along the BNSF Alternative Alignment. State Highway 43 occurs along the eastern edge of the vernal pool feature, which occurs in an area that is actively cultivated for row crops. The lack of natural habitat reduces the vernal pool SAR functions and services value to medium.

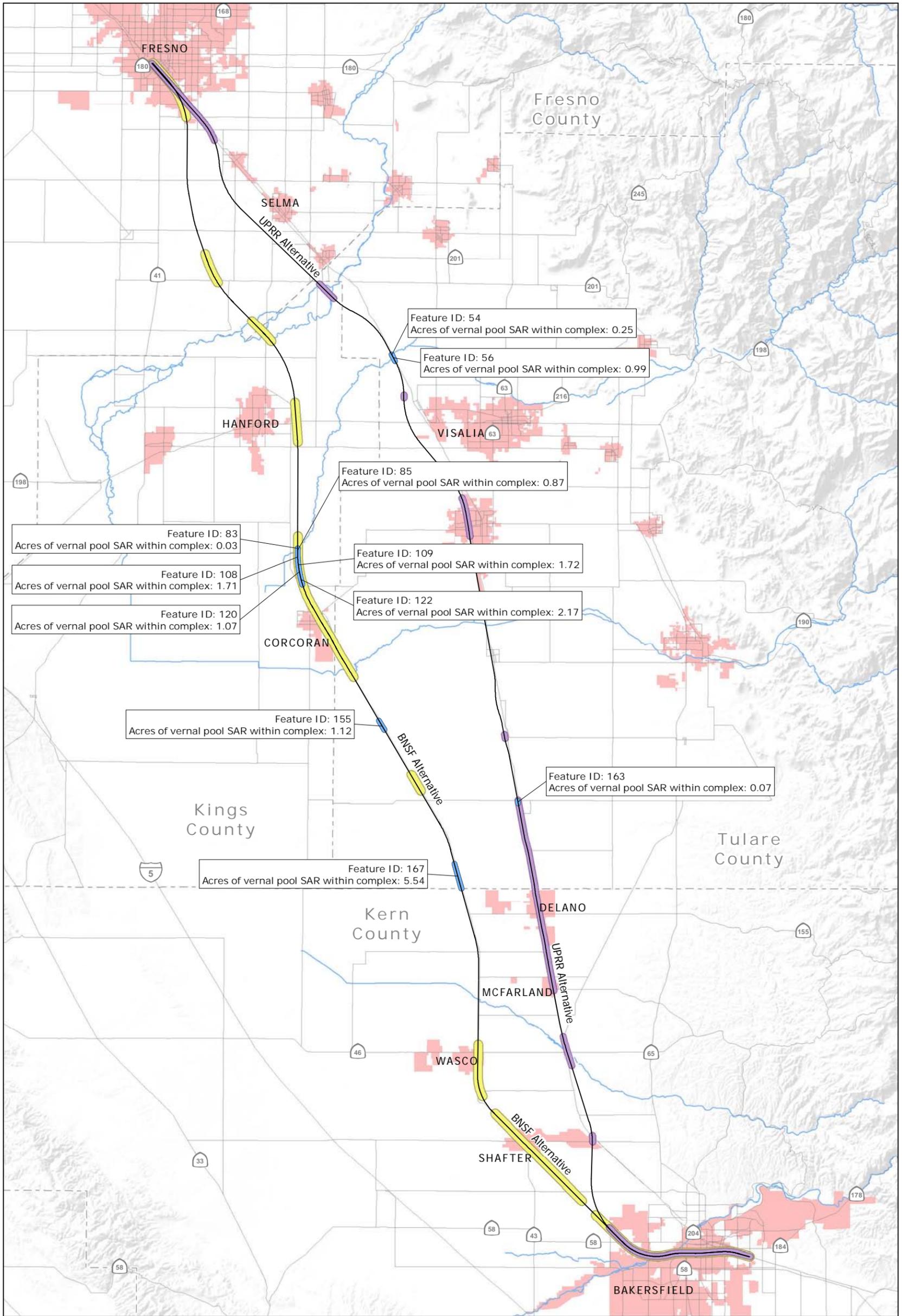
The vernal pool SAR feature (feature AB\_28) that occurs within the BNSF Avoidance Alignment Alternative is 0.37 acre in size. Based on aerial photography this feature is located within an area under agricultural production. In addition, at least two roadways were identified intersecting this vernal pool SAR feature, as well as additional tire tracks. The proximity of this vernal pool SAR feature to disturbed lands reduces the functions and services value to medium.

**Medium to High Functions and Services:** No features within any of the three alternative alignments featured medium to high functions and services values.

**High Functions and Services:** No riparian features within the BNSF Alternative Alignment and BNSF Avoidance Alternative Alignment were assigned high functions and services. Two riparian features within the UPRR Alternative Alignment were assigned high functions and services values. These features occur along Cole Slough and have well-developed and contiguous vegetation.

The BNSF Alternative Alignment has six vernal pool SAR features with high functions and services values. Five of these vernal pools are located near the town of Corcoran in a large complex surrounded by Cross Creek, canals, and ditches. These vernal pools vary in size from 0.43 to 1.08

acres. Due to their large size and their hydrological connectivity to multiple other SAR features, these vernal pools received high functions and services values for all three criteria.



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Source: URS, 2010

\*This map shows vernal pool complexes as provided by Holland (2009). Vernal pool SAR area indicated on this map and in the document were derived through application of an empirically derived coefficient (0.22) to the total area of Holland vernal pool complexes.

November 29, 2010

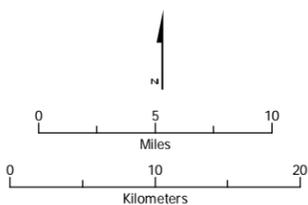


Figure 4.1-1  
Vernal pool special aquatic resources (SAR) and elevated track areas  
within the alternative alignment areas

Vernal pool feature number 167 is part of a large vernal pool complex, much of which occurs outside of the BNSF Alternative Alignment. The portion of the vernal pool complex within the BNSF Alternative Alignment has approximately 5.54 acres of vernal pools. Due to the large contiguous size of the vernal pool complex, it was assigned high values for hydrology, water quality, and habitat integrity, as it is expected to transport and filter water as well as provide habitat for sensitive species.

Two of the vernal pools contain SARs with high functions and services values in the UPRR Alternative Alignment; SAR features 54 and 56 occupy 0.25 and 0.99 acres, respectively. They occur near Cross Creek, which is a meandering channel with limited riparian vegetation. While these areas do not show the typical pockmarks associated with vernal pool habitat on the aerial photograph, they also lack the aerial photograph appearance associated with agricultural production. Due to its proximity to a functioning riverine channel, and the lack of agricultural production, these vernal pool SARs were assigned high functions and services values.

No SAR features within the BNSF Avoidance Alternative Alignment had high functions and services values.

## 4.2 Special-Status Species

This section presents a discussion of impacts on special-status species on the BNSF, UPRR, and BNSF Avoidance alternative alignments. The discussion covers special-status plant species, special-status wildlife species, critical habitat, recovery plan areas, and wildlife movement corridors.

### 4.2.1 Special-Status Plant Species

Impacts on special-status plant species are discussed in terms of the number of plant species and the amount of habitat affected for special-status plants.

Given the differences in impacts on individual plant species between the alternative alignments, a comparison of potential impacts on plants is more informative on a habitat basis. The BNSF Alternative Alignment and the BNSF Avoidance Alternative Alignment, but not the UPRR Alternative Alignment, may impact the Kern mallow. The UPRR Alternative Alignment, but not the BNSF Alternative Alignment or the BNSF Avoidance Alternative Alignment, may impact the San Joaquin adobe sunburst, San Joaquin Orcutt grass, and Hoover's spurge. All three alignments may impact San Joaquin woolly threads, Bakersfield cactus, and California jewel-flower. However, when impacts are evaluated either as total impacts on upland versus wetland habitat for special-status plant species, the BNSF Avoidance Alternative Alignment presents more impacts on upland habitat for special-status plants. The BNSF Alternative Alignment presents the second most impacts on special-status plant upland habitat. The UPRR Alternative Alignment presents the least impacts on special-status plant upland habitat, but presents more impacts on vernal pools that may provide wetland habitat for special-status plants. The BNSF Alternative Alignment and the BNSF Avoidance Alternative Alignment do not present impacts on special-status plant aquatic habitat because these species are not known to occur in the vicinity of these alternative alignments.

### 4.2.2 Special-Status Wildlife

The UPRR Alternative Alignment would have impacts on the following wildlife species: vernal pool fairy shrimp, vernal pool tadpole shrimp, valley elderberry longhorn beetle, California tiger salamander, white-tailed kite, Swainson's hawk, Nelson's Antelope squirrel, Fresno kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox. All species in the UPRR Alternative Alignment are also expected to occur in the BNSF Alternative Alignment and the BNSF Avoidance Alternative

Alignment. Additionally, the BNSF Alternative Alignment and BNSF Avoidance Alternative Alignment may affect two wildlife species (mountain plover and blunt-nosed leopard lizard) that are not present in the UPRR Alternative Alignment.

Based on the availability of potentially suitable wildlife habitat types, the BNSF Alternative Alignment would incur greater impacts on the habitats of vernal pool branchiopods, the California tiger salamander and blunt-nosed leopard lizard (Table 3.2-5). The UPRR Alternative Alignment would incur greater impacts on the habitats of the valley elderberry longhorn beetle and Fresno kangaroo rat. The BNSF Avoidance Alternative Alignment would incur greater impacts on the habitats of mountain plover, white-tailed kite, Swainson's hawk, Nelson's Antelope squirrel, Tipton kangaroo rat, and San Joaquin kit fox.

Impacts on potential habitat for the Fresno kangaroo rat are 0.52 acre (BNSF and BNSF Avoidance) and 4.71 acres (UPRR). This species has not been identified since 1993 and may be extirpated.

At the level of detail possible using this analysis, the three alternative alignments would have roughly similar impacts on habitats of the white-tailed kite, Swainson's hawk, and San Joaquin kit fox, although the actual impact acreages vary. This broadscale analysis is primarily based on broad CWHR habitat classifications. Lands classified as cropland or irrigated field crops were included as potential habitat for certain species (San Joaquin kit fox and all avian species). As discussed in Section 2.2, Methods for Special-Status Species, these habitat types may or may not actually provide suitable habitat for these species, as habitat value varies based on crop type and agricultural practices. Actual field surveys of crop types may change the impact numbers for these species along either alignment.

### 4.2.3 Critical Habitat

Of the three alternative alignments, only the UPRR Alternative Alignment would result in impacts to designated critical habitat. The UPRR Alternative Alignment would cross approximately 1.5 linear miles (17.67 acres) of combined designated critical habitat for vernal pool fairy shrimp, vernal pool tadpole shrimp, and the California tiger salamander. Neither the BNSF Alternative Alignment nor the BNSF Avoidance Alternative Alignment would affect designated critical habitat for any species.

### 4.2.4 Recovery Plan Areas

The BNSF and the BNSF Avoidance alternative alignments would result in greater impacts on recovery areas than the UPRR Alternative Alignment. Both alignments would affect two linkage areas (Highway 43 and Garces Highway), and one satellite area (Southwestern Tulare County) that would not be affected by the UPRR Alternative Alignment. The UPRR Alternative Alignment would affect only one vernal pool core area (Cross Creek), which would not be affected by the BNSF Alternative Alignment or the BNSF Avoidance Alternative Alignment. All three alternative alignments would equally affect the Poso Creek and Kern River Alluvial Fan Element linkages and the Metropolitan Bakersfield satellite area.

### 4.2.5 Wildlife Movement Corridors

Impacts to the seven wildlife movement corridors within the project vicinity are calculated qualitatively rather than quantitatively, as these linear features will lose wildlife value if bisected by a project that limits wildlife movement. All three alternatives would cross six of the seven wildlife movement corridors. Both the BNSF Alternative Alignment and the BNSF Avoidance Alternative Alignment would avoid the Tule River wildlife movement corridor, while the UPRR Alternative Alignment would avoid the Highway 43–Garces Highway wildlife movement corridor.

# **Chapter 5**

## **Modification to Federally Authorized Projects**



## 5.0 Modification to Federally Authorized Projects

### 5.1 BNSF Alternative Alignment

***Kings River Complex (Cole Slough, Dutch John Cut, and Kings River):*** The BNSF Alternative Alignment would cross natural rivers and channels with flood protection levee systems. Cole Slough, Dutch John Cut, and Kings River (collectively referred to as the Kings River Complex) are meandering channels contained between vegetated levees in Fresno and Kings counties. The BNSF Alternative Alignment would cross the Kings River Complex approximately 3.4 miles east of the town of Layton and the existing BNSF rail line. The levees at the Kings River Complex are federal project levees under the jurisdiction of the USACE and Central Valley Flood Protection Board (CVFPB) (formally known as the Reclamation Board), and are maintained by the Kings River Conservation District, which operates floodplain management facilities under a USACE agreement.

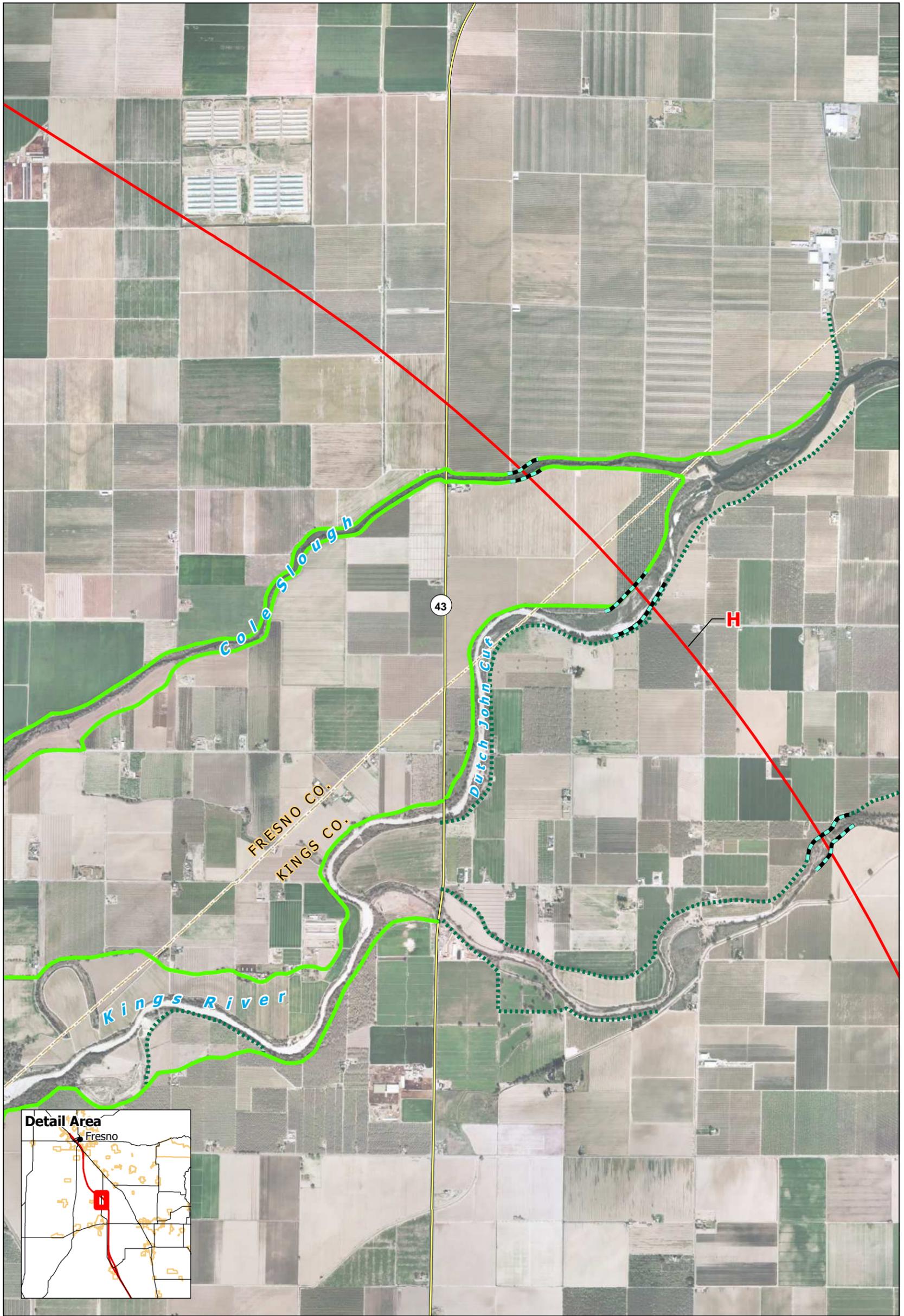
Only the levees on Cole Slough and the northern levee on Dutch John Cut are USACE jurisdictional levees (see Figure 5.1-1). The other levees at this crossing are non-jurisdictional levees.

### 5.2 Other levees potentially crossed by the HST, like those on Cross Creek, are state, local or private levee systems. UPRR Alternative Alignment

The UPRR Alternative Alignment does not cross any federal project levees.

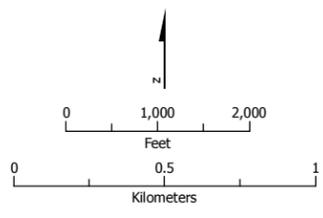
### 5.3 BNSF Avoidance Alternative Alignment

The BNSF Avoidance Alternative Alignment would cross the same linear aquatic features and levees as those discussed in Section 5.1, and would be subject to the same design constraints and regulatory compliance. This alternative would not cross any additional federal project levees.



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 Source: Imagery - Bing Maps, 2010

November, 2010



- Flood Control Project Levee
- - - Local Flood Control Feature
- Proposed HST Alignment
- CVFPB Designated Floodway Boundary

**Figure 5.1-1**  
 Cole Slough and Kings River Project Levees,  
 CVFPB Designated Floodways, and  
 Local Flood Control Features.

# **Chapter 6**

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**Appendix E-1**  
**Maps of Potential Waters on the BNSF,**  
**UPRR, and BNSF Avoidance Alternative**  
**Alignments**



**Appendix E-2**  
**Maps of Potential Occurrences of Sensitive**  
**Species on the BNSF, UPRR, and BNSF**  
**Avoidance Alternative Alignments**

