12 Geology and Soils

This chapter describes the environmental and regulatory settings of geology and soils, including mineral resources, in the area of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project) and the environmental consequences and mitigation measures as they pertain to the implementation of Project alternatives. This discussion focuses on the Great Valley geomorphic province of California where components of the Project alternatives are located (California Geological Survey [CGS] 2002).

12.1 Environmental Setting/Affected Environment

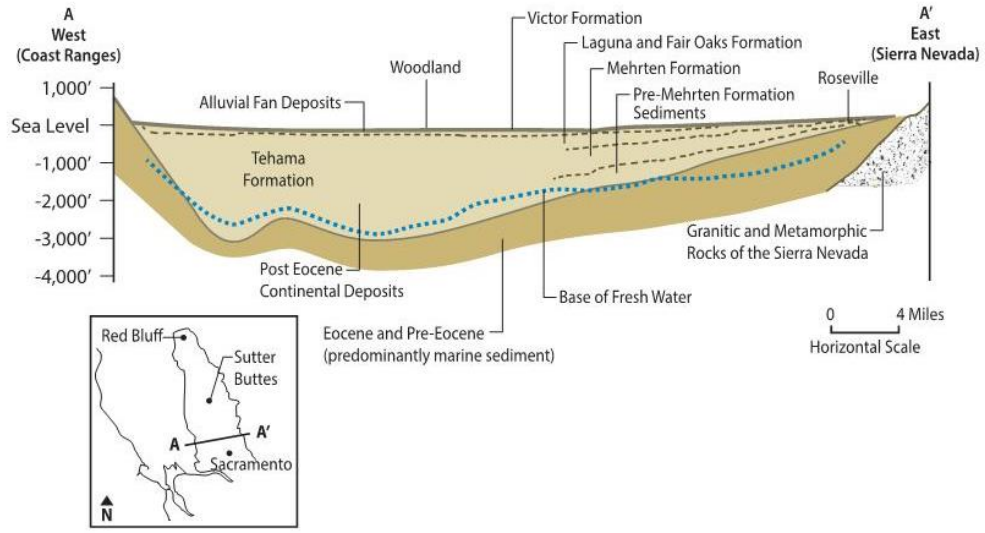
This section describes the environmental setting and affected environment related to geology, soils, mineral resources, and geologic hazards, including earthquakes and landslides.

12.1.1 Regional Geology and Topography

The area of analysis for geology and soils consists of the Project area, where project actions would occur, located within the Yolo Bypass. The majority of the Yolo Bypass is in Yolo County, with the remainder of the bypass in Sutter and Solano counties. Project actions would occur in Yolo and Sutter counties. The southern point of Yolo Bypass is in Solano County; however, no project actions or soil-related impacts, such as increased sediment deposition, would occur there. Therefore, there would be no impacts to geology and soils in Solano County, so it is not discussed further in this section. Yolo and Sutter counties are in the southern part of the Sacramento Valley Groundwater Basin. The Sacramento Valley Groundwater Basin is bordered by the Coast Range to the west, the Sierra Nevada to the east, and the San Joaquin Valley Groundwater Basin to the south. The Yolo Bypass is bounded to the north and east by the natural levees of the Sacramento River, to the west by the coalesced alluvial fans of Putah Creek and Cache Creek, and to the south by the tidal marshes of the Sacramento-San Joaquin Delta (Delta).

Many geologically different areas, called geomorphic provinces, have been created by geologic processes active in California for millions of years. The Project area is in Great Valley Province. The Great Valley Province is an alluvial plain in which sediments have been deposited almost continuously since approximately 160 million years ago (CGS 2002). The alluvial basin deposits are further described as Holocene basin deposits and Holocene alluvium (CGS 2011).

The Great Valley Province primarily consists of gently sloping to level alluvial plains. Geologic units in the Great Valley Province generally consist of Quaternary alluvium and the Quaternary Modesto and Riverbank formations, both of which consist of somewhat older alluvium and make up the alluvial fan deposits. As presented in Figure 12-1, the Tehama Formation (non-marine sandstone, siltstone, and volcaniclastic rocks) underlies the Quaternary alluvial fan deposits (Yolo County 2012).



Source: California Department of Water Resources (DWR) 1978

Figure 12-1. Geologic Cross-Section of the Lower Sacramento Valley Groundwater Basin

12.1.2 Geomorphology

The portion of the Sacramento River that is within the Project area is completely constrained by levees that are typically located within 100 feet or less of the river channel (HDR, Inc. 2017a). At Fremont Weir, the Sacramento River is relatively stable and exhibits typical river bend behavior even though natural bank migration is occurring, upwards of three feet per year over the last few decades, mainly to the north (HDR, Inc. 2017a). The prominent meander on the western end of the Fremont Weir (the western meander) has exhibited similar behavior since 1908, with the outside concave bank migrating to the north and the convex inside bank building a point bar, with trending movements to the east. Downstream of the western meander, along the Fremont Weir, the river has been relatively straight since the 1950s. Immediately downstream of the weir, the river, clinging closely to the right bank levee, has experienced an increase in width over time. Near the eastern end of Fremont Weir, the river straightens and has bank migration trends that imply the occurrence of both bank erosion and bank building (HDR, Inc. 2017a). Near the Project area, small scale lateral migrations have occurred, including river channel widening, between the upstream and downstream ends of Fremont Weir. These trends imply that the river might move toward or away from a fixed inlet structure added by Project alternatives (HDR, Inc. 2017a).

Historically, prior to the construction of weirs and levees, the Yolo Bypass area was part of the Yolo Basin, a natural depression on the Sacramento Valley floor that formed after the last Ice Age. Until the construction of the levees began (1917) and the weirs were completed (Sacramento Weir in 1917 and Fremont Weir in 1924), the basin trough formed vast wetlands (seasonal wetlands to the north, freshwater tidal marshes and slough channels to the south) and did not function as a true floodplain that directly interacted with the Sacramento River as it rose and fell with the winter and spring (California Department of Fish and Game 2008). During the winter months in the 1800s, the Yolo Basin would fill with surrounding river water and become a marsh ecosystem that could last more than 100 days, limiting travel between cities. In 1911,

Congress approved the Sacramento River Flood Control Project to divert the water and avoid travel limitations. Under the Sacramento River Flood Control Project, the natural basin was converted to a weir-regulated system called the Yolo Bypass. The bypass is surrounded completely on the east and partially on the west by United States Army Corps of Engineers levees.

12.1.3 Soils

The shrinking and swelling of soils has the potential to cause damage to crops and infrastructure such as buildings, roads, and bridges. When soils swell or expand, they exert a force and put pressure on the surrounding area, which could cause structural damage such as lifting or cracking. Typically, swelling does not negatively affect crops. When soils shrink, the particles shift, which can cause an uneven settling of the sediment under the foundation. Shrinking can pull the roots of crop plants apart, allow contaminants to penetrate deeper into the soil, and potentially result in structural failure of infrastructure. The shrink-swell potential of soils is dependent on the change in the length of an unconfined clump of soil as its moisture content is either decreased or increased. This measure is a soil's linear extensibility, and is often expressed as a percent. Linear extensibility and shrink-swell potential are closely correlated with the type and amount of clay present in the soil. The highest shrink-swell potential occurs in soils with a high ratio (two to one) of lattice clays; illitic and kaolinitic clays have intermediate and low potentials, respectively. If the linear extensibility of a soil is three to 30 percent, the shrink-swell potential is rated moderate to very high and can cause damage to infrastructure (Natural Resources Conservation Service [NRCS] Undated).

As shown in Figure 12-2, the eastern part of Yolo County where the Project is located is mainly composed of silt loam, loam, and silty clay loam. These soils are characterized as having low erodibility, low to high shrink-swell potentials, and low to high linear extensibility percentages (NRCS 2007a, 2007b, and 2007c), as shown in Figure 12-3.

As shown in Figure 12-2, the small portion of the Project area that is within Sutter County is along the Sacramento River near the county line. Soils in this area are a mixture of silt loam, loamy sand, and fine sandy loam (NRCS 2009b). These soils are typically characterized as having low linear extensibility and shrink-swell potential and mid-range to high erodibility (NRCS 2009a, 2009c).

Soils near Fremont Weir have a low shrink-swell potential and consequently a low risk of causing damage to infrastructure. Soils near Agricultural Road Crossing 1 have a moderate to high shrink-swell potential, which could potentially damage crops or infrastructure.

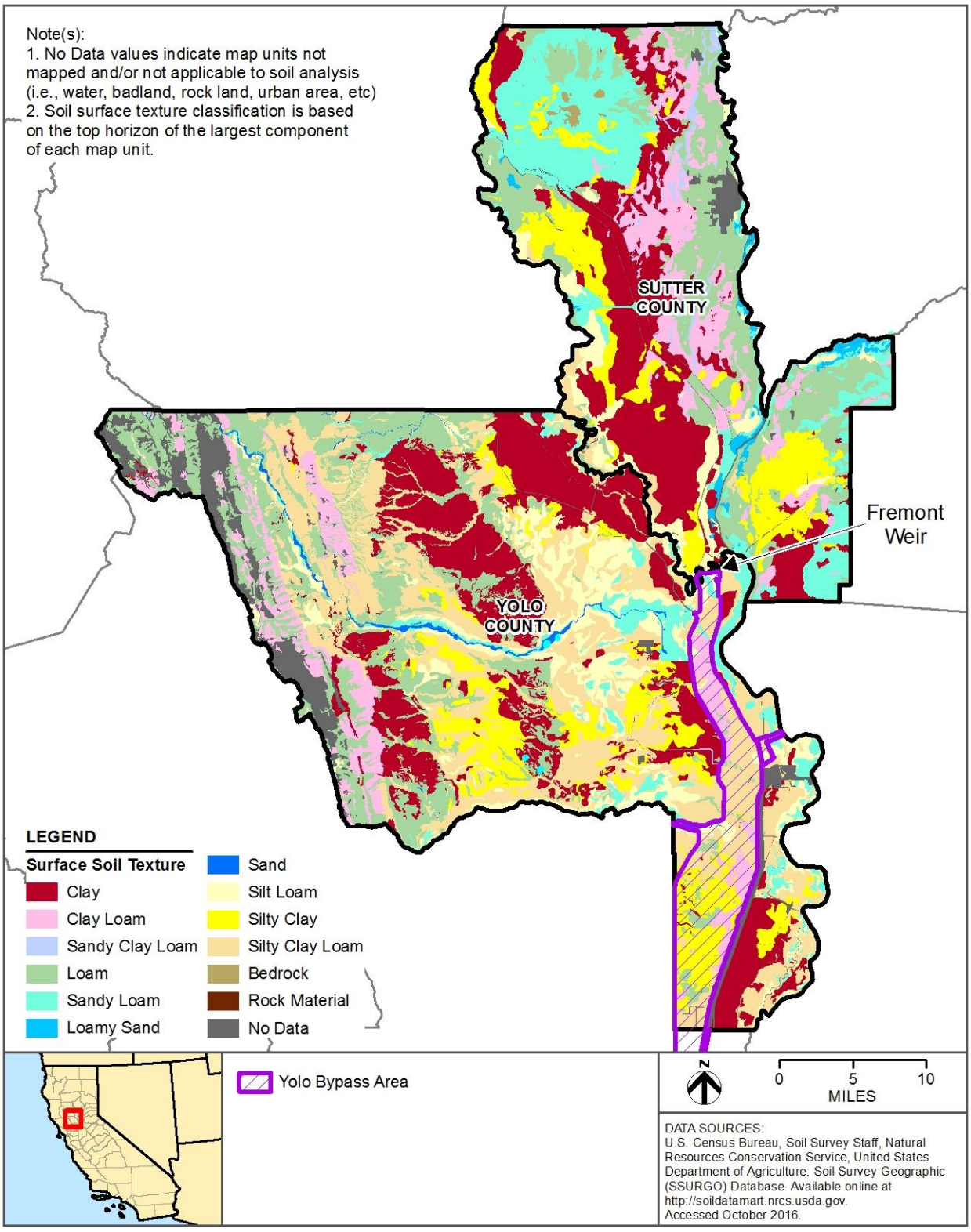


Figure 12-2. Surface Soil Texture Map for Yolo and Sutter Counties

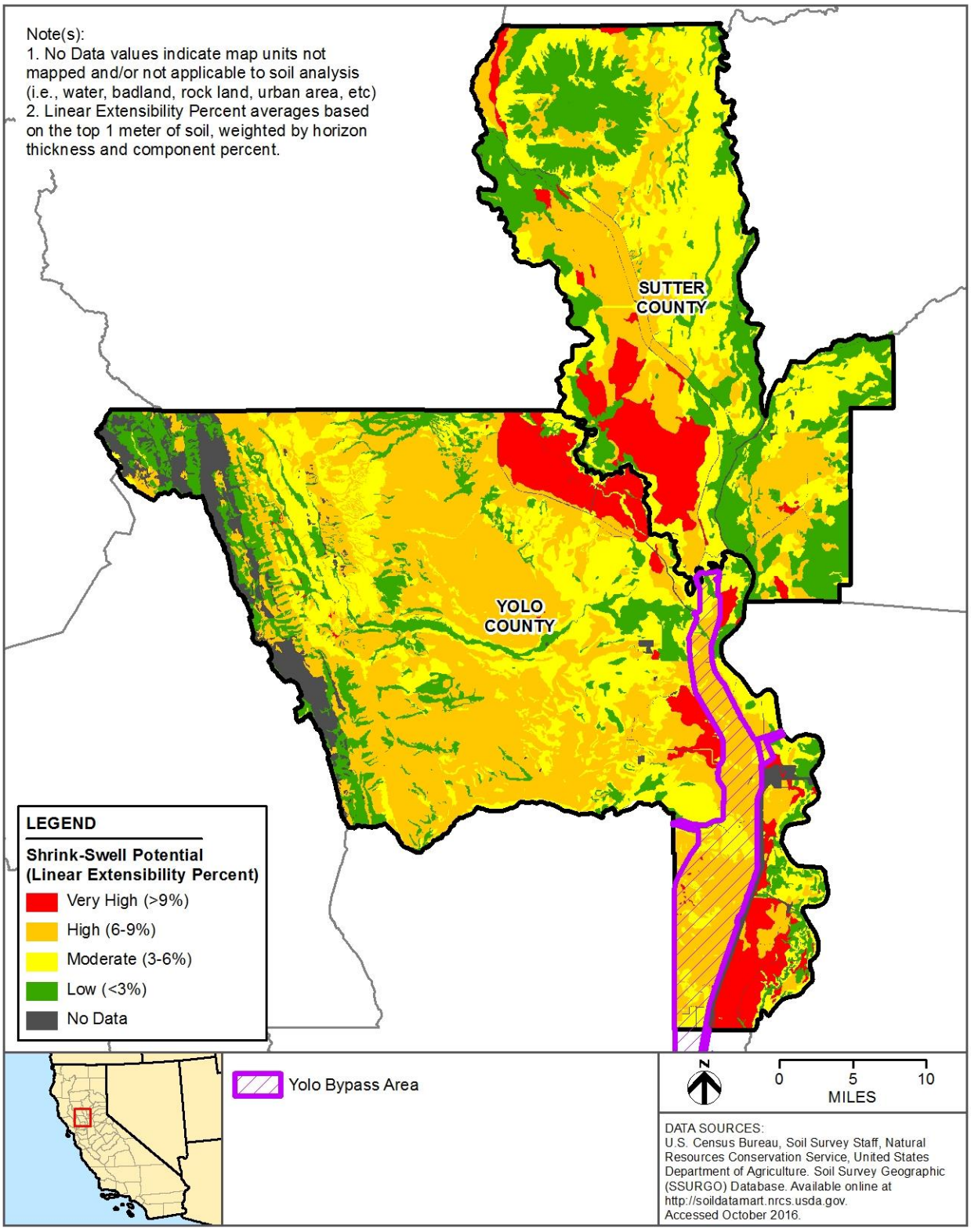


Figure 12-3. Shrink-Swell Potential of Soils in Yolo and Sutter Counties

12.1.4 Geologic Hazards

The geologic hazards discussed in this section include regional seismic activity and potential for surface fault rupture, seismic shaking, liquefaction, landslides, and land subsidence. The Project area is not located in an Alquist-Priolo Earthquake Fault Zone, no active faults have been identified in the area, and the area experiences less frequent low levels of seismic activity compared to many areas in California; therefore, the risk for surface fault rupture in the Project area is low (CGS 2015, 2010, and 2008a). As shown in Figure 12-4, the active fault in an Alquist-Priolo Earthquake Fault Zone closest to the Project area is the Hunting Creek fault just outside of the northwest portion of Yolo County, and the closest inactive fault is the Dunnigan Hills fault, centrally located in Yolo County (CGS 2010).

Strong, sustained seismic shaking (ground shaking) is the main cause of earthquake damage. Ground shaking can cause soils and unconsolidated sediments to compact and settle. When compacted, water stored in the pores of these soils can also be forced to the surface, causing soil deformation called liquefaction. Liquefaction can cause minor to major damage to infrastructure (e.g., foundation failure). The *Ground Motion Interpolator* provided by the CGS (2008b) shows a low ground shaking hazard in the Project area. There are no site-specific data or surveys to determine the liquefaction hazard in the Project area. However, because the water table near Fremont Weir is high and the soils are relatively deep, the risk of liquefaction during an earthquake near the Project area is assumed to be moderate (DWR 2017). The potential for seismic shaking in the Project area is low to minimal because there are no nearby active fault lines (as shown in Figure 12-4). The potential for liquefaction is greater when there is a seismic event. Therefore, it is assumed that because the potential for seismic events is low, there is little to no risk of liquefaction.

Landslides are characterized by the down-slope movement of soil and rock under the direct influence of gravity. Landslides can damage structures and buildings, including levees. Typically, landslides occur on steep slopes, when the slope conditions change from stable to unstable. However, landslides could also occur on low-angle slopes. The lands within the Project area have relatively low slopes associated with the topography of a valley. However, low-angle landslides could affect the nearby levees, depending on the levees' construction. Segment 171 of the Yolo Bypass East Levee was founded upon some of the weaker foundation soils in the surrounding area and has the potential to experience geologic hazards associated with erosion and stability (HDR, Inc. 2017c). The relative risk for landslides in the Project Area is very low given the low sloping topography of the area. Project actions should not disturb soils that serve as the foundation of the levee. Therefore, there is little to no risk of landslides in the Project area.

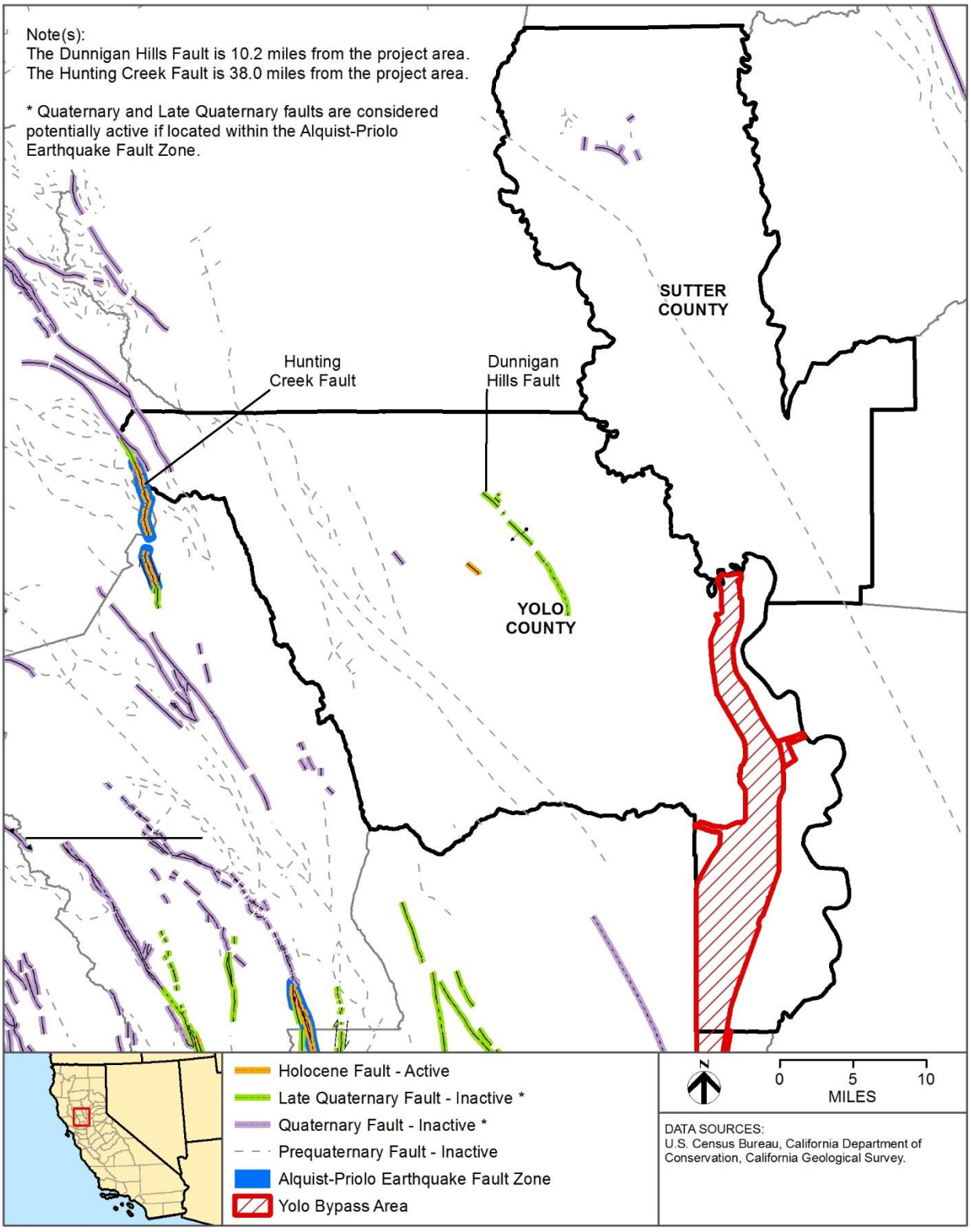


Figure 12-4. Fault Locations in Yolo, Sutter, and Surrounding Counties

Land subsidence is the sudden or gradual sinking of the earth's surface resulting from subsurface movements. Land subsidence can be caused by several events or conditions, including aquifer-system compaction due to the lowering of groundwater levels by sustained groundwater overdraft, hydrocompaction of moisture-deficient deposits above the water table, fluid withdrawal from oil and gas fields, and crustal tectonic activity during recent geologic time. In Yolo and Sutter counties, land subsidence is often attributed to the significant withdrawal of groundwater. Land subsidence and groundwater monitoring stations in Yolo and Sutter counties (Station Number 11N01E24Q008M, 09N03E08C004M, and 11N04E04N005M) have recorded land subsidence from 0.032 to 1.1 feet since the late 1900s (DWR 2016a and 2016b). For a more detailed discussion on land subsidence in the Project area, see Section 7.1.1.3 *Groundwater-Related Land Subsidence* of Chapter 7, *Groundwater*.

12.1.5 Mineral Resources

The Surface Mining and Reclamation Act (SMARA) regulations, Article 2, describe areas designated as having regional significance due to the presence of mineral resources. There are no areas within the Project area that are currently mined for aggregate mineral resources or that have been determined to contain minerals of regional, statewide, or multi-community significance (California State Mining and Geology Board 2012).

12.2 Regulatory Setting

Several Federal, State of California (State), and local regulations are applicable to geology, seismicity, and soils. These include California's Alquist-Priolo Earthquake Fault Zoning Act and Seismic Hazards Mapping Act as well as county regulations that address geologic hazards related to construction standards, structural integrity, and grading and erosion during construction. The following sections summarize applicable plans, policies, and regulations related to geology, seismicity, and soils in the Project area.

12.2.1 Federal Plans, Policies, and Regulations

Federal laws and regulations pertaining to geology, seismicity, and soils are discussed below.

12.2.1.1 Earthquake Hazard Reduction Act of 1977

The Earthquake Hazard Reduction Act of 1977 established a national goal of reducing the risks of life and property from future earthquakes in the United States through the establishment and maintenance of an earthquake program, including prediction and hazard assessment research, seismic monitoring, and information dissemination. The act established the Earthquake Hazard Reduction Program to promote the adoption of earthquake hazard reduction measures by Federal, State, and local governments. Section 8 of the act calls for the adoption of standards for assessing and enhancing the seismic safety of buildings constructed for or leased by the Federal government (42 United States Code 7701 et. seq.).

12.2.2 State Plans, Policies, and Regulations

State laws and regulations pertaining to geology, seismicity, and soils are discussed below.

12.2.2.1 Seismic Hazards Mapping Act

The 1990 Seismic Hazards Mapping Act (California Public Resources Code [PRC] Section 2690-2699.6) was enacted to minimize loss of life and property from strong ground shaking, liquefaction, landslides, or other ground failures as a result of earthquakes. The Seismic Hazards Mapping Act requires the CGS to identify and map areas with the potential for liquefaction, landslides, or ground shaking. These maps are used by cities and counties in their land use permitting process to adequately prepare the safety element of their general plans (CGS 1991). Permits for development projects are not issued until geologic investigations have been completed and mitigation has been developed to address any seismic hazard issues.

12.2.2.2 Surface Mining and Reclamation Act of 1975

SMARA of 1975 (PRC, Division 2, Chapter 9, Section 2710 et. seq.) addresses surface mining and requires mitigation to reduce adverse impacts to public health, property, and the environment. The SMARA applies to anyone (including a government agency) that disturbs more than one acre or removes more than 1,000 cubic yards of material through surface mining activities even if activities occur on Federally managed lands (California State Mining and Geology Board 2012). Local city and county lead agencies are required to develop ordinances for permitting that provide the regulatory framework for mining and reclamation activities. The California State Mining and Geology Board reviews lead agency ordinances to ensure they comply with SMARA (California State Mining and Geology Board 2012).

12.2.2.3 California Building Code

Minimum standards for structural design and construction are outlined in the California Building Standards Code (Title 24, California Code of Regulations). The California code is based on the Uniform Building Code, which is widely used throughout the United States and has been modified for California conditions with numerous, more detailed and/or more stringent regulations.

The California Building Standards Code requires that "classification of the soil at each building site…be determined when required by the building official" and that "the classification be based on observation and any necessary test of the materials disclosed by borings or excavations." In addition, the code states that "the soil classification and design-bearing capacity shall be shown on the (building) plans, unless the foundation conforms to specified requirements." The California code provides standards for various aspects of construction, including but not limited to excavation, grading, and earthwork construction; fill placement and embankment construction; construction on expansive soils; foundation investigations; and liquefaction potential and soil strength loss.

12.2.2.4 Alquist-Priolo Earthquake Fault Zoning Act

In 1972, the Alquist-Priolo Earthquake Fault Zoning Act, originally named the Special Studies Zones Act, was enacted to mitigate the risk to life and property from surface faulting hazards during earthquakes. The act requires local agencies to regulate development and construction in earthquake fault zones.

12.2.3 Regional and Local Plans, Policies, and Regulations

Local jurisdictions typically regulate construction activities through a multi-stage permitting process that may require preparation of a site-specific geotechnical investigation. The purpose of a site-specific geotechnical investigation is to provide a geologic basis for the development of appropriate project design. Geotechnical investigations typically assess bedrock and Quaternary (recent) geology, geologic structure, soils, and previous history of excavation and fill placement. They may also address the requirements of the Alquist-Priolo Earthquake Fault Act, the Seismic Hazards Mapping Act, and/or local regulations.

12.2.3.1 Yolo County General Plan

Policies related to geologic and seismic hazards that are applicable to this project are provided in the Yolo County General Plan. The General Plan includes Goal HS-1: Geologic Hazards, the aim of which is to protect the public and reduce damage to property from earthquakes and other geologic hazards (County of Yolo 2009). The following policies support this goal:

- Policy HS-1.1: Regulate land development to avoid unreasonable exposure to geologic hazards.
- Policy HS-1.2: All development and construction proposals shall be reviewed by the county to ensure conformance to applicable building standards.
- HS-1.3: Require environmental documents prepared in connection with the California Environmental Quality Act (CEQA) to address seismic safety issues and provide adequate mitigation for existing and potential hazards identified.

12.2.3.2 Sutter County General Plan

Policies related to geologic and seismic hazards that are applicable to this project are provided in the *Sutter County General Plan*. The General Plan establishes Goal PHS-2 to minimize the risk of personal injury and property damage due to geologic and seismic hazards and adverse soil conditions (Sutter County 2011). Some of the policies that will help support this goal include:

- PHS-2.1: Review and enforce seismic and geologic safety standards and require the use of best management practices in the site design and building construction methods.
- PHS-2.2: Minimize development in areas where geologic hazards exist from landslides and erosion.
- PHS-2.3: Require the preparation of a county-approved site-specific geotechnical analysis prior to approval of development in areas where there is potential for geologic or seismic hazards and incorporate recommended features to mitigate the identified hazards.
- PHS-2.4: Promote the upgrade, retrofitting, and/or relocation of existing essential facilities that do not meet current building code standards and are within areas susceptible to seismic or geologic hazards.

12.3 Environmental Consequences

This section describes the environmental consequences associated with the Project alternatives and the No Action Alternative on geology and soils, including mineral resources. This section presents the assessment methods used to analyze the effects on geology, soils, and mineral resources, the thresholds of significance that determine the significance of effects, and the potential environmental consequences and mitigation measures as they relate to each Project alternative.

Detailed descriptions of the alternatives evaluated in this chapter are provided in Chapter 2, *Description of Alternatives*.

12.3.1 Methods for Analysis

This section describes the approach for the analysis of geology and soils, and mineral resources, in the Project area. The evaluation of impacts on geology, soils, and mineral resources considers the potential for increased sedimentation in the Yolo Bypass; induced levee instability; erosion at the Yolo Bypass east levee; and increased risk of personal injury, loss of life, and damage to property, including Project facilities, because of geologic conditions in the area. The environmental consequences of the Project alternatives were analyzed qualitatively, based on a review of the soil and geologic data presented in Section 12.2.

Impacts to geology, soils, and mineral resources are determined relative to existing conditions (for CEQA) and the No Action Alternative (for the National Environmental Policy Act [NEPA]). However, the No Action Alternative would be similar to existing conditions because geology and soils, including mineral resources, are not anticipated to experience substantive changes in the area of analysis. Therefore, the analysis compares the impacts of the action alternatives only to the impacts of the existing conditions.

12.3.2 Thresholds of Significance – CEQA

The thresholds of significance for impacts were developed consistent with the CEQA Guidelines to determine the significance of potential impacts in relation to geology, soils, and mineral resources that could result from implementation of the Project. These thresholds of significance for impacts were designed to also encompass the factors under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. Impacts related to geology and soils would be considered significant if the project would:

- Result in a substantial increase in sediment deposition
- Destabilize existing infrastructure such as levees, bridges, or other structures
- Result in substantial soil erosion
- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, based on substantial evidence of a known fault
  - Strong seismic ground shaking

  - Seismic-related ground failure, including liquefaction
  - Landslides
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse.
- Be located on expansive soil, creating substantial risk to life or property.
- Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the State.

As discussed in Sections 12.1.3 and 12.1.4, the Project area is not within range of active faults or recent seismic activity and lacks features that would contribute to liquefaction or landslides. Land subsidence, primarily due to the overdraft of groundwater, has been recorded in Yolo and Sutter counties, as discussed in Section 12.1.4; therefore, impacts regarding land subsidence in the Project area are discussed in Chapter 7, *Groundwater Resources*. As discussed in Section 12.1.5, no known mineral resources of State, regional, or local importance are present in the Project area. Sediment removal during maintenance activities would restore the Project area to design capacity and would not impact the underlying geology or soils in the Yolo Bypass. Therefore, these topics are not discussed further.

12.3.3 Effects and Mitigation Measures

This section provides an evaluation of the direct and indirect effects on geology and soils from implementing the Project alternatives. This analysis is organized by Project alternative, with specific impact topics numbered sequentially under each alternative.

12.3.3.1 No Action Alternative

Under the No Action Alternative, the Project would not be implemented, and none of the Project components would be developed. There would be no Project-related construction activities.

CEQA Conclusion

There would be **no impact** on geology and soils in the area of analysis if the Project is not implemented because there would be no construction or development.

12.3.3.2 Alternative 1: East Side Gated Notch

Alternative 1, East Side Gated Notch, would allow increased flow from the Sacramento River to enter the Yolo Bypass through a gated notch on the east side of Fremont Weir. The invert of the new notch would be at an elevation of 14 feet, which is approximately 18 feet below the existing Fremont Weir crest. Alternative 1 would allow up to 6,000 cubic feet per second (cfs) to flow through the notch during periods when the river levels are not high enough to go over the crest of Fremont Weir to provide open channel flow for adult fish passage. See Section 2.4 for more details on the alternative features.

12.3.3.2.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Alternative 1 is estimated to increase the total amount of sediment entering the Yolo Bypass to approximately 743,000 cubic yards on an average annual basis, an increase of 84,000 cubic yards (13 percent) compared to existing conditions. Of the 84,000 cubic yards entering the bypass, approximately 25,200 cubic yards (30 percent) are expected to be clays and fine silts that would remain in suspension and wash through the bypass (HDR, Inc. 2017a). Approximately 21,000 cubic yards (25 percent) are expected to settle downstream of Agricultural Road Crossing 1 on agricultural fields and, once dry, would be tilled into the ground during typical agricultural activities. Spread across agricultural fields between Agricultural Road Crossing 1 and Interstate (I) 5, this amount of sediment would not result in a substantial change in ground elevation.

Approximately 37,800 cubic yards of soil (45 percent) would settle directly downstream of Fremont Weir and upstream of Agricultural Road Crossing 1 (HDR, Inc. 2017a). This sediment would need to be removed in addition to existing maintenance activities, increasing the annual amount of sediment removal to 334,350 cubic yards from 296,550 cubic yards. From 1986 to 2006, five sediment removal operations were performed on an as-needed basis (1986, 1987, twice in 1991, and 2006). Within that 20-year span, between approximately 530,000 and 1,450,000 cubic yards of soil were removed, per operation, for a total of 4,390,000 cubic yards of soils removed (HDR, Inc. 2017b). The increased sediment deposition from operation of Alternative 1 would require a change from the existing frequency of sediment removal actions (as needed) to at least every five years and as needed. Although Alternative 1 would increase the amount and frequency of sediment removal within the bypass, it would remove all deposited sediment upstream of Agricultural Road Crossing 1 and would not result in a substantial increase in sediment deposition.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass from the operation of Alternative 1 would be **less than significant** because the increased amount of sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.2.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Alternative 1 would require the excavation of a new transport channel that would connect the headworks structure to the existing Tule Pond and convey flow up to 6,000 cfs through the Yolo Bypass. Alternative 1 would include improvements to the existing channel that extends from the Tule Pond outlet to the beginning of Tule Canal. This new transport channel would run parallel to the existing Yolo Bypass east levee. Excavation near the waterside toe of the Yolo Bypass east levee has the potential to induce levee instability. This alternative includes a minimum setback distance of 112 feet from the waterside toe of the existing levee to the new channel to avoid potential impacts to the stability of the existing levee embankment. All construction would take place outside the waterside toe of the existing levee.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 1 would be **less than significant** because construction would take place at least 112 feet from the outside of the waterside toe of the existing levee.

12.3.3.2.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

The new excavated transport channel under Alternative 1 would be adjacent to and run parallel to the existing Yolo Bypass east levee. The water flow through the channel would be parallel to the existing levee and would not cause scouring at the existing levee. Construction and operation of Alternative 1 would not introduce potential soil erosion at the Yolo Bypass east levee.

Impacts of soil erosion are also addressed in detail in Chapter 6, *Water Quality*, and Chapter 18, *Air Quality*. Impacts of construction-related sedimentation are addressed in Chapter 6, *Water Quality*.

CEQA Conclusion

There would be **no impacts** related to soil erosion at the Yolo Bypass east levee associated with Alternative 1 because the channel would run parallel to the eastern bypass and would not result in scouring at the Yolo Bypass east levee.

12.3.3.3 Alternative 2: Central Gated Notch

Alternative 2, Central Gated Notch, would provide a similar new gated notch through Fremont Weir as described for Alternative 1. The primary difference between Alternatives 1 and 2 is the location of the notch; Alternative 2 would site the notch near the center of Fremont Weir. This gate would be a similar size but would have an invert elevation that is higher (14.8 feet) because the river is higher at this upstream location and the gate would allow up to 6,000 cfs through to provide open channel flow for adult fish passage. See Section 2.5 for more details on the alternative features.

12.3.3.3.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Impacts to sediment deposition from the operation of Alternative 2 would be identical to those discussed for Alternative 1.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass, resulting from operation of Alternative 2, would be **less than significant** because the increased amount of sediment deposited in Yolo Bypass would be removed during maintenance activities.

12.3.3.3.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Under Alternative 2, improvements would be made to the channel that extends from the Tule Pond outlet to the beginning of Tule Canal. These improvements would require excavation in the downstream channel, west of the Yolo Bypass east levee. Excavation near the waterside toe of

the Yolo Bypass east levee has the potential to induce levee instability. Excavation would occur more than 112 feet from the waterside toe of the levee, providing sufficient distance between the existing levee and the improved channel.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 2 would be **less than significant** because construction would take place more than 112 feet from the outside of the waterside toe of the existing levee.

12.3.3.3.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

Under Alternative 2, the angle at which the transport channel would enter Tule Canal has the potential to cause erosion on the Yolo Bypass east levee. However, a 50-foot-wide, 2.5-foot-deep area of rock revetment would be incorporated on the eastern edge of Tule Pond with 1.5:1 side slopes (horizontal to vertical) to provide scour protection. The channel revetment would also be incorporated in the areas along the proposed transport channel where the channel could interact with existing scour channels. The intake channel would be lined with rounded rock revetment to avoid scour, and the inlet and outlet transitions would be concrete.

Impacts of soil erosion are addressed in detail in Chapter 6, *Water Quality*, and Chapter 18, *Air Quality*. Impacts of construction-related sedimentation are addressed in Chapter 6, *Water Quality*.

CEQA Conclusion

Impacts related to soil erosion associated with Alternative 2 would be **less than significant** because the design incorporates erosion control measures such as rock revetment.

12.3.3.4 Alternative 3: West Side Gated Notch

Alternative 3, West Side Gated Notch, would provide a similar new gated notch through Fremont Weir as described for Alternative 1. The primary difference between Alternatives 1 and 3 is the location of the notch; Alternative 3 would site the notch on the western side of Fremont Weir. This gate would be a similar size but would have an invert elevation that is higher (16.1 feet) because the river is higher at this upstream location. Alternative 3 would allow up to 6,000 cfs through the gated notch to provide open channel flow for adult fish passage. See Section 2.6 for more details on the alternative features.

12.3.3.4.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Alternative 3 would result in the same amount of additional sediment deposition and removal on an average annual basis as described for Alternative 1. Therefore, impacts to sediment deposition, resulting from the operation of Alternative 3, would be the same as those discussed for Alternative 1.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass from operation of Alternative 3 would be **less than significant** because the increased amount of sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.4.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Impacts related to the destabilization of the exiting levee resulting from the implementation of Alternative 3 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 3 would be **less than significant** because construction would take place outside the waterside toe of the existing levee.

12.3.3.4.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

Impacts related to soil erosion resulting from the implementation of Alternative 3 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts related to soil erosion associated with Alternative 3 would be **less than significant** because the design incorporates erosion control measures such as rock revetment.

12.3.3.5 Alternative 4: West Side Gated Notch – Managed Flow

Alternative 4, West Side Gated Notch – Managed Flow, would have a smaller amount of flow entering the Yolo Bypass through the gated notch in Fremont Weir than some other alternatives, but it would incorporate water control structures to maintain inundation for longer periods of time within the northern portion of the Yolo Bypass. Alternative 4 would include the same gated notch and associated facilities as described for Alternative 3; however, it would be operated to limit the maximum inflow to 3,000 cfs. See Section 2.7 for more details on the alternative features.

12.3.3.5.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Alternative 4 is estimated to increase the total amount of sediment entering the Yolo Bypass to approximately 701,000 cubic yards on an average annual basis, an increase of 42,000 cubic yards (six percent) compared to existing conditions. Of the 42,000 cubic yards entering the bypass, approximately 12,600 cubic yards (30 percent) are expected to be clays and fine silts that would remain in suspension and wash through the bypass (HDR, Inc. 2017a). Approximately 10,500 cubic yards (25 percent) are expected to settle downstream of Agricultural Road Crossing 1 on agricultural fields and, once dry, would be tilled into the ground during typical agricultural activities. Spread across agricultural fields between Agricultural Road Crossing 1 and I-5, this amount of sediment would not result in a substantial change in ground elevation.

Approximately 18,900 cubic yards would be removed in addition to existing maintenance activities, increasing the annual amount of sediment removal to 315,450 cubic yards from 296,550 cubic yards. From 1986 to 2006, five sediment removal operations were performed on an as-needed basis (1986, 1987, twice in 1991, and 2006). Within that 20-year span, between approximately 530,000 and 1,450,000 cubic yards of soil were removed, per operation, for a total of 4,390,000 cubic yards of soils removed (HDR, Inc. 2017b). The increased sediment deposition from operation of Alternative 4 would require a change from the current frequency of sediment removal actions (as needed) to at least every five years or as needed. Although Alternative 4 would increase the amount and frequency of sediment removal within the bypass, it would remove all deposited sediment upstream of Agricultural Road Crossing 1 and would not result in a substantial increase in sediment deposition.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass resulting from the operation of Alternative 4 would be **less than significant** because the increased sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.5.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Impacts related to the destabilization of the existing levee resulting from the implementation of Alternative 4 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 4 would be **less than significant** because construction would take place outside the waterside toe of the existing levee.

12.3.3.5.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

Alternative 4 includes an intake channel, outlet transition, and transport channel identical to those described for Alternative 2. The additional engineered berms featured at the northern and southern water control structures in Alternative 4 would be rock-lined on both the land and waterside slopes to provide scour protection. The bypass channels in these areas would be earthen channels, and some soil erosion could occur. However, Alternative 4 was designed to avoid excessive soil erosion by incorporating rock-lined channels and berms, concrete transitions, and rock revetments.

Impacts of soil erosion are also addressed in detail in Chapter 6, *Water Quality*, and Chapter 18, *Air Quality*. Impacts of construction-related sedimentation are addressed in Chapter 6, *Water Quality*.

CEQA Conclusion

Impacts related to soil erosion associated with Alternative 4 would be **less than significant** because the design incorporates erosion control measures such as engineered berms and rock revetment.

12.3.3.6 Alternative 5: Central Multiple Gated Notches

Alternative 5, Central Multiple Gated Notches, would improve the entrainment of fish by using multiple gates and intake channels so that the deeper gate could allow more flow to enter the bypass when the river is at lower elevations. Flows would move to other gates when the river is higher to control inflows. Alternative 5 incorporates multiple gated notches in the central location on the existing Fremont Weir that would allow combined flows of up to 3,400 cfs. See Section 2.8 for more details on the alternative features.

12.3.3.6.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Similar to Alternative 4, Alternative 5 would require an additional 18,900 cubic yards of sediment be removed from the Yolo Bypass during maintenance activities every five years or as needed. Impacts to sediment deposition resulting from the operation of Alternative 5 would be the same as those discussed for Alternative 4.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass resulting from the operation of Alternative 5 would be **less than significant** because the increased sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.6.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Impacts related to the destabilization of the exiting levee resulting from the implementation of Alternative 5 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts to the stability of existing Yolo Bypass east levee as a result of construction under Alternative 5 would be **less than significant** because construction would take place outside the waterside toe of the existing levee.

12.3.3.6.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

The new excavated transport channels under Alternative 5 would be west of the Yolo Bypass east levee. The angle at which water would flow through the channels near the Yolo Bypass east levee would not cause scouring at the levee. Construction and operation of Alternative 5 would not introduce potential soil erosion at the Yolo Bypass east levee. The transport channels would be rock-lined, angular rocks would be placed along the bank slopes of the intake channel, and rounded rocks would be placed on the intake channel bottom to avoid scour.

Impacts of soil erosion are also addressed in detail in Chapter 6, *Water Quality*, and Chapter 18, *Air Quality*. Impacts of construction-related sedimentation are addressed in Chapter 6, *Water Quality*.

CEQA Conclusion

There would be **no impacts** related to soil erosion at the Yolo Bypass east levee associated with Alternative 5 because the channels would approach the levee at an angle that would not result in scouring at the levee.

12.3.3.6.4 Tule Canal Floodplain Improvements (Program Level)

As described in Section 2.8.1.7, Alternative 5 would include floodplain improvements along Tule Canal, just north of I-80. These improvements would not be constructed at the same time as the remaining facilities. They are included at a program level of detail to consider all the potential impacts and benefits of Alternative 5. Subsequent consideration of environmental impacts would be necessary before construction could begin.

The Alternative 5 program level of improvements to the Tule Canal Floodplain would have no impact on levee instability or soil erosion at the Yolo Bypass east levee because the improvements are not near the levee.

Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

The program level improvements to the Tule Canal Floodplain would include the construction of a series of secondary channels that connect to the Tule Canal. The channels would have a 30-foot bottom width with 3:1 side slopes (horizontal to vertical). A fish bypass channel would be constructed around the weir in the Tule Canal. These channels would require an additional amount of sediment be removed from the Yolo Bypass during maintenance activities. The amount of additional sediment to be removed in this area is not anticipated to increase sediment removal in the Yolo Bypass outside of historical ranges.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass resulting from operation of program level improvements to the Tule Canal Floodplain would be **less than significant** because the increased sediment is expected to remain within historical ranges of sediment removal in the Yolo Bypass.

12.3.3.7 Alternative 6: West Side Large Gated Notch

Alternative 6, West Side Large Gated Notch, is a large notch in the western location that would allow flows up to 12,000 cfs. It was designed with the goal of entraining more fish while allowing more flow into the bypass when the Sacramento River is at lower elevations. See Section 2.9 for more details on the alternative features.

12.3.3.7.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Alternative 6 is estimated to increase the total amount of sediment entering the Yolo Bypass to approximately 827,000 cubic yards on an average annual basis, an increase of 168,000 cubic yards (25 percent) compared to existing conditions. Of the 168,000 cubic yards entering the bypass, approximately 50,400 cubic yards (30 percent) are expected to be clays and fine silts that would remain in suspension and wash through the bypass (HDR, Inc. 2017a). Approximately 42,000 cubic yards (25 percent) are expected to settle downstream of Agricultural Road Crossing

1 on agricultural fields and, once dry, would be tilled into the ground during typical agricultural activities. Spread across agricultural fields between Agricultural Road Crossing 1 and I-5, this amount of sediment would not result in a substantial change in ground elevation.

Approximately 75,600 cubic yards would be removed in addition to existing maintenance activities, increasing the annual amount of sediment removal to 372,150 cubic yards from 296,550 cubic yards. From 1986 to 2006, five sediment removal operations were performed on an as-needed basis (1986, 1987, twice in 1991, and 2006). Within that 20-year span, between approximately 530,000 and 1,450,000 cubic yards of soil were removed, per operation, for a total of 4,390,000 cubic yards of soils removed (HDR, Inc. 2017b). The increased sediment deposition from operation of Alternative 6 would require a change from the current frequency of sediment removal actions (as needed) to at least every five years and as needed. Although Alternative 6 would increase the amount and frequency of sediment removal within the bypass, it would remove all sediment deposited between Fremont Weir and Agricultural Road Crossing 1. This alternative would add sediment to the agricultural fields in the bypass.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass resulting from the operation of Alternative 6 would be **less than significant** because the increased sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.7.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Impacts related to the destabilization of the exiting levee resulting from the implementation of Alternative 6 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 6 would be **less than significant** because construction would take place outside the waterside toe of the existing levee.

12.3.3.7.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

Impacts related to soil erosion resulting from the implementation of Alternative 6 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts related to soil erosion associated with Alternative 6 would be **less than significant** because the design incorporates erosion control measures such as rock revetment.

12.3.4 Summary of Impacts

Table 12-1 provides a summary of the identified impacts to geology and soils for construction and operation of the Project.

Table 12-1. Summary of Impacts and Mitigation Measures – Geology and Soils

Impact	Alternative	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass	No Action	NI	---	NI
	All Action Alternatives	LTS	---	LTS
Impact GEO-2: Induce levee instability at the Yolo Bypass east levee	No Action	NI	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	---	LTS
	5 (Program)	NI	---	NI
Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee	No Action	NI	---	NI
	1, 5 (Project), 5 (Program)	NI	---	NI
	2, 3, 4, 6	LTS	---	LTS

Key: LTS = less than significant; NI = no impact

12.4 Cumulative Impacts Analysis

This section describes the cumulative impacts analysis for Geology and Soils. Section 3.3 presents an overview of the cumulative impacts analysis, including the methodology, and the projects, plans, and programs considered in the cumulative impacts analysis.

12.4.1 Methodology

This evaluation of cumulative impacts for land use considers the impacts of the Project and how they may combine with the impacts of other past, present, and future projects or actions to create significant impacts on specific resources. The area of analysis for these cumulative impacts includes the area in which Project actions would occur affecting geology and soils, which is the northern portion of the Yolo Bypass. The timeframe for this cumulative analysis includes the past, present, and probable future projects producing related or cumulative impacts that have been identified in the area of analysis.

This cumulative impacts analysis utilizes the project analysis approach described in detail in Section 3.3, *Cumulative Impacts*.

Projects that would construct, remove, modify, or relocate levees and weirs in the Project area have the potential to impact geology and soils in combination with the Project alternatives. These projects are listed below:

- The American River Common Features General Reevaluation Report would involve extensive excavation activities that could impact topsoil and cause erosion in the Sacramento Bypass near the east side of Yolo Bypass.

- The Delta Plan would improve water supply reliability.
- The Lower Elkhorn Basin Levee Setback Project would remove portions of existing levees and improve or relocate associated infrastructure.
- The North Bay Aqueduct Alternative Intake Project would improve water supply reliability.
- The Sacramento River Basin-Wide Feasibility Study would include options to improve the bypass system that includes potential expansion of Yolo Bypass and Fremont Weir, which could consist of a combination of levee setbacks, weir expansions, and new bypass channels.
- *The Sacramento River General Reevaluation Report* considers widening bypasses and constructing setback levees.
- The Shasta Lake Water Resources Investigation would improve water supply reliability.

12.4.2 Cumulative Impacts

The Project alternatives would have a less than significant impact to geology and soils with the incorporation of control structures and best management practices that are included within the project description. The cumulative projects would require construction and excavation, which could impact the soils and result in increased erosion in the area or affect levee stability. However, the cumulative projects would be expected to implement proper mitigation measures, when necessary, to prevent significant cumulative impacts and reduce impacts to less than significant with mitigation measures.

The Delta Plan, North Bay Aqueduct Alternative Intake Project, and Shasta Lake Water Resources Investigation would improve water supply reliability, which should result in beneficial impacts by providing sufficient water that would reduce the amount of fallowed lands and erosion potential.

Therefore, the Project alternative's contribution to the cumulative effects associated with geology and soils **would not result in a cumulative considerable impact** because the effects would not likely result in a substantial increase to sedimentation in the Yolo Bypass, induce levee instability, or increase soil erosion.

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13 Recreation

This chapter describes existing recreation uses in the study area for the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project), the various plans and policies related to recreation use in the study area, and the regulatory agencies that oversee recreation planning and use. Although the Project alternatives do not include any specific recreation development, they would affect recreation, and these impacts are discussed in this chapter. For recreation resources, the study area is the Yolo Bypass.

13.1 Environmental Setting/Affected Environment

This section describes the recreation resources in the study area and the surrounding region.

13.1.1 Regional Recreation

The regional setting for the Project includes the Sacramento-San Joaquin Delta (Delta) region and the Sacramento, Feather, and American rivers, as shown on Figure 13-1.

13.1.1.1 Delta Region

The Project area is in the greater Delta region, which is an approximately 1,150-square-mile area consisting of a network of channels and islands at the Sacramento River and San Joaquin River confluence. This vast network of rivers, channels, sloughs, and islands provides a diverse recreation resource in California. The Project area is located primarily in the northern portion of the Delta. In general, the Delta supports a variety of recreational uses, including boating and fishing—the most popular activities—as well as wildlife viewing, hunting, sightseeing, walking, picnicking, and camping (California Department of Water Resources [DWR] and Bureau of Reclamation 2017).

The Delta region has a variety of publicly and privately owned facilities that support the above-mentioned recreational uses. The public facilities include marinas, county parks with boat-launching facilities, fishing access, campgrounds, picnic sites, two State of California (State) park units, federal and State wildlife areas, and nature preserves (DWR and Reclamation 2017). Private facilities include yacht clubs, marinas, nature preserves, and many hunting clubs (DWR and Reclamation 2017).

13.1.1.2 Sacramento River

The Sacramento River corridor is a northern California recreation resource that supports a wide variety of recreational uses, including hiking and walking, fishing, camping, hunting, horseback riding, picnicking, motorized and non-motorized boating, and wildlife viewing. These uses are supported by numerous and varied federal, State, local, and commercial facilities and lands that provide access to the river. Facilities along the river include boat launches, trails and trail access points, fishing facilities, parks, wildlife areas, undeveloped open space areas, and marinas. Near

the Project area, developed recreational facilities are limited although access to the river is available at several federal, State, and local facilities (DWR 2013). The portions of the Sacramento River adjacent to the Yolo Bypass support extensive water-based recreation, with boating and fishing as the primary recreational uses. The primary target species in the Sacramento River nearest the Project area are striped bass and Chinook salmon (Tsournos et al. 2016). Fishing use generally increases with the opening of the sturgeon fishing season (February) and continues until the Chinook salmon run decreases (typically after October). Fishing typically occurs via boat in this area, but shoreline fishing does occur sporadically throughout the area. Of note, the Sutter Bypass Wildlife Area, managed by the California Department of Fish and Wildlife (CDFW), is located immediately upstream of the Project area on the Sacramento River and portions of the lower Feather River. The wildlife area consists of the Tisdale Bypass and two long, narrow parcels on either side of the Sutter Bypass, for a total of approximately 3,200 acres (CDFW 2017). The wildlife area provides opportunities for fishing, wildlife viewing, and hunting. CDFW manages it as a Type C wildlife area, which CDFW defines as areas that are generally open daily for hunting for all legal species in season and do not require the purchase of a pass for entry (CDFW 2016a). Hunting opportunities seasonally include deer, waterfowl, mourning dove, valley quail, pheasant, rabbits, and turkeys (CDFW 2017).

13.1.2 Project Area Recreation

The Project area is the Yolo Bypass in Yolo, Sutter, and Solano counties in the Sacramento Valley region, as shown on Figure 13-1. The Yolo Bypass spans about 40 miles from its northern to its southern extent and is about 7 miles from west to east at its widest. This area is divided by two major interstate highways (Interstates 5 and 80) and bordered by the larger municipalities of West Sacramento (east) and Davis (west) and smaller towns on its northern and southern extents, including Knights Landing (north), Woodland (west), and Rio Vista (south).

Yolo Bypass lands consist of public and privately owned lands used for agricultural, public recreation, and other purposes. In the late-fall and winter, the Yolo Bypass is used as a floodplain when the bypass is periodically inundated to provide flood control for the Sacramento River. Public lands in the Yolo Bypass are limited and predominantly designated and managed by CDFW as wildlife areas or ecological reserves. These public lands include the Fremont Weir Wildlife Area (FWWA), Sacramento Bypass Wildlife Area (SBWA), Yolo Bypass Wildlife Area (YBWA), and Liberty Island Ecological Reserve (LIER).

Public use of these CDFW-managed areas typically occurs in the spring through early winter or when the Yolo Bypass is not used as a floodplain for the Sacramento River. When the Yolo Bypass is inundated, public access and recreational uses are limited. Each of these areas is managed by CDFW for recreational and agricultural uses, wildlife habitat, and wetlands and described below from north to south. In addition, private recreation areas and sites are dispersed throughout the Project area.

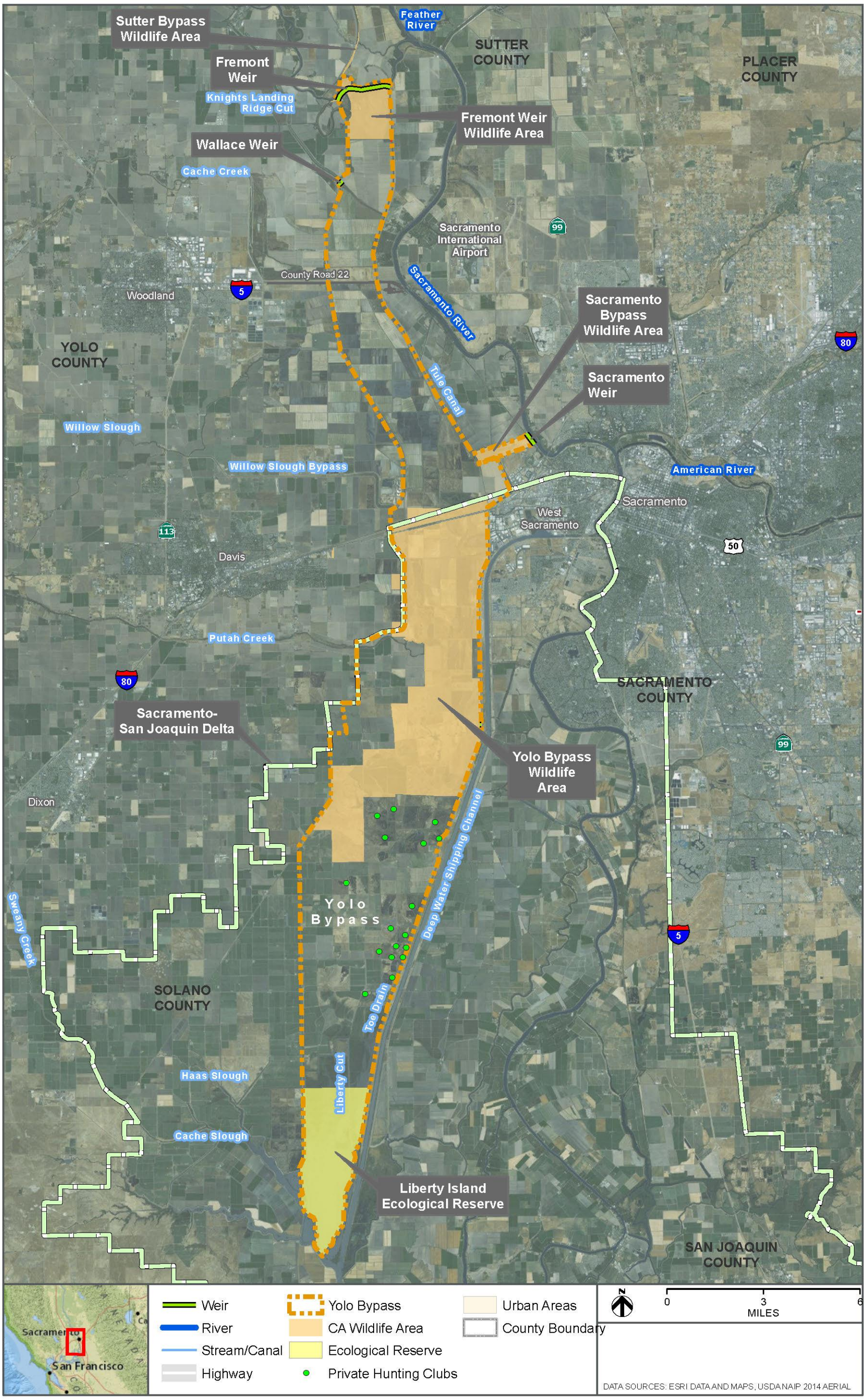

Figure 13-1. Recreation Resources in the Project Area and Region

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13.1.2.1 Fremont Weir Wildlife Area

The FWWA is a 1,461-acre wildlife area situated along the northern boundary of the Yolo Bypass in Sutter and Yolo counties, northeast of the City of Woodland on the south/west side of the Sacramento River. Fremont Weir is situated along the northern edge of the FWWA. The FWWA lands consist of mixed non-native grassland, brush, valley oaks, willows, cottonwoods, and wetlands (CDFW 2016b). The FWWA is managed by CDFW and was designated as a State Wildlife Area in 1981.

The FWWA does not have any facilities or user fees but provides opportunities primarily for seasonal hunting and fishing, bird watching, and wildlife viewing. Hunting is allowed during spring turkey season and daily from July 1 through January 31. CDFW manages the FWWA as a Type C wildlife area, with hunting opportunities for pheasant, waterfowl, quail, turkey, mourning dove, cottontail, jackrabbit, and deer (CDFW 2016b). CDFW's Waterfowl, Upland Game Hunting, and Public Use of Department Lands Regulations (CDFW 2016a) regulate public use for recreational purposes.

The only public entrance to the FWWA is at the end of County Road (CR) 16, which ends at the parking lot on the Yolo Bypass east levee. Recreation use of the FWWA is estimated to be 1,500 recreation-days annually, with two-thirds of the use attributed to hunting (DWR and Reclamation 2017) during the respective open seasons for various game species. Since the FWWA is a floodplain, it is inundated when the Sacramento River reaches water levels sufficient to flow over Fremont Weir into the Yolo Bypass. CDFW strongly cautions the public against use of the FWWA low-lying lands when inundation occurs (CDFW 2016b).

The hunting seasons for respective game species in the FWWA conform to those of other local and regional public lands. For safety reasons, hunters are limited to only archery and shotguns in the FWWA; rifles and handguns are not allowed. In general, the most popular hunting periods are linked to popular target species. Generally, the most popular periods include the archery deer season opener in mid-August, general deer season opener in late-September [Zone D-4]), dove opener on September 1 and re-opener in mid-November, quail in mid-October, pheasant in mid-November, wild turkey in late March through April and in mid-November through mid-December, and waterfowl season beginning in late October and running through January (DWR and Reclamation 2017).

13.1.2.2 Sacramento Bypass Wildlife Area

The SBWA is located immediately adjacent to and east of Tule Canal in the central portion of the Yolo Bypass in Yolo County, west of the City of Sacramento and the Sacramento River (north of Interstate [I] 80), as shown on Figure 13-1. Similar to the FWWA, the SBWA is managed by CDFW and was designated as a Type C wildlife area in 1988. CDFW's Waterfowl, Upland Game Hunting, and Public Use of Department Lands Regulations regulate the wildlife area.

This 360-acre State wildlife area is an important cover and feeding area for wildlife during late fall, winter, and early spring. The SBWA does not have any recreational facilities but provides recreational opportunities for fishing (in Tule Canal and toe canals), wildlife viewing, bird watching, and seasonal hunting (September 1 to January 31) (CDFW 2016c). Game species in the wildlife area include waterfowl, pheasant, turkey, quail, deer, and dove. Tule Canal offers

anglers opportunities to catch white catfish and black crappie while the nearby borrow pits support largemouth bass, bluegill, and white catfish (CDFW 2016c).

Public access to the SBWA occurs at several points from CRs 126 or 127; however, the latter is gated, and vehicles are not allowed on that levee road. CR 126 is paved leading up to the gate, which restricts further vehicle access onto the levee. This gate can also be reached at the south end of CR 124.

13.1.2.3 Yolo Bypass Wildlife Area

The YBWA is in the central portion of the Yolo Bypass in Yolo County between the cities of Davis and West Sacramento (south of I-80). The YBWA is a public and private restoration project managed by CDFW in consultation with the Yolo Basin Foundation. CDFW designated the area as a wildlife area in 1994. The Yolo Basin Foundation, founded in 1990, is a community-based nonprofit organization dedicated to the appreciation and stewardship of wetlands and wildlife through education and innovative partnerships, with a principal goal to facilitate environmental education in the YBWA (Yolo Basin Foundation 2016).

The YBWA consists of 17 separate management units on about 16,770 acres of wildlife habitat and agricultural land. The YBWA is open year-round from sunrise to sunset except for Christmas Day. Public access to the YBWA occurs at the primary entrance in the northwest corner of the YBWA via CR 32B (I-80, Exit 78, East Chiles Road).

Recreational uses for the YBWA include hunting, fishing, walking, hiking, wildlife viewing, nature exploration and photography, and environmental education activities for students and the general public (CDFW 2016d). Hunting historically has been a popular seasonal use of the YBWA, with about 5,000 acres open for hunting. Principal game species include several species of ducks and geese, ring-necked pheasants, and mourning doves (CDFW 2008). The hunting season runs from the opening of dove season (September) through January, but the most popular hunting season is for waterfowl from late October through January (about 100 days).

CDFW manages the YBWA as a Type A wildlife area, including hunting opportunities for waterfowl and upland game species (CDFW 2016d). CDFW defines a Type A wildlife area as an area with restricted hunter access during waterfowl season and requires a hunting pass to be purchased in advance and exchanged for an entry permit at the wildlife area. Recreational and hunting use in the YBWA can vary from year to year. For instance, use peaked in the 2013–2014 season at 7,200 hunting days compared to 6,100 days in the 2008–2009 season and 3,300 days in the 2003–2004 season (DWR and Reclamation 2017).

In addition, CDFW has partnered with the Yolo Basin Foundation to provide educational programs and outreach. Facilities supporting recreational and education uses include trails, gravel roads, parking areas, and hunting blinds. The Yolo Basin Foundation estimates that more than 4,000 students, teachers, and parents visit the area annually to participate in the Discover the Flyway program implemented in partnership with CDFW that offers field trips every Tuesday through Friday from September through May (Yolo Basin Foundation 2016). Additional environmental education and interpretation programs offered in the YBWA include Marsh Madness Youth Days, Nature Bowl, public tours, docent program, Flyway Nights lecture series, California Duck Days, Project Wet, and other workshops (CDFW 2008).

The YBWA is open to the public except during certain Yolo Bypass flooding occurrences. Currently, the YBWA public-access policy is to close the entire area soon after water overtops Fremont Weir. Much of the YBWA is closed to all non-hunting purposes from two weeks before waterfowl season to one week after waterfowl season though areas designated for wildlife viewing purposes are open on most days throughout the year (CDFW 2008). Significant flooding during the 100-day hunting season (mid-October to mid-January) requires CDFW to discontinue access to these areas, resulting in lost hunting time and other public uses (CDFW 2008).

13.1.2.4 Liberty Island Ecological Reserve

The LIER is situated along the southern boundary of the Yolo Bypass in Solano County, southeast of the City of Dixon. CDFW took ownership of the southern portion of Liberty Island in 2011 and designated it as an ecological reserve in 2014 to protect the wetlands and special-status fish species (CDFW 2016e). The LIER consists of 5,303 acres of mostly inundated tidal marsh habitat and open water in the southern portion of Liberty Island between Prospect Slough and Shag Slough (CDFW 2015).

Public access to the LIER is available either by boat or by vehicle. Public boat access occurs via the surrounding sloughs, including Miner, Cache, and Lindsey sloughs. Vehicle access to the northern portion of the ecological reserve occurs from the Town of Dixon via Liberty Island Road. Vehicle access to the southern portion of the LIER occurs from the Town of Rio Vista to the south via Liberty Island Road as well.

CDFW's Waterfowl, Upland Game Hunting, and Public Use of Department Lands Regulations regulate public use of the LIER. Recreational uses include wildlife viewing, shoreline fishing, boat fishing, and waterfowl hunting. Hunting for waterfowl in the ecological reserve is allowed seven days per week during the regular waterfowl season, and specific regulations allow the use of temporary floating blinds that must be removed daily (CDFW 2016e).

13.1.2.5 Private Recreation Areas and Sites

In addition to the public recreation areas, the Yolo Bypass also provides private recreational opportunities. Most of these opportunities are in Yolo County where 17 private hunting clubs, three marinas, and one yacht club are located (DWR 2013). The private hunting clubs are south of the YBWA and north of the LIER, as shown on Figure 13-1. Sutter County has a few private recreational opportunities (two marinas and boat clubs) adjacent to the Project area (DWR 2013). Solano County also has limited private recreational facilities, including two marinas, one yacht club, and one hunting club (DWR 2013).

Most private recreational use and opportunities occurs on the expansive private lands throughout the Yolo Bypass area where private landowners and their personnel and guests have access to private recreational opportunities, many of which occur without developed recreational facilities.

13.2 Regulatory Setting

This section describes the laws, policies, and management plans that guide the recreation resources in the study area.

13.2.1 Federal Plans, Policies, and Regulations

Federal laws and regulations pertaining to recreation resources are discussed below.

13.2.1.1 North American Waterfowl Management Plan

The *North American Waterfowl Management Plan* (NAWMP) was originally adopted in 1986 and subsequently amended in 2012 and 2014. The international plan was established by Canada and the United States in 1986 and later expanded to include Mexico in 1994. In the United States, the NAWMP is administered by the U.S. Fish and Wildlife Service (USFWS). The plan provides a broad framework for waterfowl conservation and management in North America. The plan identified population objectives for key species and established habitat goals to sustain these populations. The plan sets forth three overarching goals for waterfowl conservation (NAWMP Committee 2012):

- **Goal 1:** Abundant and resilient waterfowl populations to support hunting and other uses without imperiling habitat
- **Goal 2:** Wetlands and related habitats sufficient to sustain waterfowl populations at desired levels while providing places to recreate and ecological services that benefit society
- **Goal 3:** Growing numbers of waterfowl hunters, other conservationists, and citizens who enjoy and actively support waterfowl and wetlands conservation

13.2.1.2 U.S. Fish and Wildlife Service's Recreational Fisheries Policy

This policy defines the USFWS's stewardship role in the management of the recreational fishery resources. The policy was designed to unify the agencies, organizations, and individuals throughout the United States to enhance the vitality of the recreational fisheries at the local, state, and national levels. Specifically, the policy is to (USFWS 1989):

1. Protect, restore, and enhance fish populations and their habitats
2. Promote recreational fishing on USFWS and other lands to provide the public with a high quality recreational experience
3. Ensure that recommendations concerning recreational fisheries potentials and opportunities are included as part of appropriate field studies and management assistance efforts performed by USFWS on non-USFWS waters
4. Serve as an active partner with other Federal governmental agencies, states, Tribes, conservation organizations, and the public in developing recreational fisheries programs
5. Promote the conservation and enhancement of the nation's recreational fisheries through USFWS's grant and aid programs

6. Improve and expand quantifiable economic valuations of the nation's recreational fisheries to demonstrate the importance of this resource to the health and welfare of society and the nation's economy

13.2.2 State Plans, Policies, and Regulations

State plans, laws, and regulations pertaining to recreation resources are discussed below.

13.2.2.1 California Department of Parks and Recreation – Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh

The California Department of Parks and Recreation (DPR) issued the *Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh* in May 2011 to comply with the Delta Reform Act that required the DPR to develop recommendations to expand State recreation areas in the region. The document represents DPR's vision for the region and recommends the following (DPR 2011):

- A network of recreation areas, including parks, resorts, boating facilities, historic communities, agritourism attractions, and other visitor-oriented businesses. These areas would be connected by scenic driving routes, boating trails, or bicycling and hiking trails.
- Working cooperatively with other State agencies, including DWR.
- Providing residents and visitors with authentic outdoor experiences rooted in the unique and enduring character of the Delta and Suisun Marsh.

Further, the proposal also identifies several specific areas for DWR to consider for recreation that are relevant to the project site. These include:

- Incorporate shoreline access, trails, boat ramps, hunting opportunities, and interpretive facilities, as appropriate, in restoration projects at Dutch Slough, McCormack-Williamson Tract, Suisun Marsh, and other sites (DPR 2011).
- Elkhorn Basin: Create a base camp by partnering with landowners on the Sacramento River to secure about 1,500 acres and restore habitat at the northern end of Yolo Bypass. Provide campsites, picnic sites, trails, fishing, and interpretive services (DPR 2011).
  (The Elkhorn Basin is currently separated from the Project area by the Yolo Bypass east levee.)

13.2.2.2 California Department of Fish and Wildlife Land Management

CDFW owns and manages four areas in the study area, primarily for habitat and species protection and enhancement. These include the FWWA, SBWA, YBWA, and LIER, described above. Visitor use of all CDFW lands is subject to the general regulations in Title 14 of the California Code of Regulations (CCR) Subsections 550 and 550.5. Visitor use of wildlife areas is also subject to CCR Title 14 Subsections 551(a) through 551(h) and any other sections of Title 14 that apply. Visitor use of ecological reserves is also subject to CCR Title 14 Subsections 630(a) and (b) and any other sections of Title 14 that apply. These regulations also include several property-specific regulations of public use of CDFW lands, which are summarized for each area in Table 13-1.

Table 13-1. Regulations for Public Use at CDFW Wildlife Areas and Ecological Reserves in the Yolo Bypass

Area	Subsection of CCR Title 14	Regulation
Entire Yolo Bypass	5.80 (i) – Special Yolo Bypass Flood Control System Sturgeon Closure	It is unlawful to take any sturgeon in the Yolo Bypass, Toe Drain Canal, and Tule Canal upstream of Lisbon Weir at any time.
FWWA	551(o)(15) – Designated Closures and Restrictions on Wildlife Areas	(15) Closed to hunting February 1 through June 30 except for the spring turkey season when only turkeys may be hunted.
	551(r) (18) – Firearm Restrictions on Type C Wildlife Areas	(18) Rifles and pistols are prohibited.
	2.35 – Taking Fish Near Dams, Fishways, Screens, and Egg-Taking Stations	No fish may be taken within 250 feet of: (b) any dam or any weir or rack that has a fishway or an egg-taking station.
SBWA	551(o)(48) – Designated Closures and Restrictions on Wildlife Areas	(48) Closed to hunting February 1 through August 31.
	551(r)(44) – Firearm Restrictions on Type C Wildlife Areas	(44) Rifles, pistols, and archery equipment are prohibited. Buckshot and slugs are prohibited.
	551(t)(22) – Species Restrictions for Hunting on Type C Wildlife Areas	(22) All legal species except big game.
YBWA	551(i)(14) – Wildlife Areas Authorized for Dog Training and/or Dog Trials	(14) Dog training: Allowed with written authorization from the area manager. Dog trials: Not authorized.
	551(j)(9) – Bicycles	(9) Allowed only in designated areas.
	551(l)(29) – Wildlife Areas with Boat and/or Horse and Pack Stock Restrictions	(29) No boats or flotation devices allowed. Horses and pack stock: Prohibited.
	551(o)(62) – Designated Closures and Restrictions on Wildlife Areas	(62) Closed to all non-hunting uses from two weeks prior to opening of waterfowl season through one week after the end of waterfowl season except those areas designated for wildlife-viewing purposes. Pheasant hunting is prohibited in assigned blind areas.
	551(s)(29) – Pheasant Hunting	(29) Pheasant hunting is open daily for the first nine days of the pheasant season and on waterfowl hunt days for the remainder of the pheasant season.
	551(x)(27) – Number of Hunters Per Reservation	(27) Blinds: Up to four hunters. Free roam: Two adults; each adult hunter may bring up to two junior hunters or two non-shooters or one of each. Reservation expires: One and one-half hours before shoot time.
LIER	630(d)(23) – Ecological Reserves with Hunting as a Designated Public Use	(23) Allowed only at such times and in the specific areas designated by the department.
	630(e)(19) – Fishing Restrictions and Additional Regulations on Ecological Reserves pursuant to subsection 550(h) of these regulations	(19) Non-commercial fishing at LIER: Allowed from boats and from shore.
	630(f)(9) – Swimming and Boating	(9) Swimming: Prohibited. Boating: Allowed.

Key: FWWA = Fremont Weir Wildlife Area; LIER = Liberty Island Ecological Reserve; SBWA = Sacramento Bypass Wildlife Area; YBWA = Yolo Bypass Wildlife Area

13.2.2.3 California State Lands Commission Regulations

The California State Lands Commission has jurisdiction over lands that underlie navigable and tidal waterways (sovereign lands). Such lands occur under the Sacramento River adjacent to the Project area. The California State Lands Commission has entered into a memorandum of understanding with DWR to allow DWR access to sovereign lands required for the development, operation, and maintenance of the State Water Project and its related activities and projects.

13.2.2.4 2015 Statewide Comprehensive Outdoor Recreation Plan

The *Statewide Comprehensive Outdoor Recreation Plan* (SCORP) was prepared by DPR and functions as a statewide master plan for State and local parks and outdoor recreational open-space areas. The SCORP also provides policy guidance to outdoor recreation providers, including Federal, State, local, and special district agencies throughout California. The SCORP is the result of broad public input and an assessment of existing statewide park and recreation lands. The critical element of the SCORP that relates to recreation needs and goals is the *Survey on Public Opinions and Attitudes on Outdoor Recreation in California 2012* (SPOA). Specifically, the SPOA provides focused recreational user feedback that can be applied to the Project vicinity.

The 2012 SPOA identifies the top 15 recreational activities in California with the highest latent demand. The following are activities that additional Californians would participate in, from a statewide perspective, if more facilities and opportunities were provided (DPR 2014, 28–29):

1. Picnicking in picnic areas
2. Walking for fitness or pleasure on paved surfaces
3. Camping in developed sites with facilities such as tables and toilets
4. Beach activities
5. Swimming in a pool
6. Day-hiking on unpaved trails
7. Attending outdoor cultural events
8. Visiting outdoor nature museums, zoos, gardens, or arboretums
9. Shopping at a farmers' market
10. Visiting historic or cultural sites
11. Wildlife viewing, bird watching, and viewing natural scenery
12. Driving on paved surfaces for pleasure, sightseeing, and driving through natural scenery
13. Swimming in freshwater lakes, rivers, and/or streams
14. Jogging and running for exercise (on trails, streets, sidewalks, or paths)
15. Bicycling on paved surfaces

Other relevant findings from the 2012 SPOA include (DPR 2014):

- More than two-thirds of Californians reported spending the same (33.2 percent) or more time (35.2 percent) in outdoor recreation activities compared to five years ago.
- Most respondents (91.6 percent) had visited a park within the past 12 months. The majority (71.5 percent) had visited a park within the past month.
- Within the past 12 months, a majority of respondents visited highly developed parks and recreation areas; developed nature-oriented parks and recreation areas; historic or cultural buildings, sites, or areas; and natural and undeveloped areas.
- About three-quarters of Californians traveled to parks with family (52.5 percent) and friends (23.5 percent), whereas almost one-third went to parks with both family and friends.
- The respondents would like to participate more often in picnicking (55.1 percent), walking (37.4 percent), camping (35.1 percent), and beach activities (34.6 percent).
- Over one-third (34.7 percent) of respondents reported using an unpaved trail for hiking, biking, or horseback riding at least once or twice a month or more during the last 12 months. At the same time, 31 percent of respondents reported never using an unpaved trail.
- The most important facilities were wilderness-type areas with no vehicles or development; play areas for children; areas for environmental and outdoor education; large group picnic sites; recreation facilities at lakes, rivers, and reservoirs; and single-use trails.

13.2.3 Regional and Local Plans, Policies, and Regulations

Regional and local plans and policies pertaining to recreation resources are discussed below.

13.2.3.1 Yolo County General Plan

Yolo County's *2030 Countywide General Plan* (County of Yolo 2009) identifies policies to maintain and expand public access and recreational activities throughout the county.

Several policies and implementation actions specifically address recreation. These include policies that generally guide planners to coordinate opportunities to expand recreation lands, access, and facilities.

- **Policy CO-1.1:** Expand and enhance an integrated network of open space to support recreation, natural resources, historic and tribal resources, habitat, water management, aesthetics, and other beneficial uses.
- **Policy CO-1.2:** Develop a connected system of recreational trails to link communities and parks throughout the county.
- **Policy CO-1.3:** Create a network of regional parks and open-space corridors that highlight unique resources and recreational opportunities for a variety of users.
- **Policy CO-1.6:** Develop "gateways" or trailheads that provide access for the public to county, State, and Federal lands. Where located on private land, gateways shall be developed, working with willing landowners.
- **Policy CO-1.8:** Encourage responsible stewardship of private lands. Promote increased opportunities for public access to waterways and other natural areas.

Several policies also address Yolo Bypass specifically. These include:

- **Policy CO-1.23:** Increase public access and recreational uses along waterways wherever feasible, particularly Cache Creek, Lower Putah Creek, Yolo Bypass, and Sacramento River.
- **Policy CO-1.28:** Balance the needs of agriculture with recreation, flood management, and habitat within Yolo Bypass.

Two implementation actions are related to the Project area setting. These are:

- **Action CO-A6:** Connect the future Bay Delta Trail system, the future trail system in the lower Yolo Bypass, and the future Cache Creek Parkway system and link those trails to the American River Bikeway system in Sacramento County.
- **Action CO-A11:** Provide recreational uses that are river- or creek-dependent in locations directly on Cache Creek, Putah Creek, and the Sacramento River. Examples include fishing, canoeing, boating, and nature observation. Except for boat launches and docks, more active uses, such as parking, restrooms, and picnic areas, shall be located in areas away from the river and sensitive riparian habitat.

13.2.3.2 2007 Integrated Regional Water Management Plan

Yolo County also proposed multiple projects with recreation features in its *2007 Integrated Regional Water Management Plan* (Water Resources Association of Yolo County 2007). Proposed recreation improvements include the Knights Landing Boat Launch (just north of the Project area) and Elkhorn Regional Park. The latter proposes to renovate the southern portion of Elkhorn Regional Park located eight miles north of West Sacramento. Improvements would include an accessible educational trail, river overlooks, wildlife habitat, interpretive kiosks, and an easement to connect the park to the state's SBWA.

13.2.3.3 Sutter County General Plan

The *Sutter County General Plan* identifies a vision through 2030 with a desired framework for growth and conservation in unincorporated Sutter County. The purpose of the plan is to ensure a long-term, sustainable county by balancing agricultural traditions, natural resource preservation, and economic growth opportunities. Specific to recreation, the plan has two goals in Chapter 8, Public Services: 1) to ensure that adequate park, recreation, and open-space lands and programs are provided to meet the diverse needs of Sutter County's residents and 2) to support creation of an interconnected multi-use trail system that enhances Sutter County's recreational opportunities (Sutter County 2011).

13.2.3.4 Solano County General Plan

Only a small portion of the Yolo Bypass at the extreme southern end is in Solano County. These lands are mostly privately owned or managed by CDFW in the LIER. Few public lands are in the Yolo Bypass; therefore, much of the *Solano County General Plan* is not directly relevant to the Yolo Bypass.

The Park and Recreation Element of the *Solano County General Plan* provides the overall planning function specific to recreation. The Park and Recreation Element has the stated purpose

"to provide a long-range guide for the development of regional recreation facilities and the preservation of natural and historical resources in Solano County" (Solano County 2008). This element also has two stated goals to guide regional recreation planning: 1) to preserve and manage a diverse system of regional parks and natural resources for the enjoyment of present and future county residents and park visitors and 2) to promote, develop, and manage diversified recreational facilities to meet the regional recreation needs of the county (Solano County 2008).

13.2.3.5 Delta Protection Commission Land Use and Resource Management Plan for the Primary Zone of the Delta

The Delta Protection Commission (DPC) was created by the State legislature in 1992 with the goal of developing regional policies for the Delta to protect and enhance the existing land uses (agriculture, wildlife habitat, and recreation) in the primary zone. The DPC adopted the *Land Use and Resource Management Plan for the Primary Zone of the Delta* initially in 1995 and amended it most recently in 2010. A large portion of the YBWA is within the Primary Zone of the Delta. The DPC's *Land Use and Resource Management Plan for the Primary Zone of the Delta* states the following four goals related to recreation and access (DPC 2010):

- To promote continued recreational use of the land and waters of the Delta
- To ensure needed facilities that support such uses are constructed, maintained, and supervised
- To protect landowners from unauthorized recreational uses on private lands
- To maximize public funds for recreation by promoting public-private partnerships and multiple use of Delta lands

In addition, the plan includes several recreation and access-related goals and policies applicable to YBWA (DPC 2010):

- To encourage new regional recreational opportunities, such as Delta-wide trails that take into consideration environmental, agricultural, infrastructure, and law enforcement needs and private property boundaries, and to promote opportunities for water, hiking, and biking trails
- To support multiple uses of Delta agricultural lands such as seasonal use for hunting and provision of wildlife habitat

13.2.3.6 Yolo Bypass Wildlife Area Land Management Plan

The *Yolo Bypass Wildlife Area Land Management Plan* was prepared through a partnership between CDFW and the Yolo Basin Foundation with extensive public involvement. The stated purpose of the plan is to (CDFW 2008):

- Guide management of habitats, species, appropriate public uses, and programs to achieve CDFW's mission
- Direct an ecosystem approach to managing YBWA in coordination with the objectives of the CALFED Bay-Delta Program's Ecosystem Restoration Program
- Identify and guide appropriate, compatible public-use opportunities within YBWA

- Direct the management of YBWA in a manner that promotes cooperative relationships with adjoining private-property owners
- Establish a descriptive inventory of the sites and the wildlife and plant resources that occur in YBWA
- Provide an overview of YBWA's operation, maintenance, and personnel requirements to implement management goals and serve as a planning aid for preparation of the annual budget for CDFW's Bay-Delta Region
- Present the environmental documentation necessary for compliance with State and Federal statutes and regulations, provide a description of potential and actual environmental impacts that may occur during plan management, and identify mitigation measures to avoid or lessen these impacts

13.3 Environmental Consequences

This section describes the environmental consequences of the Project alternatives and the No Action Alternative on recreation resources. This section presents the assessment methods used to analyze the effects on recreation, the thresholds of significance that determine the significance of effects, and the environmental consequences and mitigation measures as they relate to each Project alternative.

Detailed descriptions of the alternatives evaluated in this section are provided in Chapter 2, *Description of Alternatives*.

13.3.1 Methods for Analysis

Data collection and analysis for recreation resources consisted of a review of the plans and policies referenced in Section 13.2, a review of the Project operation and maintenance program, and use of geographic information system (GIS) data pertaining to existing public recreation areas and Project components.

Construction impacts were determined using the following methods:

- GIS analysis to determine the distance of recreation areas from the Project, the amount of recreation land that would be affected, and the recreational facilities and functions that would be temporarily affected because of Project construction
- Review and analysis of the design and the proposed construction right-of-way to determine whether there would be temporary or permanent changes to access and reduction in parking capacity for recreation uses

Operation impacts of the Project alternatives were determined using the following methods:

- Review and analysis of the design and location of Project components to determine whether any barriers to recreation-area access and use would be created or changed
- GIS analysis to determine the distance of recreation areas from the Project, the amount of recreation land that would be affected, and the recreational facilities and functions that would be permanently affected

- Review and analysis of the Project alternatives to determine whether there would be any Project-related increase in the use of recreation areas and resources such that substantial physical deterioration of the resource would occur or would be accelerated

Impacts to recreation are determined relative to Existing Conditions (for California Environmental Quality Act [CEQA]) and the No Action Alternative (for the National Environmental Policy Act [NEPA]). However, as described below, the No Action Alternative would be the same as Existing Conditions because recreation resources are not anticipated to experience substantive changes in the area of analysis. Therefore, the analysis compares the impacts of the action alternatives only to Existing Conditions.

13.3.2 Thresholds of Significance – CEQA

The thresholds of significance for impacts are based on the environmental checklist in Appendix G of the CEQA Guidelines, as amended. These thresholds also encompass the factors considered under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. An impact resulting from implementing an alternative would be significant under CEQA if it would:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated
- Require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment

The Project alternatives do not require the construction of new or expanded recreational facilities that might have an adverse physical effect on the environment. Therefore, there would not be an adverse physical impact on the environment.

13.3.3 Effects and Mitigation Measures

This section provides an evaluation of the direct and indirect effects on recreation resources from implementing the Project alternatives. This analysis is organized by Project alternative, with specific impact topics numbered sequentially under each alternative.

13.3.3.1 No Action Alternative

13.3.3.1.1 Impact REC-1: Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated

Under the No Action Alternative, the Project would not be constructed, and the effects would be similar to Existing Conditions. Therefore, there would be no increase in use of existing recreational areas and no effects on recreational resources overall.

Under the No Action Alternative, no additional actions would be taken to increase seasonal floodplain inundation in the lower Sacramento River Basin or to improve fish passage throughout the Yolo Bypass. The Yolo Bypass would continue to be inundated during overtopping events at Fremont Weir, and additional flows would not pass through Fremont Weir

when the Sacramento River is below Fremont Weir. Therefore, there would be no impacts on recreation compared to Existing Conditions.

CEQA Conclusion

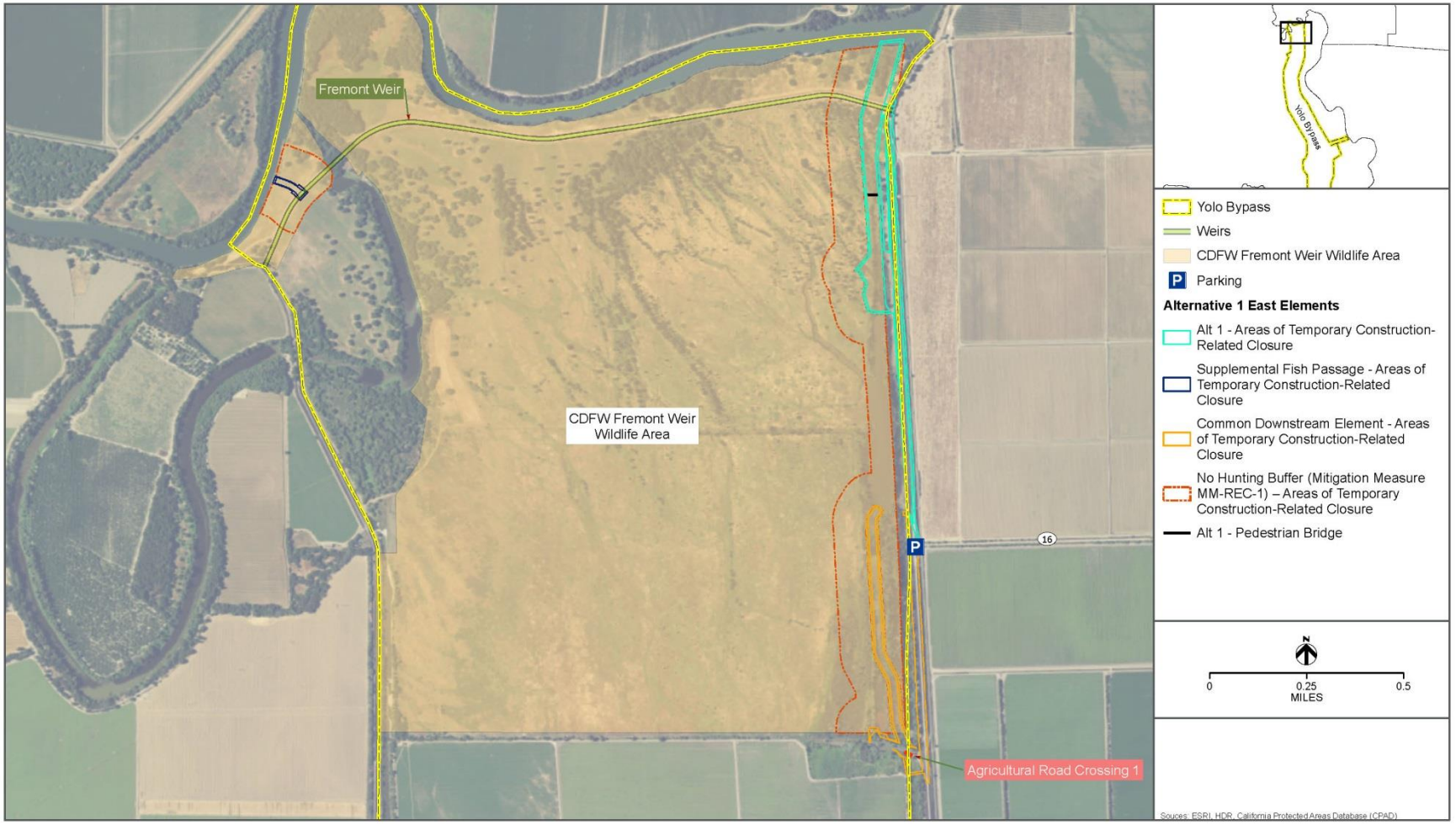
Under the No Action Alternative, there would be **no impact** to recreational demand or change to any recreation facilities because adoption of the No Action Alternative would not result in a change in the environment.

13.3.3.2 Alternative 1: East Side Gated Notch

Alternative 1, East Side Gated Notch, would allow increased flow from the Sacramento River to enter the Yolo Bypass through a gated notch on the east side of Fremont Weir. The invert of the new notch would be at an elevation of 14 feet, which is approximately 18 feet below the existing Fremont Weir crest. Alternative 1 would allow up to 6,000 cubic feet per second (cfs) to flow through the notch during periods when the river levels are not high enough to go over the crest of Fremont Weir to provide open channel flow for adult fish passage. See Section 2.4 for more details on the alternative features. The construction of Alternative 1 would not result in long-term increases in the use of the FWWA nor other nearby wildlife areas such as the SBWA, YBWA, or LIER. Recreational areas in the Project area, namely the SBWA and YBWA, could experience local temporary additional use, depending on the timing and season, due to construction-related FWWA closures. The construction crews would occupy the FWWA access areas temporarily during the 28-week construction period (April 15 to November 1) but would not directly affect the recreational use of the wildlife areas. Maintenance associated with the alternative would be similar but more frequent than Existing Conditions and would not adversely affect recreation opportunities in the Project area. Thus, maintenance is not discussed further.

Effects on Access to Recreation Opportunities at the Established Wildlife Areas

Access for recreation is considered a social effect and is addressed subject to NEPA, whereas CEQA focuses on the physical changes to the environment. This discussion will, therefore, address the social impacts and not make a CEQA finding of significance. During construction, Alternative 1 could have direct effects on recreational access to FWWA due to temporary closures in areas where construction activities would occur. Since Alternative 1's components only exist within the FWWA, these effects do not exist at SBWA, YBWA, or LIER. At FWWA, the sole legal public recreational access occurs from Yolo CR 16 where vehicles may park and then access FWWA lands. This access area would be utilized during construction for staging and access and could be closed to the public to allow for construction equipment and staging, as shown on Figure 13-2. Since this is the only legal public access to FWWA, Alternative 1 could result in reduced access of the FWWA during the construction period. In addition, Alternative 1 components would be located primarily along the eastern boundary of the FWWA, and the construction activities on these lands could further affect recreational access to the FWWA and subsequently affect recreation use. These effects would be short-term and temporary and only occur during the construction period. Other established wildlife areas near FWWA, particularly SBWA and YBWA, offer similar recreational opportunities and could provide viable alternatives to FWWA during the short-term/temporary effects at FWWA during the construction period.



Key: CDFW = California Department of Fish and Wildlife

Figure 13-2. Alternative 1 Areas of Temporary Construction-Related Closure in the CDFW Fremont Weir Wildlife Area

Construction of permanent components for Alternative 1 would affect access throughout the FWWA lands due to the location and alignment of the permanent components. The permanent components would not be located within SBWA, YBWA, or LIER and thus these areas would not be affected by the presence of Alternative 1 components. At FWWA, Alternative 1 would have a direct effect on recreational access from the parking area to FWWA lands due to the barrier created by the proposed transport channels and downstream channel improvements along the full extent of the eastern boundary of the FWWA. However, to maintain access for recreational uses, Alternative 1 includes plans for a pedestrian bridge that would maintain access to and movement through the FWWA lands for recreational uses by crossing the transport channel in the northeast corner of the FWWA, as shown on Figure 13-3. The bridge would maintain access to and movement through FWWA lands.

Effects on Available Lands for Recreation Opportunities at Established Wildlife Area

Loss of lands available for recreation is considered a social effect and is addressed subject to NEPA, whereas CEQA focuses on the physical changes to the environment. This discussion will address the social impacts and not make a CEQA finding of significance. The construction of Alternative 1 would have a direct effect on the amount of lands available for recreational use at the FWWA due to areas of temporary construction-related closure that includes the Alternative 1 components (e.g., headworks, control building, outlet transition, transport channel, and the supplemental fish passage) and the additional lands needed for construction activities and access. In all, the areas of temporary construction-related closure related to the alternative components only would convert a total of 36.1 acres, or 2.5 percent, of the existing lands at FWWA to a non-recreational use in the short-term during construction, as shown in Table 13-2. An additional "no hunting" buffer of 150 yards around the areas of temporary construction-related closure for alternative structures would be implemented as part of a construction mitigation measure (MM-REC-1 below) that would further reduce the amount of available lands in the short-term during construction, as shown on Figure 13-3. The 150-yard mitigation buffer would convert an additional 127.2 acres, or 8.7 percent, of the existing lands at FWWA to a non-recreational use in the short-term during construction, as shown in Table 13-2. These combined areas would result in a total of 163.3 acres of converted lands or 11.2 percent of the existing lands at FWWA. As noted with the access effects above, other established wildlife areas near FWWA, particularly SBWA and YBWA offer similar recreational opportunities and could provide viable alternatives to FWWA during the short-term/temporary effects at FWWA during the construction period.

Table 13-2. Short-term construction effects of Alternative 1 on Recreational Lands and Uses in the 1,461-acre FWWA

Alternative 1 Affected Areas	Affected FWWA Land (acres)	Affected FWWA Land (percent)
Alternative 1 areas of temporary construction-related closure	36.1	2.5%
No hunting buffer (mitigation)	127.2	8.7%
Total	**163.3**	**11.2%**

Key: FWWA= Fremont Weir Wildlife Area

Key: CDFW = California Department of Fish and Wildlife

Figure 13-3. Alternative 1 Areas of Permanent Disturbance in the CDFW Fremont Weir Wildlife Area

Alternative 1 would have a direct permanent effect on the amount of lands available for recreational use at the FWWA due to the areas of permanent disturbance (e.g., headworks, control building, outlet transition, transport channel, and the supplemental fish passage channel), as shown on Figure 13-3. The components would permanently convert a total of 26.7 acres, or 1.8 percent, of the existing lands at FWWA to a non-recreational use.

Beyond the general reduction in lands, the type of lands that would be permanently lost due to the alternative components could have an effect on specific recreational uses or opportunities. The riparian wooded areas and wetland areas in FWWA provide quality habitat for hunting and birding species. Under Alternative 1, the downstream channel improvements in the southeastern corner of FWWA would be located within a riparian wooded area. Despite being located within the riparian wooded area, the channel improvements would be made to the existing channel between the Tule Pond outlet through Agriculture Road Crossing 1, which currently lacks definition and would have limited effects on the riparian wooded area and be focused on the existing channel. As such, Alternative 1 would not impact the valuable wooded area for birding and recreational hunting for deer or ducks. Regarding wetlands, Alternative 1 would result in the permanent conversion of 7.7 acres, or 11.2 percent, of the wetlands in the FWWA.

In contrast to the access affects, the operation of Alternative 1 could result in a more widespread reduction in the amount of lands available for recreation opportunities at the established wildlife areas due to an increased frequency of inundation. This impact would reduce the overall amount of lands available for recreation. Figure 13-4 and Figure 13-5 show the location and changes in the duration of inundation (number of wet days) at the FWWA and SBWA under Alternative 1 and Existing Conditions, respectively. Figure 13-6 and Figure 13-7 show the location and change in duration of inundation at YBWA under Alternative 1 and Existing Conditions, respectively. LIER is not included in this impact discussion because LIER is tidally influenced with two low tides and two high tides each day and is largely a tidal open water and tidal marsh setting with nominal uplands in the northernmost portion of the reserve. Since the primary recreational uses at LIER are water-based recreation uses (e.g., shoreline fishing, boat fishing, waterfowl hunting often using floating blinds, and wildlife viewing), any changes in inundation of the nominal non-open water/upland areas would have a very limited effect on these recreational uses or access.

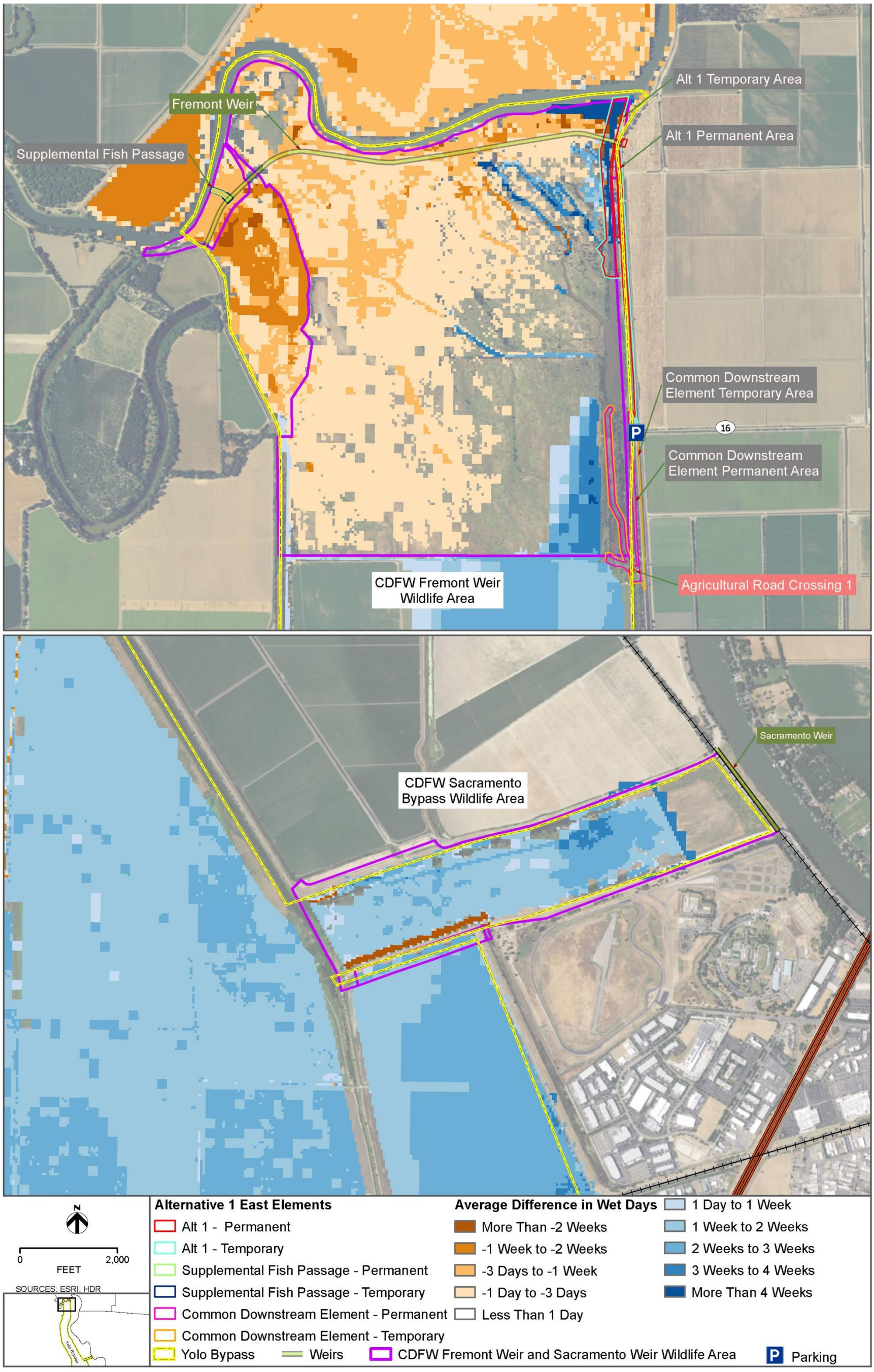
At the FWWA, Alternative 1 would result in a decrease in the duration of inundation across most of the FWWA lands (56 percent or 813.9 acres), as shown in Table 13-3. The most prevalent duration decrease would be one to three days. Alternative 1 would result in an increase in the duration of inundation across 37 percent of FWWA lands, or 546.0 acres, as shown in Table 13-3. Most of the increased periods of inundation (29 percent of FWWA lands or 423.5 acres) would be less than one day. Larger periods of increased inundation (from one week to more than four weeks) would be much smaller in scale and localized in the northeast and southeast portions of FWWA, as shown in Table 13-3 and on Figure 13-4. The riparian wooded area in the southeast portion of FWWA (as highlighted above) would not have any increased periods of inundation. Rather, the increased inundation areas would be to the west of the riparian wooded area. The impacts associated with the areas of longer periods of substantial increased inundation (one week to more than four weeks) under Alternative 1 would be limited as these areas are minimal, discontinuous, and localized. In comparison, Existing Conditions would result in a typical duration of inundation of four to six weeks for the majority of FWWA lands, as shown on Figure 13-5.

Table 13-3. Alternative 1 Changes in Duration of Inundation (in Wet Days) at FWWA, SBWA, and YBWA

Average Difference in Duration of Wet Days	Alternative 1 FWWA (acres)	Alternative 1 FWWA (percent)	Alternative 1 SBWA (acres)	Alternative 1 SBWA (percent)	Alternative 1 YBWA (acres)	Alternative 1 YBWA (percent)
More than -2 weeks	6.1	0%	10.0	3%	0.0	0%
-1 to -2 weeks	15.7	1%	0.3	0%	0.0	0%
-3 days to -1 week	147.3	10%	0.1	0%	0.0	0%
-1 day to -3 days	644.7	44%	0.6	0%	0.2	0%
No change	101.1	7%	47.4	13%	2707.7	16%
Less than 1 day	423.5	29%	43.2	12%	3260.5	19%
1 day to 1 week	20.3	1%	16.4	5%	1524.7	9%
1 week to 2 weeks	10.3	1%	153.5	43%	7005.2	42%
2 weeks to 3 weeks	29.7	2%	77.8	22%	2263.1	13%
3 weeks to 4 weeks	42.9	3%	10.7	3%	8.6	<1%
More than 4 weeks	19.5	1%	0.0	0%	0.0	0%
Total	**1,461**	**100%**	**360**	**100%**	**16,770**	**100%**

Key: FWWA= Fremont Weir Wildlife Area; SBWA= Sacramento Bypass Wildlife Area; YBWA= Yolo Bypass Wildlife Area

At the SBWA, Alternative 1 would result in an overall increase in the duration of inundation across the majority of SBWA lands (84 percent or 301.5 acres), as shown in Table 13-3. The most prevalent duration increases would be one to two weeks in areas covering 153.5 acres, or 43 percent of SWBA lands, and two to three weeks in areas covering 77.8 acres or 22 percent of SBWA lands. Alternative 1 would result in only small areas (10.7 acres or 3 percent) of SBWA land with an increased duration of three to four weeks. In comparison, Existing Conditions (or No Action Alternative) would result in widely varying periods of inundation across SBWA lands, as shown on Figure 13-5. The predominant period of inundation would be four to six weeks, spanning most of the western and central areas, with some areas resulting in six- to eight-week periods of inundation. Areas of substantially longer periods of inundation would also occur, particularly a large, contiguous area in the eastern portion of SWBA that would result in 10 to 15 weeks of inundation as well as linear areas along the northern and southern boundaries of SBWA that would result in more than 20 weeks of inundation. For the majority of SBWA (i.e., in the central and eastern portions), Alternative 1 impacts would represent a 33 to 50 percent increase in the duration of inundation compared to Existing Conditions. The SBWA lands that would result in the longest periods of increased inundation between three and four weeks under Alternative 1 would have limited effects as these lands are nominal in size and occur within areas of SBWA that would be inundated substantially longer (20 weeks or more) under Existing Conditions.



Key: CDFW = California Department of Fish and Wildlife

Figure 13-4. Alternative 1 Location and Change in Frequency of Inundation (in Wet Days) at the CDFW Fremont Weir Wildlife Area and Sutter Bypass Wildlife Area Region

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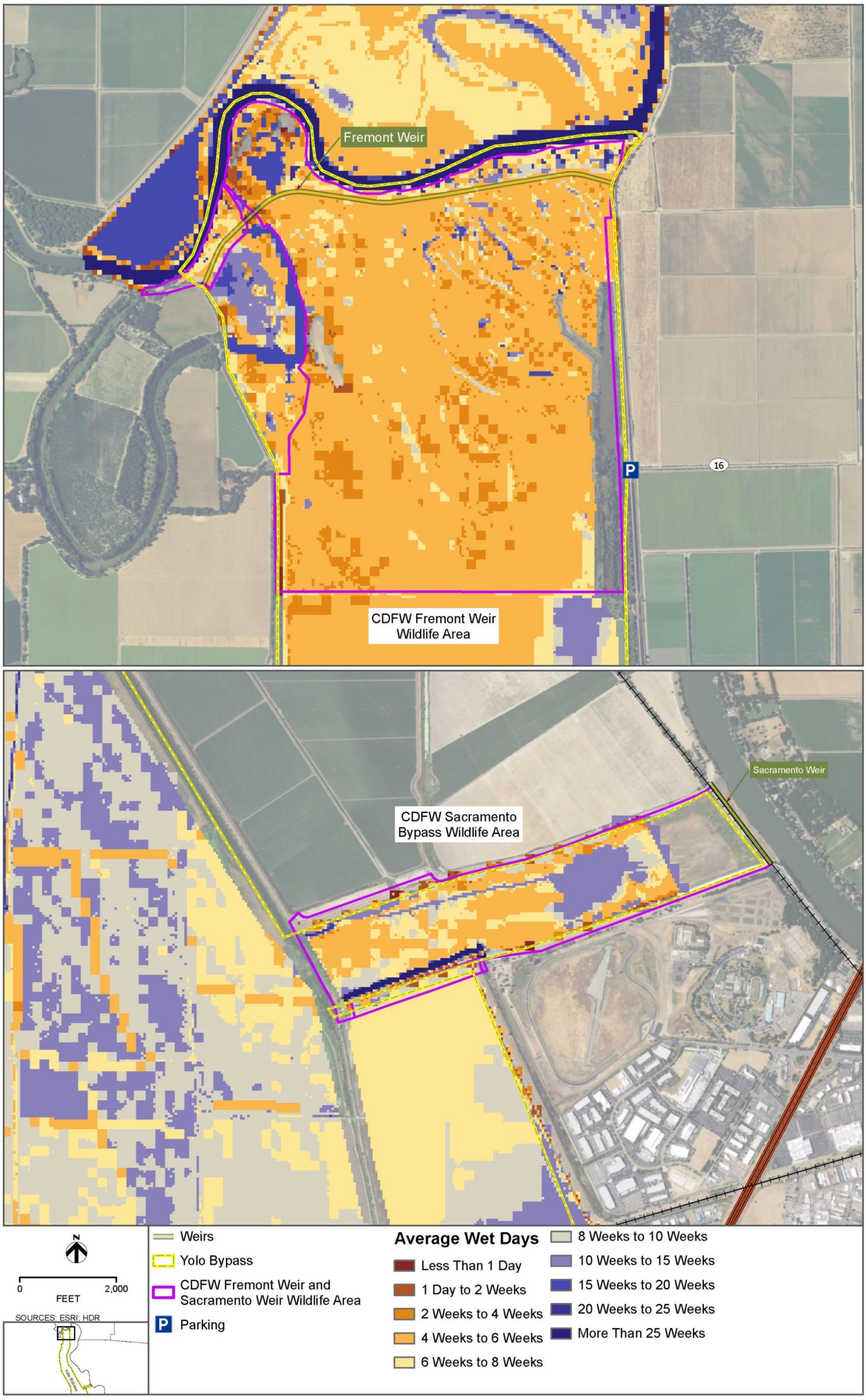

Key: CDFW = California Department of Fish and Wildlife

Figure 13-5. Location and Change in Frequency of Inundation (in Wet Days) at the CDFW Fremont Weir Wildlife Area and Sutter Bypass Wildlife Area under Existing Conditions Region

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At the YBWA, Alternative 1 would result in an overall increase in the duration of inundation across 84 percent of SBWA lands, or 14,062.1 acres, as shown in Table 13-3. The most substantial duration increases would be one to two weeks in areas covering 7,005.2 acres, or 42 percent of YWBA lands, and two to three weeks in areas covering 2,263.1 acres, or 13 percent of YBWA lands, mostly in the northern and central portion of the YBWA, as shown on Figure 13-6. Alternative 1 would result in only small areas (8.6 acres or less than 1 percent) of YBWA land with an increased duration of three to four weeks. In comparison, Existing Conditions would result in six to eight weeks of inundation, as shown on Figure 13-7. Overall, the Alternative 1 impacts would represent a 38 to 50 percent increase over Existing Conditions.

For the private hunting clubs south of YBWA, Alternative 1 would result in varying periods of increased duration of inundation, as shown on Figure 13-6. Alternative 1 would result in an increase in inundation up to two weeks, on average, for approximately half of the private hunting clubs, up to one week for approximately one-quarter of the clubs, and no change for the remaining one-quarter of the clubs. In comparison, Existing Conditions would result in up to six weeks of inundation, on average, where the private hunting clubs are located, as shown on Figure 13-7. Overall, the Alternative 1 impacts would represent a 33 percent increase over Existing Conditions for most of the private hunting clubs.

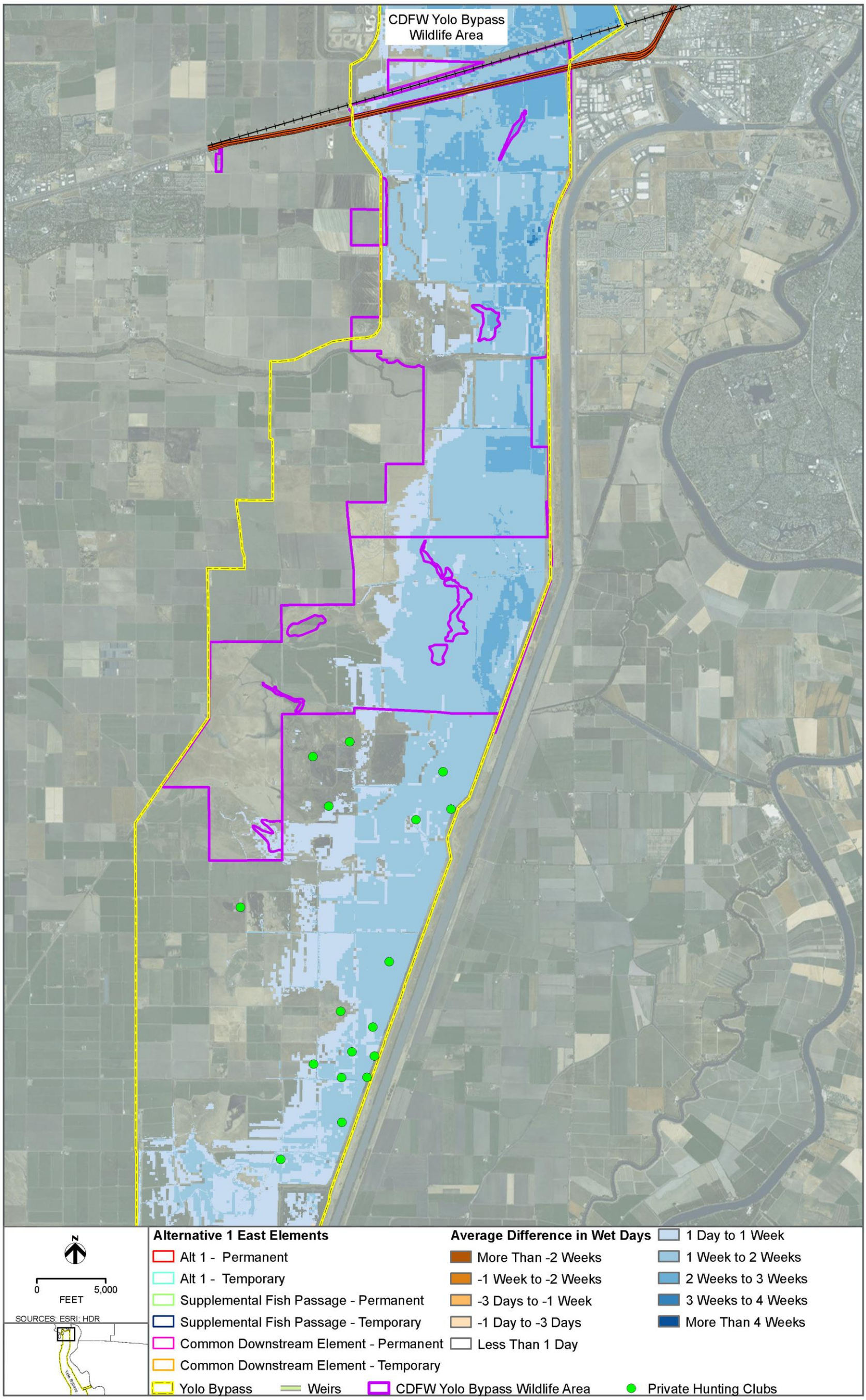
Further, the increased duration of inundation from the operation of Alternative 1 could also result in additional YBWA closures that could result in a loss of popular waterfowl hunting opportunities that has a short season and overlaps with periods of inundation under Existing Conditions. The CDFW closes the YBWA when the water surface elevation at Lisbon Weir is greater than 12 feet. Waterfowl hunting opportunities at YBWA last for approximately 100 days from late October through January. As shown in Table 13-4, during this critical waterfowl hunting season, Alternative 1 would result in YBWA closures for a total of 10.3 days, on average, which equates to an additional 4.1 days or a 66.1 percent increase over Existing Conditions. However, the change in comparison to the 100-day hunting season would only be a 4.1 percent reduction in the number of available hunting days, which would not be a substantial reduction.

Table 13-4. Alternative 1 Changes in Number of Days the Yolo Bypass Wildlife Area is Closed due to Inundation.

Scenario	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total (Oct-May)	Total Waterfowl Hunting Season (Oct-Jan)
Existing Conditions	0.0	0.0	0.9	5.3	5.7	7.0	3.4	0.7	23.0	6.2
Alternative 1	0.0	0.0	1.7	8.6	6.6	7.3	3.4	0.7	28.2	10.3
Difference	0.0	0.0	0.8	3.3	0.9	0.3	0.0	0.0	5.2	4.1

Key: Apr = April; Dec = December; Feb = February; Jan = January; Ma r= March; Nov = November; Oct = October

The change in depth of the inundation could affect the recreational opportunities particularly waterfowl hunting in the Yolo Bypass due to reductions in available shallow-flooded (i.e., less than 18 inches in depth) seasonal managed wetlands (shallow-flooded wetlands) that are critical to waterfowl. Alternative 1 would result in a loss of shallow-flooded wetlands, which are critical lands/habitat for waterfowl. This loss of shallow-flooded wetlands would affect the amount of lands available for recreational waterfowl hunting and thus, indirectly could affect the recreational waterfowl hunting opportunities in the managed wetlands of the Yolo Bypass. The operation of Alternative 1 could also potentially indirectly affect the incentive for private hunting clubs to continue to manage the shallow-flooded wetlands for hunting if the loss of critical waterfowl habitat reduced the hunting opportunities, particularly if the loss occurred in successive years or frequently within a short time period. The shallow-flooded wetlands analysis was conducted for the Yolo Bypass overall and did not assess individual parcels; thus, the timing and magnitude of the potential effects on site-specific parcels such as the private hunting club lands are uncertain. Adding to the uncertainty of these effects, some of the private hunting clubs within the Yolo Bypass have additional hunting areas outside the Yolo Bypass as alternatives when hunting areas are inundated within the Yolo Bypass.



Key: CDFW = California Department of Fish and Wildlife

Figure 13-6. Alternative 1 Location and Change in Frequency of Inundation (in Wet Days) at the CDFW Yolo Bypass Wildlife Area

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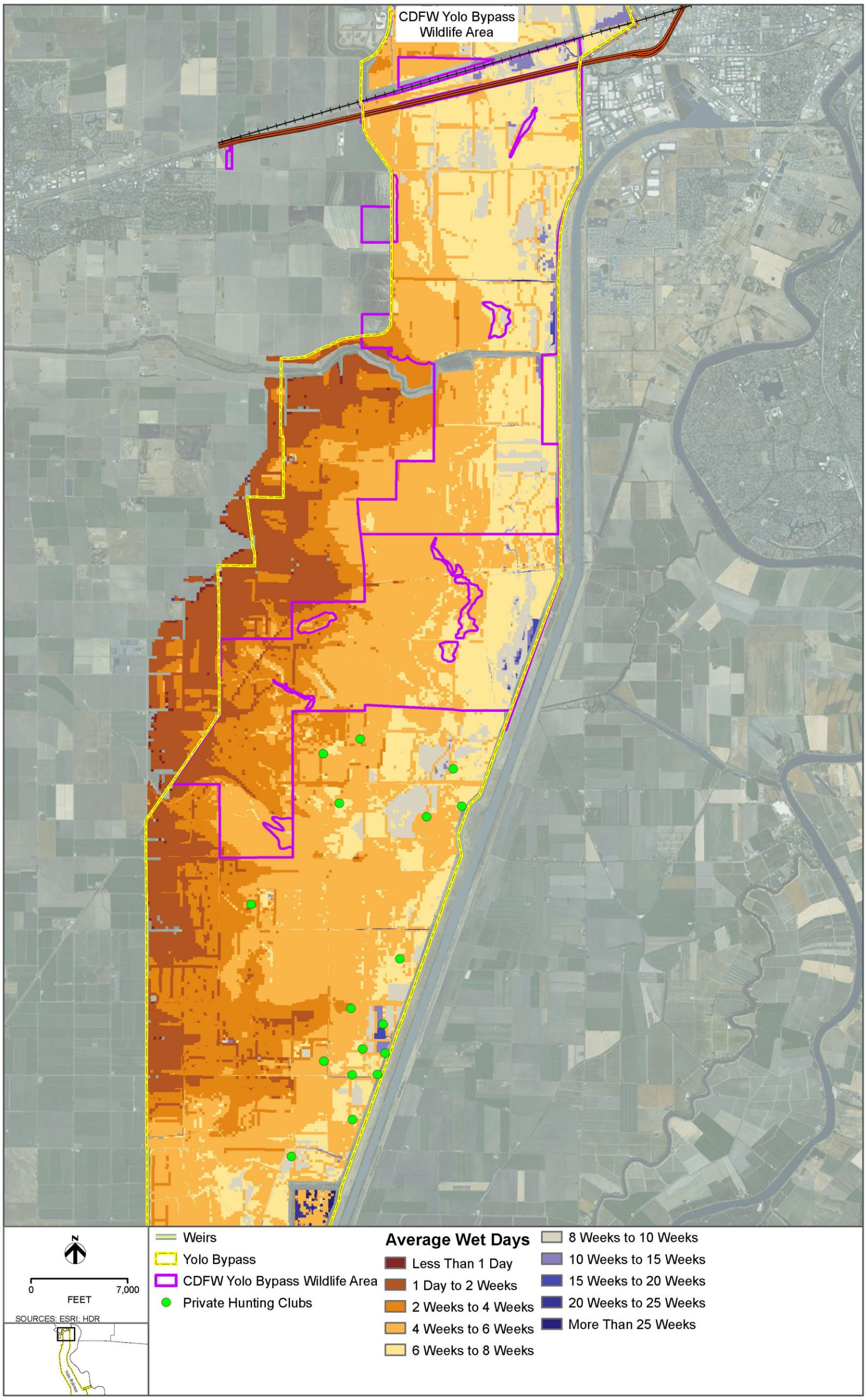

Key: CDFW = California Department of Fish and Wildlife

Figure 13-7. Location and Change in Duration of Inundation (in Wet Days) at the CDFW Yolo Bypass Wildlife Area under Existing Conditions

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More specifically, the operation of Alternative 1 would result in a reduction in the amount of available shallow-flooded wetlands in the three different water years (WY) analyzed -- 1999 (Wet WY), 2002 (Dry WY) and 2005 (Above Normal WY) (Ducks Unlimited 2017). Further, the timing of these reductions would occur during the 100-day waterfowl hunting season from late October through January. In the 1999 Wet WY, Alternative 1 would result in a reduction of shallow-flooded wetlands by up to 4,500 acres, or 38 percent of the of the shallow-flooded wetlands under Existing Conditions. The reductions occur in two separate periods from late November through early December for approximately four weeks and again in the latter half of January into early February for approximately three weeks--both in the midst of the 100-day waterfowl hunting season, as shown on Figure 13-8 (Ducks Unlimited 2017). These two periods of reductions do not occur at all under Existing Conditions. Wet WYs account for 30.5 percent of the WYs during the period of analysis from 1922-2003. In the 2002 Dry WY, Alternative 1 would result in a reduction of shallow-flooded wetlands with the timing and duration of the reductions similar to Existing conditions from late December through late January for approximately four weeks in the midst of the 100-day waterfowl hunting season, as shown on Figure 13-9 (Ducks Unlimited 2017). However, Alternative 1 would result in slight increases in the magnitude of the reductions up to approximately 1,900 acres, or 25 percent of the of the shallow-flooded wetlands under Existing Conditions. Dry WYs account for 19.5 percent of the WYs during the period of analysis from 1922-2003. In the 2005 Above Normal WY, Alternative 1 would result in a reduction of shallow-flooded wetlands with the timing and duration of the reductions similar to Existing Conditions from late December through late January for approximately four weeks in the midst of the 100-day waterfowl hunting season, as shown on Figure 13-10 (Ducks Unlimited 2017). While the reductions under Alternative 1 occur during the same periods as under Existing Conditions, the reductions are greater in magnitude under Alternative 1 with up to approximately 3,700 acres, or 43 percent of the of the shallow-flooded wetlands under Existing Conditions. Above Normal WYs account for 14.6 percent of the WYs during the period of analysis from 1922-2003.

Overall, the operation of Alternative 1 would have an indirect effect on waterfowl hunting opportunities in the Yolo Bypass overall due to the substantial reductions in the availability of shallow-flooded wetlands, especially when combined with the timing of these reductions during the popular 100-day waterfowl hunting season. While reductions in shallow-flooded wetlands occur under Existing Conditions, the magnitude of the reductions under Alternative 1 is considerably greater. In general, while reductions in shallow-flooded wetlands occur under Existing Conditions, the magnitude of the reductions under Alternative 1 is considerably greater. The operation of Alternative 1 could potentially have a considerable indirect effect on the incentive for private hunting clubs to continue managing the shallow-flooded wetlands for waterfowl hunting, particularly if the loss occurred in successive years or frequently within a short period of time. However, there is uncertainty of the magnitude of the effects on individual parcels such as the private hunting clubs since the analysis was conducted for the Yolo Bypass overall and not for individual sites or areas.

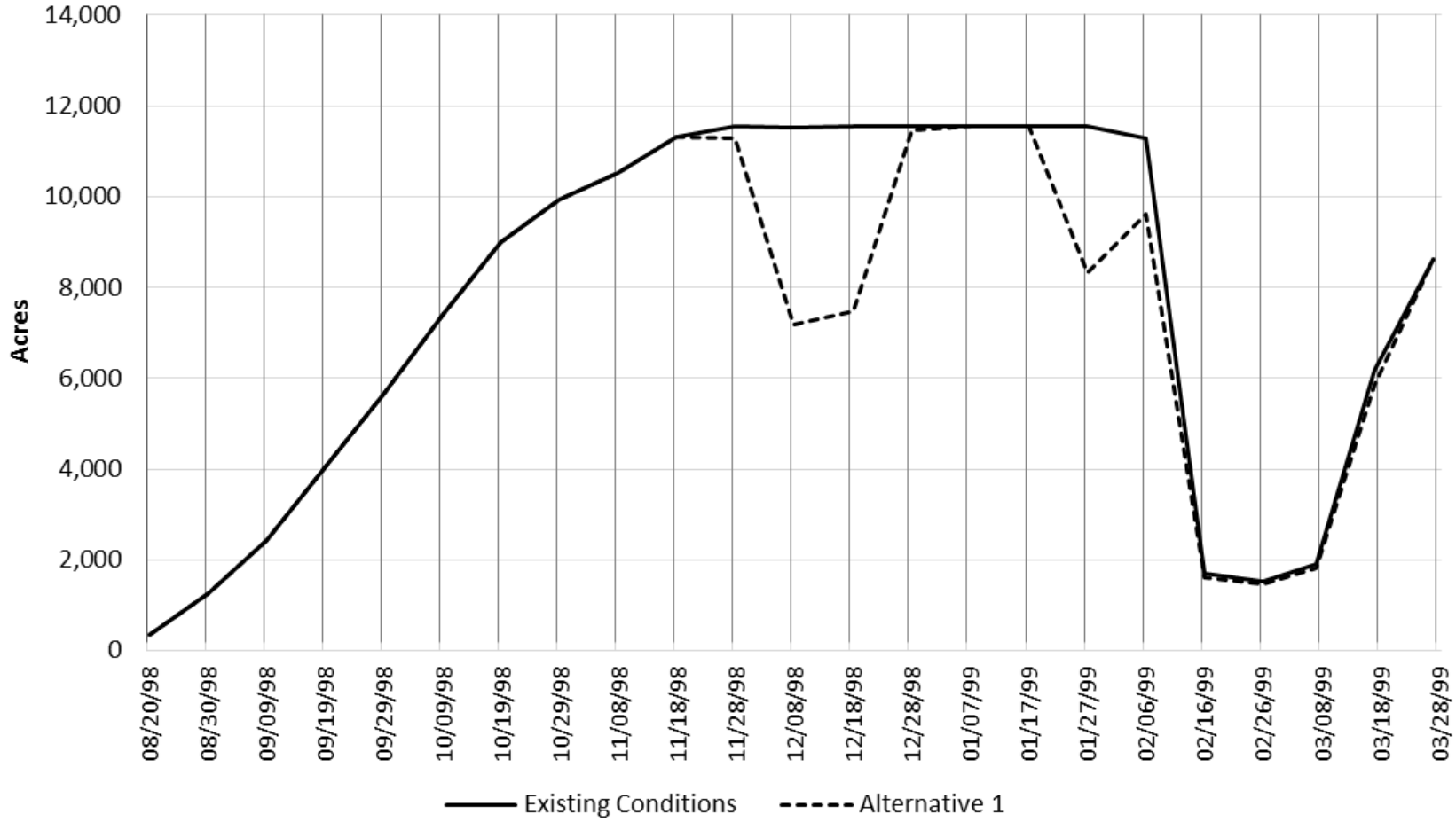


Figure 13-8. Average of number of acres of shallow-flooded (≤18”) managed seasonal wetlands over 10 day periods in the Yolo Bypass for Alternative 1 and Existing Conditions in the in the Wet Water Year 1999 (Ducks Unlimited 2017).

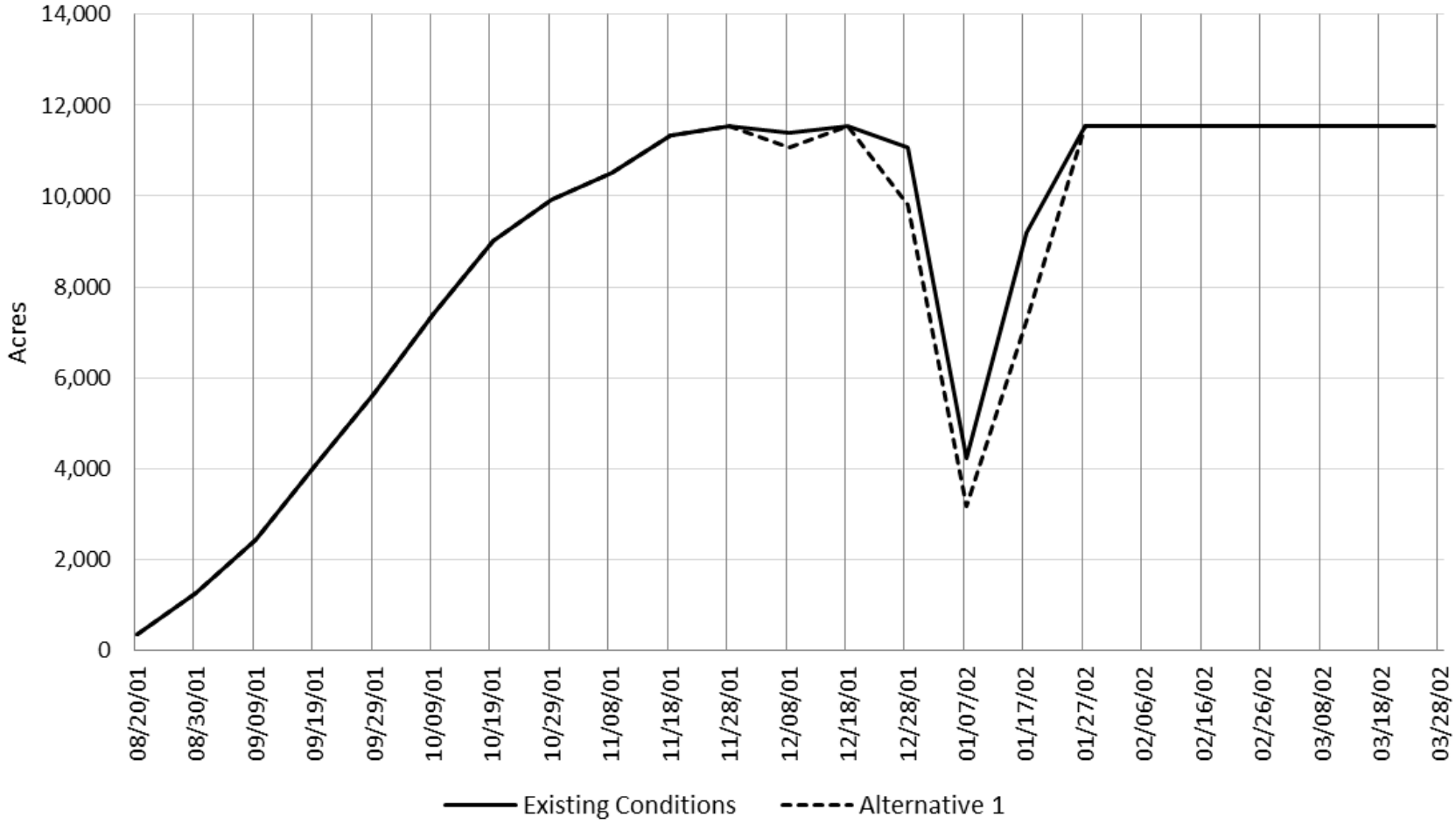


Figure 13-9. Average of number of acres of shallow-flooded (≤18”) managed seasonal wetlands over 10 day periods in the Yolo Bypass for Alternative 1 and Existing Conditions in the in the Dry Water Year 2002 (Ducks Unlimited 2017).

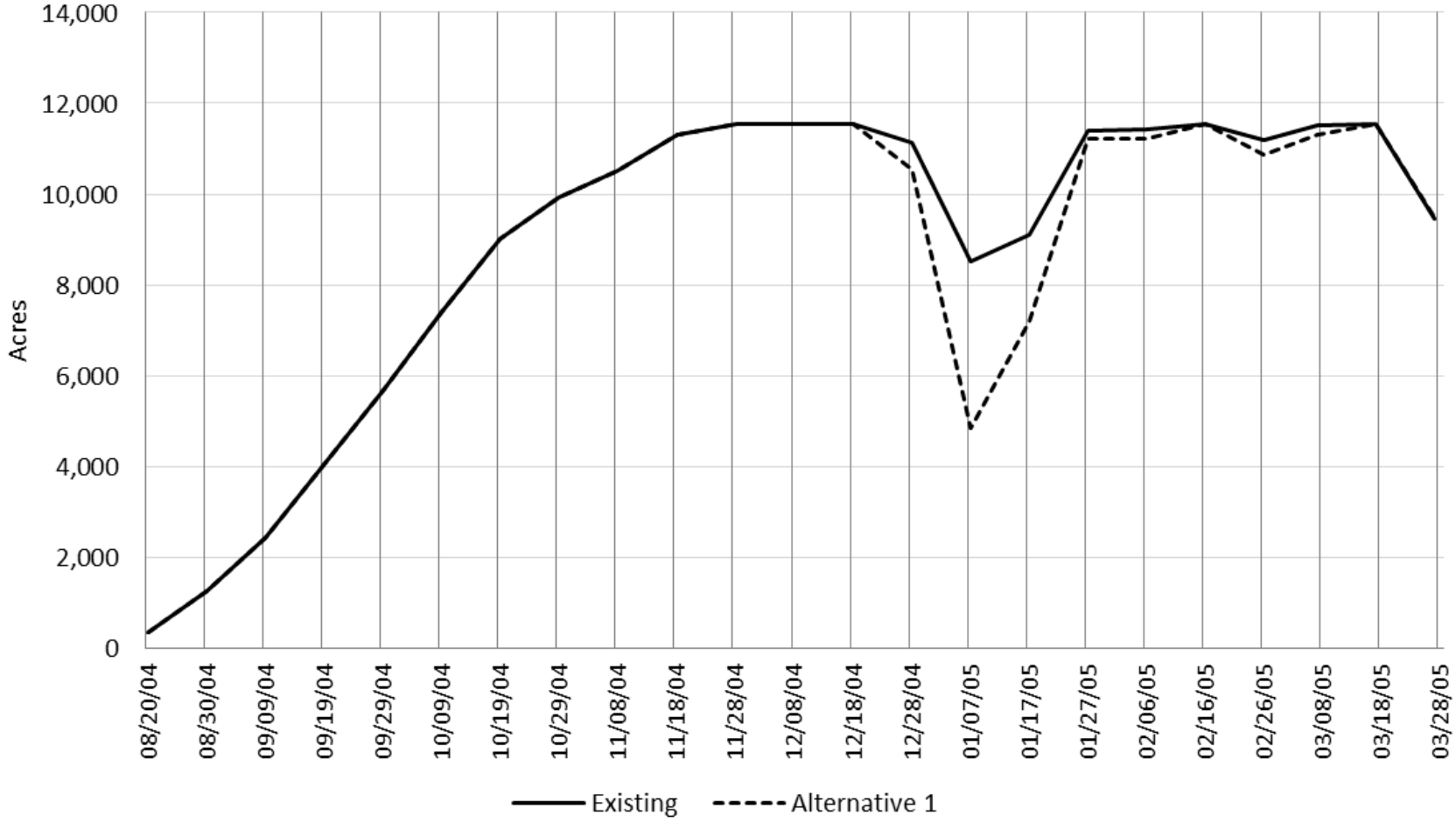


Figure 13-10. Average of number of acres of shallow-flooded (≤18") managed seasonal wetlands over 10 day periods in the Yolo Bypass for Alternative 1 and Existing Conditions in the in the Above Normal Water Year 2005 (Ducks Unlimited 2017).

Closure of Well-Established Wildlife Areas

Loss of lands available for recreation is considered a social effect and is addressed subject to NEPA, whereas CEQA focuses on the physical changes to the environment. Therefore, this discussion will address the social impacts and not make a CEQA finding of significance. Alternative 1 would not result in any additional closures due to the presence of the permanent components, particularly with the plans for a pedestrian bridge to maintain access to FWWA lands. However, Alternative 1 could result in additional closures at YBWA due to the increase in the duration of inundation since current CDFW management closes YBWA when certain levels of inundation occur. CDFW does not formally close FWWA or SBWA during periods of inundation. The operation of Alternative 1 would result in 28.2 days of closures, which represents an increase of 5.2 days or 22.6 percent over Existing Conditions. However, when considering YBWA is generally open year-round, Alternative 1 would result in a 1.4 percent increase in the number of days closed over the year, which would not be substantial.

Conflict with the YBWA LMP by Affecting Access for the Educational Uses of the YBWA

Access to lands available for educational opportunities is considered a social effect and is addressed subject to NEPA, whereas CEQA focuses on the physical changes to the environment. Therefore, this discussion will address the social impacts and not make a CEQA finding of significance. The increased periods of inundation under Alternative 1 could impede access to areas of the YBWA for educational programs and activities, which typically occur from September through May or an approximately 37-week period, particularly the Discover the Flyway program. If substantial increases in the number of wet days occur in the YBWA, impassable road conditions and/or reduced access to bus routes and facilities could occur due to the high water levels. If road and facility access is not available, the educational uses of the YBWA would be reduced, which could conflict with the goals included in the YBWA Land Management Plan (LMP) to support and expand public use of the YBWA for environmental education and interpretation. As shown in Table 13-4, the operation of Alternative 1 would result in YBWA closures for a total of 28.2 days, on average, which equates to an additional 5.2 days or a 22.6 percent increase over Existing Conditions. However, the change in comparison to the 37-week educational program period would only be a 2.0 percent reduction in days, which would not be expected to reduce access to YBWA facilities in a way that would eliminate or substantially reduce the educational uses of the YBWA. Therefore, Alternative 1 would not conflict with the YBWA LMP by substantially affecting access for educational uses.

13.3.3.2.1 Impact REC-1: Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated

Closures of portions of the FWWA would be necessary during the construction period for Alternative 1. Construction activities are anticipated to occur from April 15 through November 1, which overlaps with several hunting seasons. The reduced area available for hunting could result in increased hunting use in other areas of the FWWA or increased use at the YBWA or SBWA. Increased use of recreational areas could result in adverse impacts on the condition of those facilities. But, construction and the associated closures would be temporary, and recreation use levels at the FWWA are relatively low (1,500 recreation days annually), with hunters accounting for approximately two-thirds of those use levels. The potential temporary

increase in use levels within other areas of the FWWA or adjacent recreation areas (e.g., SBWA and YBWA) would be minimal and temporary and would not be expected to result in the substantial physical deterioration of those recreation areas or require the expansion of those recreation areas to accommodate the temporary increase in use levels. The Sutter Bypass Wildlife Area does exist immediately to the north of the Project area, but the wildlife area is a thin linear levee system stretched out the length of the bypass and does not provide a quality hunting experience and is not a viable alternative area. Thus, it would not require expansion of the wildlife area to accommodate temporary use during the construction period.

CEQA Conclusion

Alternative 1 would result in short-term closures during construction that could temporarily increase use levels within other areas of the FWWA or at SBWA and YBWA, but these increases would be minimal and temporary and would not be expected to result in the substantial physical deterioration of those recreation areas. Therefore, this impact would be **less than significant**.

In addition, implementation of Mitigation Measure MM-REC-1 would help to minimize the short-term construction-related effects to recreational access due to closures of the areas where construction is occurring through coordination with CDFW FWWA managers and public notifications. Nonetheless, recreational access would still be restricted in the limited areas of temporary construction-related closures (11.2 percent of FWWA lands) during the construction period from April 15 through November 1, which coincides with much of FWWA's hunting season, including several key hunting periods. Specifically, the construction season would restrict hunting during some of the most popular hunting periods, including the archery deer season opener in mid-August, the general deer season opener in late-September, the dove opener on September 1, quail in mid-October, wild turkey in mid- to late April, and waterfowl season in late October. However, Mitigation Measure MM-REC-1 would provide public notification of the areas of temporary construction-related closure and, thus, allow recreational visitors the ability to utilize FWWA lands outside the construction disturbance (88.8 percent of FWWA lands) or utilize the alternative wildlife areas in the areas that provide similar opportunities, particularly SBWA and YBWA, during the temporary construction period.

Mitigation Measure MM-REC-1: Post notices of scheduled closures and coordinate closures with the Fremont Weir Wildlife Area Manager; rehabilitate the public parking area

During construction, the FWWA will remain open to the public for recreational uses, but the lands under construction and potentially the primary FWWA parking area will be closed to recreational uses. The construction contractor shall post and distribute notifications at the main public FWWA entrance parking area. The construction contractor shall notify the CDFW FWWA manager of any scheduled closure of FWWA lands or features at least 30 days in advance of the construction work. Further, the construction contractor shall coordinate with the CDFW FWWA manager at least 1 week prior to construction and weekly during construction periods so that the manager can provide website notifications related to any access restrictions or area closures. Additionally, the construction contractor, in coordination with DWR, shall make a good faith effort to notify any affected private-property owners or lessees if there will be a closure or other conditions imposed on entry of their respective private property near Project activities.

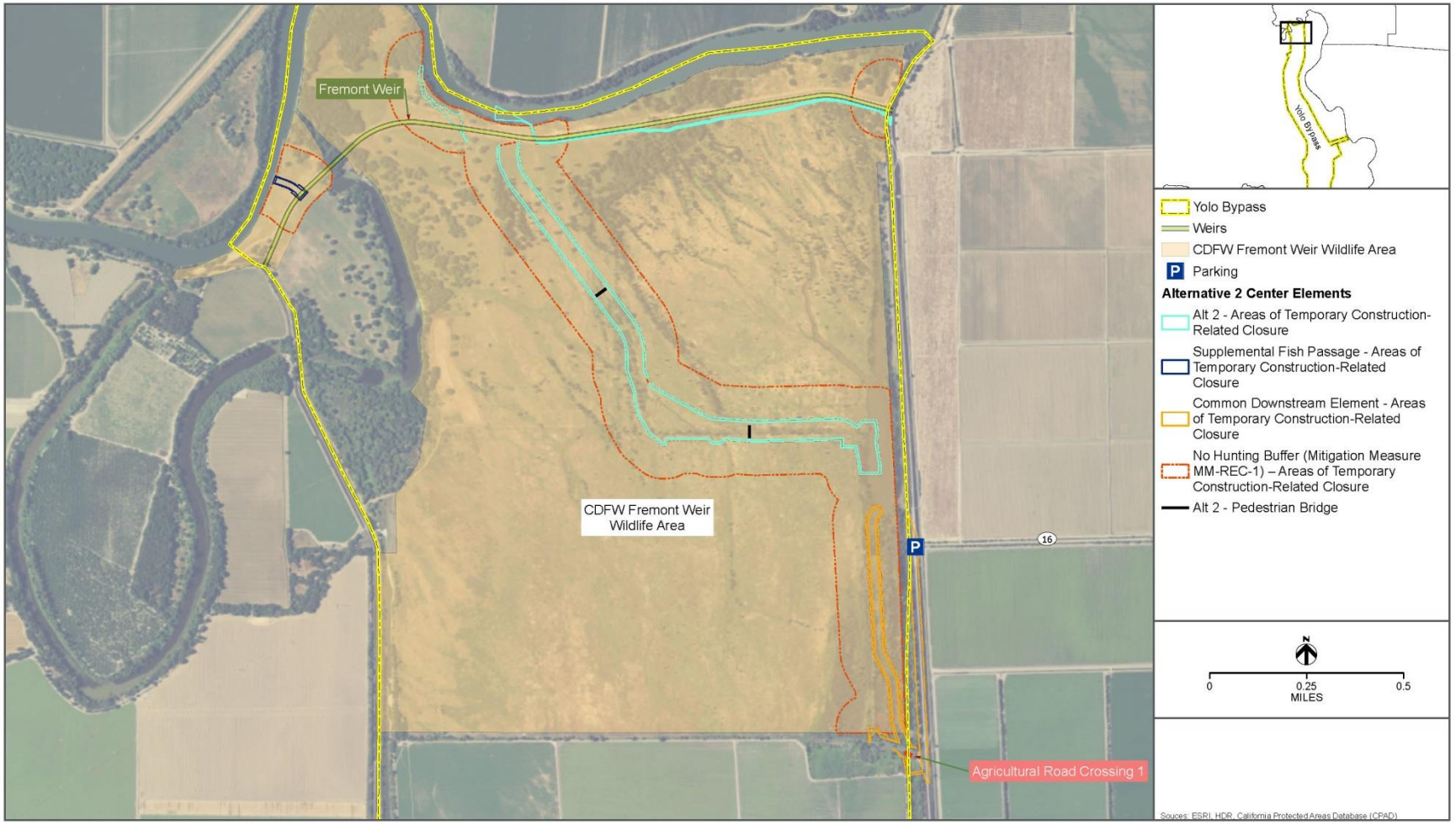
The construction contractor shall construct and maintain a temporary no-hunting boundary extending 150 yards away from the construction area. The construction contractor will mark the boundary with fencing and provide "No Hunting" signs around the buffer, stating the periods of construction and associated hunting restrictions. If the existing FWWA parking area is utilized for construction purposes and the FWWA remains open to the public, an alternative parking area will be provided to allow the public to access the FWWA lands for recreation purposes. Upon completion of construction activities, DWR shall, in consultation with CDFW, rehabilitate the existing parking area to provide adequate public parking for long-term access and use of FWWA. Internal route closures and detours (service roads and trails) shall be established by the construction contractor during construction at Fremont Weir and Agricultural Road Crossing 1, as necessary during heavy traffic periods, to ensure public and worker safety. The construction contractor shall construct a detour around the fish passage facility construction area to redirect users traveling along the Fremont Weir to travel south around the construction site.

13.3.3.3 Alternative 2: Central Gated Notch

Alternative 2, Central Gated Notch, would provide a similar new gated notch through Fremont Weir as described for Alternative 1. The primary difference between Alternatives 1 and 2 is the location of the notch; Alternative 2 would site the notch near the center of Fremont Weir. This gate would be a similar size but would have an invert elevation that is higher (14.8 feet) because the river is higher at this upstream location, and the gate would allow up to 6,000 cfs through to provide open channel flow for adult fish passage. See Section 2.5 for more details on the alternative features.

Effects on Access to Recreation Opportunities at the Established Wildlife Areas

Compared to Alternative 1, Alternative 2 would have slightly different components and alignments, but the temporary construction-related effects and mitigation for recreational access would be the same as those associated with Alternative 1, which would affect only FWWA. The linear transport channel in Alternative 2 would be located along the southeastern boundary of FWWA and would bisect the northern portion of FWWA, as shown on Figure 13-11. Refer to Section 13.3.3.2.1 for a more detailed discussion of the effects of Alternative 1. Similar to Alternative 1, the areas of permanent disturbance for Alternative 2 would also affect access



Key: CDFW = California Department of Fish and Wildlife

Figure 13-11. Alternative 2 Areas of Temporary Construction-Related Closure in the CDFW Fremont Weir Wildlife Area

throughout the FWWA lands due to the location and alignment of the permanent components but would not affect access within SBWA, YBWA, or LIER. Alternative 2 includes plans for two pedestrian bridges that would maintain access to and movement through the FWWA lands for recreational uses by crossing the transport channel in two locations, as shown on Figure 13-12.

Effects on Available Lands for Recreation Opportunities at Established Wildlife Area

Alternative 2 would have effects similar to Alternative 1 on the amount of available lands due to the areas of temporary construction-related closure and the areas of permanent disturbance. The primary difference between Alternatives 1 and 2 is the extent of the areas of temporary closure and permanent disturbance. Under Alternative 2, the areas of temporary construction-related closure for Alternative 2 components plus the additional 150-yard "no hunting" buffer area as part of MM-REC-1 would result in a total of 346.3 acres of converted lands or 23.7 percent of FWWA lands. Alternative 2 would result in the permanent conversion of 65.4 acres, or 4.5 percent of FWWA lands, which includes 6.8 acres of wetlands or 9.9 percent of wetlands within FWWA.

Regarding increased duration of inundation, Alternative 2 would have similar changes in the duration of inundation as Alternative 1, with the same resulting impacts, as shown on Figure 13-4 and Figure 13-6 for Alternative 1. YBWA and SBWA would be affected in terms of recreational access and opportunities from increased periods of inundation up to three weeks on average, which would represent a 33 to 50 percent increase over Existing Conditions and would be considerable. In addition, critical waterfowl hunting opportunities and educational programs would be affected due to increased periods of inundation. Alternative 2 would result in additional closures of YBWA by four additional days or a 66 percent increase over Existing Conditions. However, the change in comparison to the 100-day hunting season would only be a 4.1 percent reduction in the number of available hunting days, which would not be a substantial reduction. Regarding effects on waterfowl hunting opportunities due to changes in the depth of inundation, Alternative 2 would have reductions in the shallow-flooded wetlands and indirect effects on waterfowl hunting opportunities similar to Alternative 1, as shown on Figures 13-8 through 13-10.

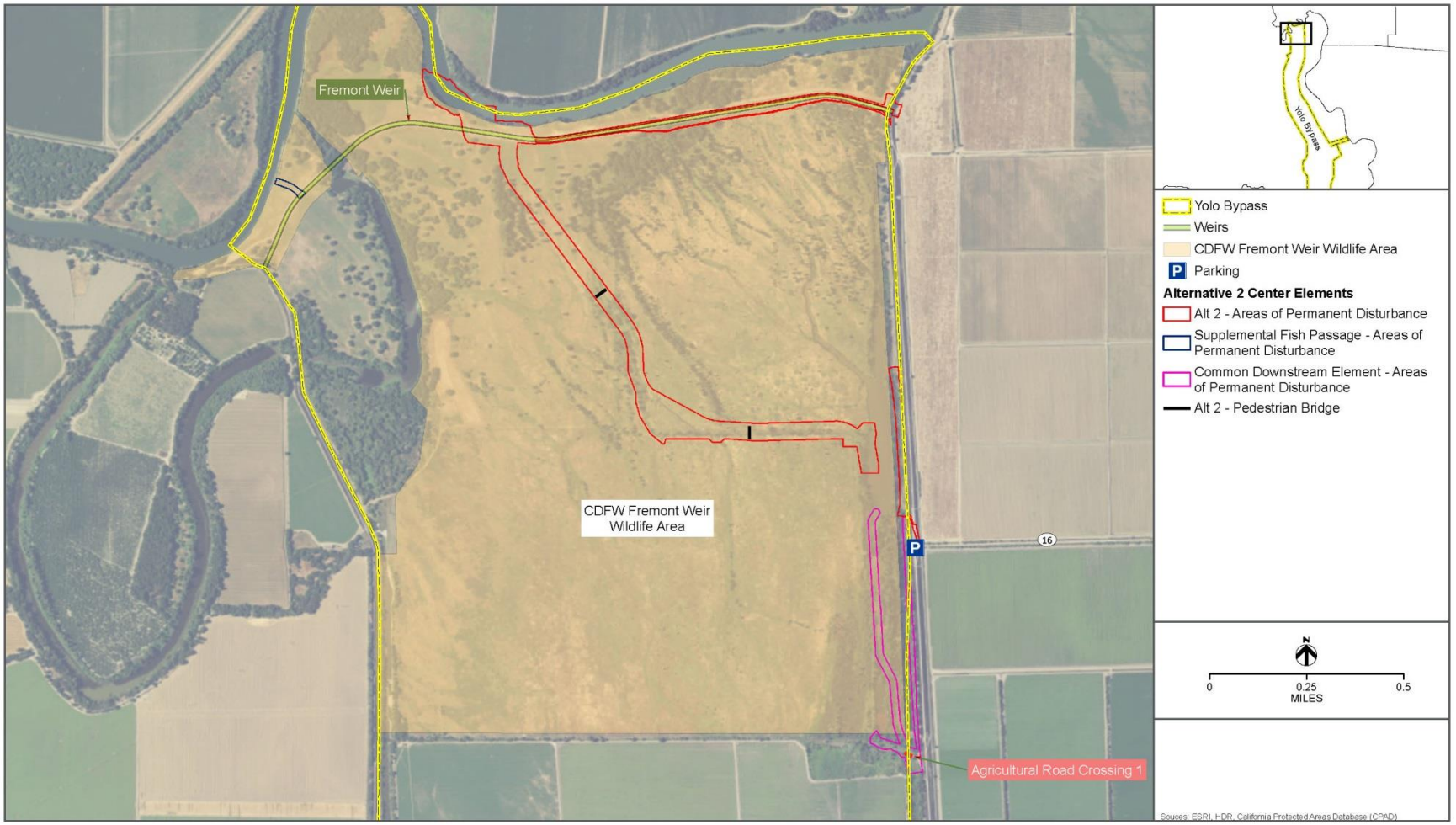
Refer to Section 13.3.3.2.1 for a more detailed discussion of the effects of Alternative 1.

Closure of Well-Established Wildlife Areas

Regarding additional closures of the wildlife areas, Alternative 2 would have the same effects as Alternative 1, whereby Alternative 2 would result in 28.2 days of closures, which represents an increase of 5.2 days or 22.6 percent over Existing Conditions. However, when considering YBWA is generally open year-round, Alternative 2 would result in a 1.4 percent increase in the number of days closed over the year, which would not be substantial.

Conflict with the YBWA LMP by Affecting Access for the Educational Uses of the YBWA

Alternative 2 would have the same effects as Alternative 1, whereby Alternative 2 would result in YBWA closures for a total of 28.2 days, on average, which equates to an additional 5.2 days or a 22.6 percent increase over Existing Conditions. However, the change in comparison to the 37-week educational program period would only be a 2.0 percent reduction in days, which would not be expected to reduce access to YBWA facilities in a way that would eliminate or substantially reduce the educational uses of the YBWA. Therefore, implementation of



Key: CDFW = California Department of Fish and Wildlife

Figure 13-12. Alternative 2 Areas of Permanent Disturbance in the CDFW Fremont Weir Wildlife Area