Covered Species-Specific Criteria for HM Lands Suitable for Compensatory Mitigation

1. HM lands Criteria for California Tiger Salamander Terrestrial Cover and Aestivation Habitat

   Grasslands, associated vernal pools, and alkali seasonal wetlands will be protected in perpetuity as compensation for effects on California tiger salamander (CTS). HM lands protected as compensatory mitigation for impacts to CTS shall be approved in writing by CDFW and be prioritized based on the following characteristics:

   - Large contiguous landscapes that consist of grasslands, vernal pool complex, and alkali seasonal wetland complex and encompass the range of vegetation, hydrologic, and soil conditions that characterize these communities.

   - Lands that maintain connectivity with protected grassland, vernal pool complex, and alkali seasonal wetland complex landscapes near the project area, including connectivity with lands that have been protected or may be protected in the future under the East Contra Costa County HCP/NCCP.

   - Grasslands containing stock ponds and other aquatic features that provide aquatic breeding habitat for CTS.

   - Adjacent or connected to occupied CTS upland or aquatic habitat.

2. HM Lands Criteria for Swainson's Hawk Habitat

   HM lands protected as compensatory mitigation for impacts to Swainson's hawk (SWHA) nesting habitat shall be approved in writing by CDFW and meet the following criteria:

   - SWHA suitable nesting habitat includes mature trees (20 feet or greater) in riparian systems as well as in single, isolated and roadside trees.

   - Nest sites are generally adjacent to or within easy flying distance to alfalfa or hay fields or other habitats or agricultural crops which provide an abundant prey source.

   - The following tree types are known to be preferred by Swainson's hawk:

     - Valley oaks (*Quercus lobata*)

     - Fremont's cottonwood (*Populus fremontii*)

     - Willows (*Salix* spp.)

     - Sycamores (*Platanus* spp.)

     - Walnuts (*Juglans* spp.)

   HM lands protected as compensatory mitigation for impacts to SWHA foraging habitat shall be approved in writing by CDFW and meet the following criteria:

   - Foraging habitat shall be protected within 3 miles of a known SWHA nest tree and within 50 miles of the Project Area.

- Protected foraging habitat shall have land surface elevations equal to or greater than -1 foot NAVD88 to minimize the risk of flooding and loss of suitable habitat due to future sea level rise.

- Individual patches of foraging habitat shall be at least 40 acres in size.

- SWHA prey populations shall be supported by establishing 20- to 30-foot-wide hedgerows along field borders and roadsides at a minimum rate of 400 linear feet per 100 acres of protected cultivated lands.

- Cultivated lands shall be maintained in non-permanent crop types as follows, and as described in Table A6-1:

    - At least 37.5% of SWHA HM lands will be in Very High Value foraging habitat on an annual basis.
    - The amount of SWHA HM lands in Very High Value habitat shall increase to at least the amount impacted as a result of Covered Activities, if it is more than 37.5% of the toal impacted SWHA foraging habitat.
    - At least 25% of SWHA HM lands shall be in High Value foraging habitat and other grasslands managed for SWHA use on an annual basis.
    - No more than 15% of SWHA HM lands shall be in Low Value foraging habitat on an annual basis.
    - No SWHA HM lands shall be in No Value foraging habitat.

Table A6-1. Swainson's Hawk Foraging Habitat Value Classes

Foraging Habitat Value Class	Assigned Agricultural Crops/ Habitats	Rationale for Assignment of Agricultural Crop Class	Information Sources
Very High Value	Alfalfa	Alfalfa has the highest value because it is semi-perennial (up to 5 years before rotation), which increases prey abundance; has a relatively low profile such that prey are accessible season-long; and has a management regime (mowing and irrigation) which further increases prey accessibility.	Estep 1989, 2009; Swolgaard et al. 2008
High Value	Native pasture, mixed pasture, clover, miscellaneous grasses, non-irrigated native pasture and pasture, native vegetation[a]	These pasture types provide a relatively consistent vegetation structure and rodent prey populations. There is less seasonal variability with respect to prey abundance and accessibility compared with grain and vegetable crops, but they lack the management practices that enhance prey accessibility found in alfalfa.	Estep 1989, 2009; Swolgaard et al. 2008
Medium Value	Grasslands, managed wetlands, alkali seasonal wetlands, Vernal pool complex, tomatoes, beets, wheat, oats, miscellaneous grain and hay, nonirrigated miscellaneous grain and hay, mixed grain and hay, non-irrigated mixed grain and hay	Certain row crops, such as beets and tomatoes have a relatively high value because they support large rodent prey populations, are accessible season-long because of their relatively low vegetation profile, and they are harvested prior to migration, when an abundance of prey becomes available. Most grain crops (primarily wheat in Yolo County) provide value during and following harvesting, when prey become accessible. Grasslands are generally available season-long but provide lower prey abundance compared with higher value agricultural habitats, don't provide a peak period of high-value abundance and accessibility like some agricultural crops (e.g., tomatoes), and in some cases grass height reduces prey accessibility during a portion of the breeding season.	Estep 1989, 2009; Swolgaard et al. 2008
Low Value	Broccoli, sudan, dry beans, field crops, asparagus, green beans, carrots, melons/squash/ cucumbers, onions/garlic, peppers, lettuce truck/nursery/ berry crops, miscellaneous field, Safflower, corn, grain sorghum, sunflower	The truck and berry/field crop agriculture types are suitable for a portion of the breeding season depending on their structure and planting/harvesting regime. In general, they produce less prey abundance and less prey availability than the other agriculture types listed above.	Estep 1989, 2008; Swolgaard et al. 2008
No Value	Rice, orchards, vineyards (i.e., permanent crops)	Permanent crops have little use because they are very difficult for Swainson's Hawks to access prey in them.	Estep 1989, 2009; Swolgaard et al. 2008

[a] Native vegetation is a land use designation within the California Department of Water Resources crop type dataset (2007). For the purposes of incorporating native vegetation classes into the correct species models, and, when applicable, assigning habitat foraging values, the management on these lands most resembles that of native pasture, an irrigated pasture type.

3. HM Lands Criteria for Tricolored Blackbird Habitat

HM lands protected as compensatory mitigation for impacts to tricolored blackbird (TRBL) nesting habitat shall be approved in writing by CDFW and meet the following criteria:

- Occupied or recently occupied (within the last 15 years) stands of bulrush/cattail emergent vegetation.

- Wetland marsh habitat that contains standing water to a depth of 1 foot in most years from late January through late July to encourage dense development of cattail and bulrush vegetation and to provide protection from predators until nesting is completed; and that is within 6 kilometers of high or very high quality foraging habitat (see Table 2).

- Alternative nesting habitat may be considered based on best available science (e.g., protection of upland TRBL nesting habitat including blackberries or some of the other upland vegetation species frequently used by TRBL for nesting).

HM lands protected as compensatory mitigation for impacts to TRBL foraging habitat shall be approved in writing by CDFW and meet the following criteria:

- Large contiguous landscapes that consist of high or very high quality cultivated lands, grasslands, vernal pool complex, and alkali seasonal wetland complex (see Table 2).

- Cultivated lands that incorporate riparian corridors, water conveyance channels, grasslands, and wetlands.

- Cultivated lands that provide opportunities to maintain a mosaic of crop types and allow for the periodic rotation of essential crop types (those crop types with very high, high, and moderate foraging habitat values) to nonessential crop types to ensure acreage commitments (Table A6-2).

- Cultivated lands that expand upon or provide connectivity between existing conservation lands.

Table A6-2. Tricolored Blackbird Foraging Habitat Value Classes

Foraging Value Class	Breeding Season Foraging Habitat	Nonbreeding Season Foraging Habitat
Very high	Native pasture, nonirrigated native pasture, annual grasslands, vernal pool grasslands, alkali grasslands, unsprayed alfalfa, unsprayed sunflower, unsprayed mixed alfalfa	Livestock feed lots
High	Sunflower, alfalfa and mixed alfalfa, mixed pasture, induced high water table native pasture, nonirrigated mixed pasture, dairies	Corn, sunflower, millet, alfalfa and mixed alfalfa, mixed pasture, native pasture, induced high water table native pasture, nonirrigated native pasture, rice, dairies, annual grasslands, vernal pool grasslands, alkali grasslands
Moderate	Miscellaneous grass pasture, fallow lands cropped within 3 years, new lands prepped for crop production, livestock feed lots, organic rice	Miscellaneous grass pasture nonirrigated mixed pasture, fallow lands cropped within 3 years, new lands prepped for crop production, organic rice
Low	Wheat, mixed grain and hay, farmsteads, Rice	Wheat, oats, mixed grain and hay, farmsteads

4. HM Lands Criteria for Giant Garter Snake Habitat

HM lands protected as compensatory mitigation for impacts to giant garter snake (GGS) aquatic nontidal marsh and associated upland habitat shall be approved in writing by CDFW and meet the following criteria:

- Restored or protected nontidal marsh will be characterized by sufficient water during the giant garter snake's active summer season (May 1–October 1) to supply constant, reliable cover and sources of food such as small fish and amphibians.

- Restored or protected nontidal marsh will consist of still or slow-flowing water over a substrate composed of soil, silt, or mud characteristic of those observed in marshes, sloughs, or irrigation canals.

- Restoration designs will not create large areas of deep, perennial open water that will support nonnative predatory fish. The restored marsh will be characterized by a heterogeneous topography providing a range of depths and vegetation profiles consisting of emergent, herbaceous aquatic vegetation that will provide suitable foraging habitat and refuge from predators.

- Aquatic margins or shorelines will transition to uplands consisting of grassy banks, with the dense grassy understory required for sheltering. These margins will consist of approximately 200 feet of high ground or upland habitat above the annual high water mark (highest level to which water rose that year) to provide cover and refugia from floodwaters during the dormant winter season.

- The upland habitat will have ample exposure to sunlight to facilitate giant garter snake thermoregulation and will be characterized by low vegetation, bankside burrows, holes, and crevices providing critical shelter for snakes throughout the day. All giant garter snake upland and aquatic habitat will be established at least 2,500 feet from urban areas or areas zoned for urban development.

HM lands protected as compensatory mitigation for impacts to giant garter snake (GGS) aquatic tidal marsh and associated upland habitat shall be approved in writing by CDFW and meet the following criteria:

- The restored wetlands will provide sufficient water during the active summer season (May 1 – October 1) to supply constant, reliable cover and sources of food (e.g., small fish and amphibians) for giant garter snake.

- The restored wetlands will be designed to mute or reduce flows; provide still or slow-flowing water over a substrate composed of soil, silt, or mud characteristic of those observed in marshes, sloughs, or irrigation canals; and avoid fast-flowing water over sand, gravel, or rock substrate.

- The restored wetlands will be designed (e.g., through grading) to facilitate extended hydroperiods in shallow basins that experience only small, gradual (i.e., slower than tidal flooding/draining) changes in inundation. Design features may include notched or lowered levees that prevent full draining during low tides, intertidal dendritic channels with variable bottom elevations, and other features that retain water such as potholes, ponds/pannes, and shallow isolated backwaters.

- The restored wetlands will not include large areas of deep, open water that will support nonnative predatory fish.

- The restored wetlands will be characterized by a heterogeneous topography that provides the range of depths and vegetation profiles (i.e., emergent, herbaceous aquatic) required for suitable foraging habitat and refuge from predators at all tide levels.

- The restored wetlands will be designed to provide adjacent terrestrial refuge—grasslands above the high water mark—for giant garter snake.

- Topography of the restored wetlands will be designed to provide adjacent terrestrial refuge persisting above the high water mark. Terrestrial features will be sited in close proximity to aquatic foraging areas at all tide levels, with slopes and grading designed to avoid exposing largely denuded intertidal mud flats during low tide.

5. HM Lands Criteria for Winter- and Spring- Run Chinook Habitat

Tidal perennial aquatic habitat will be restored and protected in perpetuity as compensation for effects on CHNWR and CHNSR. HM lands protected as compensatory mitigation for impacts to CHNWR and CHNSR tidal perennial aquatic habitat shall be sited in consultation with NMFS, USFWS, and CDFW, within areas of the Delta appropriate for offsetting effects of the Project, approved in writing by CDFW, and prioritized based on the following characteristics:

- Restoration of tidal perennial aquatic habitat will primarily occur through breaching or setback of levees, thereby restoring tidal fluctuation to land parcels currently isolated

behind those levees. Factors to be considered when evaluating sites for potential location and design of tidal perennial habitat restoration include the potential to create small (1st and 2nd order) dendritic tidal channels (channels that end in the upper marsh) for rearing (Fresh 2006); tidal freshwater sloughs with rich production of such insects as chironomid (midge) larvae; brackish marshes with emergent vegetation providing insect larvae, mysids, and epibenthic amphipods; and open-water habitats with drifting insects, zooplankton such as crab larvae, pelagic copepods, and larval fish (Quinn 2005).

- Shallow subtidal areas in large portions of the Delta support extensive beds of nonnative SAV that adversely affect listed species of fish (Nobriga et al. 2005; Brown and Michniuk 2007; Grimaldo et al. 2012). In other portions of the Delta, shallow subtidal areas provide suitable habitat for native species, such as Delta Smelt in the Liberty Island/Cache Slough area, and do not promote the growth of nonnative SAV (Nobriga et al. 2005; McLain and Castillo 2009). Tidal perennial habitat restoration is not intended to restore large areas of shallow subtidal aquatic habitat, which would collaterally create habitat for nonnative predators; rather, shallow subtidal aquatic habitat restoration is proposed in association with tidal habitat, which will provide more heterogeneity and support pelagic habitat adjacent to emergent wetland.
- Bench habitats will be incorporated into site selection and design to provide added specific benefits to salmonids, such as shallow-water foraging and refuge habitat.
- Where appropriate, portions of restoration sites will be raised to elevations that will support tidal marsh vegetation following levee breaching. Depending on the degree of subsidence and location, lands may be elevated by grading higher elevations to fill subsided areas, importing clean dredged or fill material from other locations, or planting tules or other appropriate vegetation to raise elevations in shallowly subsided areas over time through organic material accumulation (Ingebritsen et al. 2000). Surface grading will create a shallow elevation gradient from the marsh plain to the upland transition habitat.
- Based on assessments of local hydrodynamic conditions, sediment transport, and topography, restoration activities may be designed and implemented in a manner that accelerates the development of tidal channels within restored marsh plains. Following reintroduction of tidal exchange, tidal marsh vegetation is expected to establish and maintain itself naturally at suitable elevations relative to the tidal range. Depending on site-specific conditions and monitoring results, patches of native emergent vegetation may be planted to accelerate the establishment of native marsh vegetation on restored marsh plain surfaces.

Channel margin habitat will be restored and protected in perpetuity as compensation for effects on CHNWR and CHNSR. HM lands protected as compensatory mitigation for impacts to CHNWR and CHNSR channel margin habitat shall be sited in consultation with NMFS, USFWS, and CDFW, within areas of the Delta appropriate for offsetting effects of the Project, approved in writing by CDFW, and prioritized based on the following characteristics:

- Channel margin restoration will be accomplished by improving channel geometry and restoring riparian, marsh, and mudflat habitats on the water side of levees along channels that provide rearing and outmigration habitat for juvenile salmonids, similar to what is currently done by the USACE and others when implementing levee improvements.
- Channel margin enhancements associated with federal project levees will not be implemented on the levee, but rather on benches to the waterward side of such levees, and flood conveyance will be maintained as designed. Channel margin enhancements associated with federal project levees may require permission from USACE in accordance with USACE's authority under the Rivers and Harbors Act (33 USC Section 408) and USACE levee vegetation policy.
- Sites will be selected at locations along the Sacramento River, Steamboat and Sutter Sloughs, or in other areas subject to approval by NMFS and CDFW.
- Linear miles of enhancement will be measured along one side of a given channel segment (e.g., if both sides of a channel were enhanced for a length of 1 mile, this would account for a total of 2 miles of channel margin enhancement).
- Chinook salmon use channel margin habitat for rearing and protection from predators, and the primary purpose of channel margin enhancement is to offset shoreline effects caused by permanent habitat removal. Vegetation along channel margins contributes woody material, both instream and on channel banks, which increases instream cover for fish and shall be incorporated into channel margin restoration.
- Channel margin habitat is expected to provide rearing habitat and improve conditions along important migration corridors by providing increased habitat complexity, overhead and in-water cover, and prey resources for CHNWR and CHNSR.
- Channel margin restoration or enhancement is intended to increase habitat diversity and complexity, provide long-term nutrient storage and substrate for aquatic macroinvertebrates, moderate flow disturbances, increase retention of leaf litter, and provide refuge for fish during high flows. Channel margin enhancement is expected to increase rearing habitat for Chinook salmon fry in particular, through enhancement and creation of additional shallow-water habitat that will provide foraging opportunities and refuge from unfavorable hydraulic conditions and predation.
- The following habitat suitability factors will be considered when evaluating sites for potential location and design of enhanced or restored channel margins.
    - Existing poor habitat quality and biological performance for CHNWR and CHNSR combined with extensive occurrence of CHNWR and CHNSR.
    - Locations where migrating salmon are likely to require rest during high flows.
    - The length of channel margin that can be practicably enhanced and the distance between enhanced areas (there may be a tradeoff between enhancing multiple shorter reaches that have less distance between them and enhancing relatively few longer reaches with greater distances between them).

- The potential cross-sectional profile of enhanced channels (elevation of habitat, topographic diversity, width, variability in edge and bench surfaces, depth, and slope).
- The potential amount and distribution of installed woody debris along enhanced channel margins.
- The extent of shaded riverine aquatic overstory and understory vegetative cover needed to provide future input of large woody debris.