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Informal Biological Evaluation for Mosquito Source Reduction Activities in Tidal Habitats of the San Francisco Bay Area

Final Report

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1 Introduction

1.1 Purpose and Scope of the Informal Biological Evaluation

The purpose of this "informal" biological evaluation (IBE) is to supplement materials required by San Francisco Bay Area mosquito abatement, and mosquito and vector control districts (MADs) for renewal authorization of permits required for mosquito source reduction work in tidal habitats. Wetlands and Water Resources, Inc. (WWR) has prepared this IBE on behalf of the following MADs: Marin/Sonoma, Napa, Solano, Alameda, and San Mateo (Figure 1). This IBE describes mosquito source reduction actions that may potentially be implemented in tidal habitats within each MAD jurisdiction. This IBE also identifies potentially affected federally listed species under the Endangered Species Act (ESA) and designated or proposed critical habitats under the management jurisdiction of the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service (NMFS). The IBE describes the current status, distribution, and likelihood of occurrence of federally listed species (endangered threatened, or candidate species) within the mosquito source reduction work areas (here forth referred to as 'work areas') and identifies potential effects on these species. The IBE also provides proposed Best Management Practice Measures (BMP) aimed to reduce potential impacts to and prevent incidental take of federally listed species.

This document is not, nor is it intended to replace a formal U. S. Fish and Wildlife Service (USFWS) Biological Evaluation (BE) or Biological Assessment (BA). The IBE does not quantify effects on federally listed species that could result from proposed mosquito source reduction actions, nor does it offer an effects determination. It is WWR's understanding that the USFWS will utilize the information contained in this document to prepare a BA in support of permits for MAD source reduction activities.

1.2 Regulatory History

Mosquito and vector control districts in the San Francisco Bay Area have practiced mosquito source reduction within tidal marsh habitats since the first district was formed in 1915. Since 1976, this work has been continuously sponsored by the California Department of Health Services Vector-Borne Disease Section, and permitted under a US Army Corps of Engineers (USACE) Regional Permit (the most recent being Regional Permit No. 4). A water quality certification from the California Regional Water Quality Control Board (RWQCB) San Francisco Bay Region and a permit from the San Francisco Bay Conservation and Development Commission (BCDC) have also been required. As part of the renewal process for these permits, the USFWS has requested that the MADs reassess potential impacts to federally listed species. The USFWS will prepare a formal BA, using the findings of this IBE, which will assist the renewal process for 2015 mosquito source reduction work.

Figure 1. San Francisco Bay Area Mosquito Control Districts and Regional Vicinity

2 Description of Areas Proposed for Mosquito Source Reduction

The areas proposed for mosquito source reduction work (work areas) include a range of tidal marsh habitats that occur within the above-listed MAD service area boundaries, which generally include all lands within the associated county or counties jurisdiction (Figure 1). Appendix A provides maps illustrating the proposed work areas within each MAD's jurisdiction.

The proposed tidal marsh work areas were identified by the individual MADs as locations which previously have required management of mosquito habitats and/or locations known to have environmental conditions that could support mosquito breeding and production.

The extent of each work area that may be affected by mosquito source reduction activities will be dependent on vector presence and abundance levels, as well as on the levels of risk of health issues related to abundance of biting mosquitoes and/or spread of mosquito-borne pathogens.

3 Description of Proposed Project Actions

This section describes the needs for mosquito source reduction in San Francisco Bay tidal marsh habitats and provides details about proposed mosquito source reduction actions.

3.1 Purpose and Need for Mosquito Source Reduction Actions

Tidal marsh habitats within the San Francisco Bay area have a long history of producing large populations of mosquitoes, including species known to transmit pathogens such as West Nile virus, as well as other endemic or enzootic pathogens. Reports of human cases of West Nile virus within the San Francisco Bay area are currently relatively low compared to neighboring counties (e.g. Sacramento County and Yolo County; CDPH 2014). However, in 2013, cases were confirmed in Marin County (2), Napa County (1), and Solano County (1) (CDPH 2014). In California, 1,251 dead birds and 13 horses tested positive for West Nile Virus in 2013 (CDPH 2014). Humans, horses, birds, squirrels, and mosquitoes continue to test positive for the virus and mosquitoes remain a public health issue and a source of concern for the general public in California. Two common salt marsh mosquito species in California (*Aedes squamiger* and *Aedes dorsalis*) have public health impacts in California. These two species breed in extraordinary numbers in tidal and managed marshes, have flight ranges that can exceed twenty miles, and exhibit very aggressive biting behaviors. This aggressive biting behavior causes extreme discomfort and injury to residents, visitors, wildlife, and livestock.

Mosquito source reduction is an important component of Integrated Vector Management (IVM) programs. Source reduction activities are designed to minimize mosquito production and thus the potential for mosquito-borne disease transmission, minimize needs for repeated applications of mosquito larvicides (and potentially adulticides), and minimize equipment use in sensitive areas (for mosquito surveillance and control operations). This type of work is necessary to carry out the responsibilities of the MADs pursuant to the California Health and Safety Code, Division 3, Chapter 1, Articles 1 - 8, Section 2000 et. seq.

Mosquito source reduction work in tidal marshes is often performed in collaboration with wildlife management and regulatory agencies (e.g. USFWS) for the dual purposes of mosquito source reduction and tidal habitat enhancement. Reestablishing efficient tidal circulation is beneficial (e.g. increases vigor) to tidal marsh vegetation, which, in turn, provides habitat to many organisms, including endangered wildlife species such as the Ridgway's rail and salt marsh harvest mouse. Additionally, some tidal channels, connected to MAD circulation ditches, can provide habitat and nursery areas for native fishes, including federally listed species.

3.2 Description of the Proposed Actions - Mosquito Source Reduction

In areas where mosquito production has been documented, MADs seek to reduce or eliminate larval mosquito production through habitat manipulation. Determinations about whether implementation of mosquito source reduction action(s) is required and appropriate are dependent upon the conditions that contribute to mosquito production. Generally, such conditions consist of those that result in impaired site hydrology, specifically, poor water circulation and drainage. Elements that typically create or contribute to these conditions include:

- Poorly functioning or non-functioning water control structures
- Vegetation overgrowth within or adjacent to tidal channels and/or ditches
- Build-up of sediments within tidal channels
- Insufficient marsh plain drainage

Within tidal marsh habitats, mosquito source reduction is generally accomplished through excavation and maintenance of circulation ditches to facilitate efficient tidal exchange. Other mosquito source reduction actions may include the management and maintenance of water control structures (e.g. tide gates and culverts), and vegetation removal/trimming. The following types of mosquito source reduction actions may be implemented within MAD tidal marsh work areas:

1) Water control structure repair
2) Ditch excavation and maintenance
3) Vegetation removal/trimming in and/or adjacent to water circulation ditches

4) Fill of non-functioning ditches
5) Site Access

The MADs primarily utilize manual labor and tools (e.g. shovels, picks, etc.) to conduct the above listed mosquito source reduction actions (collectively, the 'project actions'). The Marin/Sonoma MAD (and potentially other MADs in the future) periodically enlists the use of larger equipment (rotary ditchers, low ground pressure excavators, etc.) for ditch excavation and maintenance actions. The source reduction activities evaluated in this IBE, and equipment associated with these project actions are further described below.

3.2.1 Water Control Structure Repair

Water control structure repair or replacement actions are not frequently undertaken by the MADs. However, in the event that the failure or blockage of a water control structure (e.g. tide gate, flap gate, culvert) results in impairment of marsh hydrology, repair or replacement of the structure may be undertaken. Repairs would be performed as necessary to restore the affected structure to its original (or minimum desired) function. Such actions could potentially involve limited removal of vegetation surrounding the structure and/or clearing/excavation of associated circulation ditches. Replacement of water control structures, would in most cases, require the use of heavy equipment.

3.2.2 Ditch Excavation and Maintenance

Mosquito control, or circulation ditches are designed to reduce stagnant water conditions conducive to mosquito production, and to enhance access for fish that prey on mosquitoes by increasing tidal circulation. Circulation ditches are constructed or existing ditches maintained in tidal marsh areas where there is insufficient drainage and/or connection to natural tidal channels. Such ditches are generally excavated between poorly drained areas and tidal source waters (the bay edge or tidal marsh channels) or between existing circulation ditches to improve inter-ditch drainage where excavation of these ditches has not sufficiently improved hydrologic conditions.

Circulation ditches are generally small in size, with "V-shaped" configuration. In some cases, however, medium to large ditches may be needed to increase drainage and/or flow. Recent and historical USACE permits have included coverage of two different size configurations for circulation ditches: small and medium to large (see Appendix B). Typical maximum dimensions for small circulation ditches are: 12" bed width, 24" top of bank to top of bank, and 18" maximum depth at thalweg. Maximum dimensions for medium to large circulation ditches are 5' top of bank to top of bank and 4' max depth with variable side slopes.

Circulation ditches are excavated to shallow depths, sufficient to create enhanced circulation, but not so deep as may alter marsh water table levels. Build-up of sediments and debris in circulation ditches can also result in poor water circulation and ponding, therefore, periodic maintenance of these ditches is often required. Typically, MADs employ the use of hand labor and tools (shovels, picks, etc.) for excavation and maintenance of circulation ditches (see Appendix B). Excavation of circulation ditches infrequently requires the use of low ground pressure equipment such as: snow cats with rotary ditcher attachments, tracked excavators, small caterpillar tractors, or amphibious drag lines. Equipment is generally used to maintain larger sized ditches, maintain a substantial length of ditch, or when conditions preclude the use of hand tools. The snow cat with the rotary ditcher attachment provides a higher level of control with respect to ditch dimensions as compared to older speed scavel attachment technology. The rotary ditcher also side casts ditch spoils in slurry, which is sprayed up to approximately 50 feet from the circulation ditch (depending on water content in the marsh soil). This minimizes the volume of spoils placed immediately alongside the ditches, thus eliminating the need to further spread spoils, and also serves to reduce the potential for creation of conditions favorable for colonization by invasive plant species (e.g. *Lepidium latifolium*). Generally, within one year of rotary ditching, the vegetation adjacent to newly created circulation ditches, including vegetation lying within the spoils deposit area, regains vigor (see Appendix B).

3.2.3 Vegetation Removal in and/or Adjacent to Water Circulation Ditches

Vegetation growing in or partially obstructing circulation ditches can impede flow and lead to sediment trapping and deposition. Additionally, overhanging vegetation and vegetation within stagnant water provides shelter for mosquitoes in all life stages. MADs most commonly perform vegetation removal using of hand tools, including, but not limited to, shovels, picks, hedge trimmers, and weed whackers. Larger equipment such as a rotary ditcher may be used if significant vegetation encroachment has occurred and/or significant lengths of ditch are affected by vegetation encroachment.

3.2.4 Fill of Non-Functioning Ditches

In some cases, poor water circulation within circulation ditches may lead to reduced native wetland plant vigor and non-native weedy plant invasions. These conditions can promote mosquito breeding and lead to decreased hydrologic functioning of other (connected) ditches within a wetland. Should other remedial actions (vegetation removal, ditch maintenance activities, as described above) fail to improve circulation ditch function, the ditch may be filled. The fill of such a non-functioning circulation ditch would involve plugging the ditch with marsh soils at its connection to a tidal channel (if applicable) to a level above mean higher high water MHHW, to preclude tidal inundation. The fill would be accomplished using hand labor and tools within small ditches, or using low ground pressure excavators for medium to large ditches.

3.2.5 Site Access

All of the above-described source reduction actions require that MAD personnel gain access to mosquito breeding areas within tidal marsh habitat. Tidal marsh areas requiring source reduction work are generally accessed on foot, from nearby roads or levees. Where source reduction work requires traveling long distances, across marsh or open space areas not readily traversed by street vehicles, and/or transport of tools etc., all-terrain vehicles (ATV's or Argos) are utilized. The Argos used by the MADs are small one- to two-person vehicles with tracks, which distribute the weight and put comparatively little (as compared to wheeled vehicles) pressure on vegetation as they travel across the marsh surface.

4 Evaluation of Potentially Affected Threatened, Endangered, or Candidate Species

4.1 Methods

WWR consulted the following resources to identify and evaluate federally endangered and/or threatened wildlife and plant species and/or their habitats with potential to occur within the MAD jurisdictions:

U.S. Fish and Wildlife Service

- Endangered and Threatened Wildlife and Plants: Sacramento-San Joaquin Species (USFWS 2013a)
- Environmental Conservation Online System Species Profiles (USFWS 2013b)

California Department of Fish and Wildlife

- California Natural Diversity Database (CNDDB) Query for Alameda, Napa, Sonoma, Marin, San Mateo, and Solano counties (CDFW 2013)
- California Cooperative Anadronomous Fish and Habitat Data Program (CalFish 2014)

WWR staff ecologists, Esa Crumb and Stephanie Bishop, performed the CNDDB queries for federally listed wildlife and plant species. Due to the large geographic extent of proposed work areas for the combined MADs, WWR included the entirety of each MAD associated county (Alameda, Marin, Napa, San Mateo, Solano, and Sonoma counties) in the CNDDB queries for federally listed species. This 'broad net' method was employed to ensure that all species occurrences within tidal habitats and adjacent areas would be captured. From the resulting species list, WWR, with support from Josh Phillips of Pacific Biology, identified those species that are known to occur within or directly adjacent to tidal marsh habitats, and those that could be indirectly affected by mosquito source reduction activities within the tidal habitats (e.g., fish

species). Maps illustrating the CNDDB-documented occurrences of federally listed species in each MAD county are provided in Appendix C. The results of the CNDDB queries are summarized in Appendix D.

In addition, WWR consulted regional experts to gain additional information about the current status of species with limited distributions within the queried counties.

4.2 Threatened, Endangered, or Candidate Species that may occur within Areas Proposed for Source Reduction Actions

Appendix E provides a list of the federally listed species that have potential to occur within tidal habitats of the San Francisco Bay area MAD counties (Alameda, Marin, Napa, San Mateo, Solano, and Sonoma counties). The species listed were identified from the CNDDB searches and USFWS lists, and selected based on documented habitat requirements and regional occurrence records. Appendix E includes a description of the general habitat requirements of each species and indicates potential presence or absence within the MAD counties. Potential for presence for each species is characterized according to the four categories defined below:

None. Suitable habitat is not present within the MAD county and/or proposed work areas, the local range for the species is restricted, and/or the species is extirpated from the MAD county.

Not Expected. Suitable habitat is present, and documented occurrence records have identified the species within the MAD county; however, the habitat and/or species is isolated or limited, and not likely to occur within the proposed work areas.

Possible. Suitable habitat is present, and documented occurrence records have identified the species within the MAD county; the species has been documented near the proposed work areas within the MAD county.

Expected. Suitable habitat is present, and documented occurrence records have identified the species within the proposed work area(s) of the MAD county.

No surveys or site specific habitat evaluations were performed to rule out the presence or absence of federally listed species within the proposed work areas; therefore, all species with potential to occur within/or use the habitat features of tidal marsh habitats were queried and considered in this evaluation.

4.3 Species Considered but Eliminated from Further Evaluation

Using the methods described above in Section 4.1, WWR excluded from the list generated by the CNDDB search those species that are unlikely to occur within the proposed work areas due

to habitat requirements and/or restricted distributions. The majority of the excluded species are not expected to occur within or use the habitat features of tidal wetlands.

A few species that are known to occur within tidal marsh habitats (or within adjacent open water habitats) were eliminated from further consideration due to lack of suitable habitat within proposed work areas and/or lack of documented occurrences within proposed work areas. Tidal species excluded for these reasons are: Tidewater goby (*Eucyclogobius newberryi*), Chinook salmon (*Oncorhynchus tshaqytscha*), and Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*).

Tidewater goby is thought to be extirpated within San Francisco Bay (USFWS 2005) and is thus not expected to occur in work areas in any MAD counties. Critical habitat has been designated for this species in Marin, Alameda, San Mateo, and Sonoma counties, but all critical habitat is outside of the MAD work areas. The range for Chinook salmon is within several of the MAD counties; however, the expected distribution of this species is not within the proposed work areas.. Suisun thistle is restricted to four known populations that occur within Suisun Marsh, which is outside of the proposed work areas for Solano County.

4.4 Species or Habitats Potentially Affected by Proposed Source Reduction Actions

Based on the species occurrence and distribution information gathered from the above listed sources and resources (Section 4.1) and information provided by the MADs (potential project area maps and habitat conditions), four fish species, three bird species, one mammal species, and two plant species were identified as having some potential to occur within proposed work areas, and thus possibly be affected by mosquito source reduction actions.

These possible affected species are: delta smelt (*Hypomesus transpacificus*), steelhead (*Oncorhynchus mykiss)*, green sturgeon (*Acipenser medirostris*), longfin smelt (*Spirinchus thaleichthys*), Ridgway's rail (*Rallus obsoletus*), western snowy plover (*Charadrius alexandrinus nivosus*), California least tern (*Sternula antillarum browni*), salt marsh harvest mouse (*Reithrodontomys raviventris*), California seablite (*Suaeda californica*), and soft bird's beak (*Chloropyron molle* ssp. *molle*).

5 Description of Potentially Affected Species within Work Areas

This section includes descriptions of the species identified as potentially affected by mosquito source reduction activities (Section 4.4). Natural history information provided each species

includes: status and distribution, habitat requirements, occurrences and available habitat within work areas.

5.1 Fish

Our review of fish species occurrences and suitable habitat presence within or near potential MAD work areas identified four federally listed species that could be affected by proposed source reduction actions: delta smelt (*Hypomesus transpacificus*), steelhead (*Oncorhynchus mykiss)*, green sturgeon (*Acipenser medirostris*), longfin smelt (*Spirinchus thaleichthys*). These species are described below.

5.1.1 Delta Smelt

Status and Distribution

The delta smelt was listed as a threatened species under the ESA in 1993, and critical habitat was designated in 1994. In 2010, the USFWS determined that reclassification of delta smelt to endangered was warranted, but the status change was precluded by higher listing priorities (USFWS 2010a). Delta smelt historically were one of the most abundant fishes found in the San Francisco Bay Estuary. The current habitat range for this species spans from San Pablo and Suisun bays to their freshwater tributaries, including the Delta and the Sacramento and San Joaquin Rivers (Sommer and Mejia 2013). Delta smelt have also been observed in the Napa River (Mertz et al. 2011). In recent decades, delta smelt, along with other pelagic fish species, have experienced a substantial decline in population size. This decline has been attributed to multiple factors, including decreased turbidity, water quality issues, altered hydrologic regimes, and non-native species invasions (Baxter et al. 2010). Designated critical habitat for delta smelt includes all water and all submerged lands below ordinary high water, and the entire water column bounded by and contained in Suisun Bay, including the contiguous Grizzly and Honker bays; and the existing contiguous water contained within the legal boundaries of the Delta. **As such, no MAD work areas lie within critical habitat for delta smelt.**

Habitat Requirements

Delta smelt are euryhaline (tolerate a wide range of salinities) small fish, roughly 60–70 millimeters (mm) (2.3–2.7 inches [in]) in length, and spend their entire one- to two-year lifespans within brackish to freshwater bays, channels, and tidal marshes of the San Francisco-Bay Delta (Moyle 2002). Distribution of this species is concentrated around the low salinity zone (<6 parts per thousand [ppt]) in areas of turbid water (Sommer and Mejia 2013). Delta smelt migrate upstream for spawning, which is usually triggered by winter “first flush” flow events (Sommer et al. 2011). During wet years, abundance levels are generally higher, and the distribution is very broad; however, during drought years, this species has been documented primarily in deeper waters of the Sacramento River (USFWS 1996). Delta smelt feed primarily on copepods, but will also consume zooplankton, mysid shrimp, and amphipods (Sommer and

Mejia 2013). Delta smelt usually cannot tolerate water temperatures above 25° Celsius (C) or areas with high densities of submerged aquatic vegetation (SAV). Channel width is likely not a constraint for delta smelt; instead, related habitat features such as tidal excursion, velocity, temperature, food, and turbidity likely influence channel use (Sommer and Mejia 2013).

Occurrence and Available Habitat within the Work Areas

Occurrences of delta smelt are documented by CNDDB in San Pablo Bay from 2006, and at the tidal restoration site adjacent to the Napa River known as "Pond 2A" from 2004. Surveys conducted by Merz et al. (2011) also documented several occurrences of delta smelt in east San Pablo Bay and in the lower and upper Napa River. Therefore, work areas in Solano County along San Pablo Bay and marshes adjacent to the Napa River in Solano and Napa counties provide potential habitat for delta smelt. Suitable habitat within these areas would include the adjacent waters of San Pablo Bay and the Napa River as well as small functional tidal channels within marshes adjacent to these waters. **No MAD work areas lie within critical habitat for delta smelt.**

5.1.2 Steelhead

Status and Distribution

Steelhead (*Oncorhynchus mykiss*) is listed as threatened under the ESA. This species is found as far north as the Russian River and south to Soquel Creek, and also occurs in stream tributaries of the San Francisco Bay and San Pablo Bay basins. Critical habitat for this species is designated in all MAD counties, including: South San Francisco Bay, San Francisquito Creek, Petaluma River, Sonoma Creek, and Napa River.

Habitat Requirements

Steelhead spawn in freshwater, rear in fresh and estuarine habitats, migrate to the ocean to mature, and then return to upstream freshwater riverine habitats to spawn as adults. Steelhead are iteroparous, and can return to freshwater several times as adults to spawn. Steelhead use of tidal wetland habitat is poorly understood (Brown 2003).

Occurrence and Available Habitat within the Work Areas

Available Steelhead habitat occurs in all MAD counties where work areas are within or adjacent to designated critical habitat. Steelhead are known to occur within the following watersheds that lie within potential work areas (Leidy et al. 2005):

Alameda County – Alameda Creek Watershed, San Lorenzo Creek Watershed, San Leandro Creek Watershed

Marin County – Novato Creek Watershed, Miller Creek Watershed

Sonoma County – Petaluma River Watershed, Sonoma Creek Watershed

San Mateo County – San Mateo Creek Watershed

5.1.3 Green Sturgeon

Status and Distribution

Green sturgeon (*Acipenser medirostris*) is listed as a threatened species under the ESA. This species ranges from the west coast of Mexico north to Alaska, and is often observed in bays and estuaries on the coasts of California, Oregon, and Washington. The National Marine Fisheries Service (NMFS) has designated Suisun Bay, San Pablo Bay, and San Francisco Bay as critical habitat for green sturgeon.

Habitat Requirements

Green sturgeon are thought to spend the majority of their lives in nearshore oceanic waters, bays, and estuaries. Young fishes reside in freshwater, with adults returning to freshwater to spawn when they are about 15 years old (NOAA 2013). Spawning occurs in deep pools, where large cobble is the preferred spawning substrate, but spawning substrate used by this species can range from clean sand to bedrock. Green sturgeon are known to spawn in the Sacramento and Klamath Rivers at temperatures between 8-14° C\ (NOAA 2013).

Occurrence and Available Habitat within Work Areas

Green sturgeon occurrences have not been documented by the CNDDB within the MAD counties; however, as San Pablo Bay and San Francisco Bay are designated as critical habitat for this species, **all MAD work areas are adjacent to critical habitat**. Green sturgeon are expected to occur mainly in the bays (San Pablo Bay and San Francisco Bay), and may venture near project work areas, **but are not expected to occur in rivers, creeks, and tidal channels**.

5.1.4 Longfin Smelt

Status and Distribution

The San Francisco Bay-Delta Distinct Population Segment (DPS) of longfin smelt is currently a candidate species for federal listing. The distribution of this DPS includes San Pablo Bay, San Francisco Bay, South San Francisco Bay, the Gulf of the Farallones, Suisun Bay and Suisun Marsh, Humboldt Bay, Eel River Estuary and local coastal areas.

Habitat Requirements

Longfin smelt are generally anadromous, spawning in freshwater and then moving down stream to brackish water to rear, though some populations remain in freshwater throughout their entire lifespans. Longfin smelt are pelagic, and therefore feed primarily in open water areas, away from shore. They feed primarily on copepods as juveniles and shift to mysids as their primary food source as adults. Their distribution in the San Francisco Bay-Delta has been strongly tied to Delta inflow and the location of X2 (low salinity zone relative to the Golden Gate Bridge) (USFWS 2009).

Occurrence and Available Habitat within Work Areas

Longfin smelt occur within San Francisco Bay, South San Francisco Bay, and San Pablo Bay, mainly during their adult lives, and migrate to freshwater to spawn. They typically occur in mid-water habitats or near the bottom in open bays, **and are not expected to occur in the small tidal channels associated with mosquito source reduction work areas.**

5.2 Birds

Review of bird species occurrences and suitable habitat presence within or near potential MAD work areas identified three species that could be affected by proposed source reduction actions. These species are described below.

5.2.1 Ridgway's rail

Status and Distribution

Ridgway's rail (*Rallus obsoletus*) is listed as endangered under the ESA. It is endemic to tidal marshes in the San Francisco Bay Estuary.

Habitat Requirements

Ridgway's rails occur almost exclusively in tidal salt marshes and brackish marshes. The Ridgway's rail uses the edges of sloughs and mudflats in the low marsh zone for foraging, and uses upland habitat for refugia and escape from high tides. The high marsh zone provides optimal foraging, resting, and nesting habitat. Plant species predominantly used for the construction of nests include pickleweed (*Sarcocornia pacifica*), Pacific cordgrass (*Spartina foliosa*), and gumplant (*Grindelia stricta)* (Swanson et al. 2013). Taller vegetation, 0.75 meters or higher above the marsh plain, is considered suitable nesting locations for Ridgway's rail (Swanson et al. 2013)

Occurrence and Available Habitat within the Work Areas

There is available tidal marsh habitat for Ridgway's rail in all MAD work areas, and there are numerous reported occurrences of the species in all MAD counties. **Therefore, this species has *potential* to occur in all work areas containing suitable habitat.**

5.2.2 Western Snowy Plover

Status and Distribution

Western snowy plover (*Charadrius alexandrinus nivosus*) is listed as threatened under the ESA. The current Pacific coast breeding range of the western snowy plover extends from Washington to Baja California, Mexico. Western snowy plover was once more widely distributed and abundant in coastal Washington, Oregon, and northern California (USFWS 2007).

Habitat Requirements

Western snowy plovers nest on sandy beaches, levees around salt ponds and tidal marshes, and shores of large alkali lakes. This species prefers to nest in protected areas. Human disturbance (namely human and domestic animal presence within close proximity of nest sites) degrades nesting habitat quality (Lafferty et al. 2006).

Occurrence and Available Habitat within Work Areas

This species is not expected to occur within tidal marsh habitats; however, Western snowy plovers have been documented nesting on levees or islands within or adjacent to tidal marshes or salt ponds in all MAD counties except Solano County. Nesting was most recently documented in Alameda County in 2009, at Eden Landing Ecological Reserve, Don Edwards National Wildlife Refuge, and Hayward Regional Shoreline. Also in 2009, occurrences were documented in the Ravenswood Complex, north and south of Dumbarton Bridge, and along San Francisquito Creek in San Mateo County. In Marin County, nesting was documented within the Hamilton Wetland Restoration site in 2013. Nesting has occurred along levees and islands within the Napa-Sonoma Marshes Wildlife Area in Napa and Sonoma Counties since 2009 (Pers. Comm. Karen Taylor, CDFW, Sept. 25, 2013).

5.2.3 California Least Tern

Status and Distribution

The California least tern (*Sterna antillarum browni*) is listed as endangered under the ESA. California least terns nest on the Pacific coast of California. The California least tern once nested widely along the central and southern California coasts and the Pacific coast of Mexico. Nesting today is limited to colonies in the San Francisco Bay and Sacramento River Delta regions, and areas along the California coast from San Luis Obispo County to San Diego County. The largest colony is located at Alameda Point, in San Francisco Bay, on the runway complex of the former Naval Air Station Alameda (NAS Alameda), in Alameda County. Smaller colonies can be found at the Napa–Sonoma Marshes Wildlife Area (Napa and Sonoma counties), Montezuma Wetland Restoration site (Solano County), and Hayward Regional Shoreline (Alameda County).

Habitat Requirements

Least terns feed on smelt, anchovies, silversides, and other small fish, in shallow estuaries or lagoons where fish are abundant. California least terns breed in loose colonies from April through September, and prefer barren or sparsely vegetated sites near water, such as sandy beaches, alkali flats, landfills, or paved areas for nesting.

Occurrence and Available Habitat within Work Areas

There are two known breeding areas within Alameda County: Alameda Point (formerly NAS Alameda), which is adjacent to proposed work areas, and Hayward Regional Shoreline, where a

proposed work area is also located (CDFW 2013b). **There is also a known nesting colony at a proposed work area in Napa County** at the restored Napa Plant Site within Napa-Sonoma Marshes Wildlife Area (Pers. Comm. Karen Taylor, Sept. 25, 2013). Potential habitat for nesting California least terns also occurs in both Napa and Alameda counties adjacent to MAD work areas.

5.3 Mammals

Review of mammal species occurrences and suitable habitat presence within or near potential MAD work areas identified a single species that could be affected by proposed source reduction actions. This species is described below.

5.3.1 Salt Marsh Harvest Mouse

Status and Distribution

The salt marsh harvest mouse (SMHM, *Reithrodontomys raviventris*) is listed as an endangered species under the ESA. This species is restricted to saline emergent wetlands within the San Francisco Bay area and tributaries to the Bay. SMHM is divided into two known subspecies, the northern and southern subspecies. The northern subspecies is found in Marin, Sonoma, Napa, Solano, and northern Contra Costa counties; and the southern subspecies is found in San Mateo, Alameda, and Santa Clara counties.

Habitat Requirements

SMHM prefer dense pickleweed-dominated marshes, located above (MHHW) (Swanson et al. 2013). Pickleweed marsh habitat is used for foraging and nesting sites, and for protection from predators. SMHM only leave dense pickleweed vegetation during extreme high tide events, at which time they are more vulnerable to predation and drowning (Swanson et al. 2013). Thus, the presence of high tide refugia habitat adjacent to pickleweed marsh is very important to the species.

Occurrence and Available Habitat within Work Areas

Documented occurrences and potential habitat for SMHM exist in work areas in all MAD counties. SMHM surveys conducted within the San Pablo Bay National Wildlife Refuge documented the northern subspecies in several marshes along San Pablo Bay, in Sonoma and Solano counties (Block 2008). The CNDDB also contains recently documented occurrences of SMHM in Petaluma Marsh (Sonoma County) and Fagan Marsh (Napa County). Additionally, there is potential habitat (pickleweed dominated marsh) within most MAD work areas within Marin, Sonoma, and Solano counties. The five-year recovery plan for SMHM, released by USFWS in 2010, indicates that in spite of sparse survey data, SMHM are believed to occur with fluctuating populations sizes along most of northern San Pablo Bay (Petaluma River to Mare Island Strait).

The southern subspecies population trends are generally less stable than the northern subspecies (USFWS 2010b). Less recent occurrences of SMHM have been documented in the CNDDB for Alameda and San Mateo counties. Secure populations are known to persist at Hayward Marsh, Roberts Landing, Mayhews Landing, Baumberg, and Calaveras Point (all within Alameda County), and at Emily Renzel Marsh and Redwood Shores (within San Mateo County). Potential SMHM habitat is also present in other work areas of these counties.

5.4 Plants

Review of plant species occurrences and suitable habitat presence within or near potential MAD work areas identified two species that could be affected by proposed source reduction actions. These species are described below.

5.4.1 California Seablite

Status and Distribution

California seablite (*Suaeda californica*) is listed as an endangered species under the ESA. This species is historically known only from the San Francisco Bay area and Morro Bay/Cayucos. The last confirmed occurrence of California seablite from the San Francisco Bay area was from a 1958 collection made in San Leandro, in Alameda County. Currently, the only known populations that occur in the San Francisco Bay area are a few reintroduced populations in San Francisco and Alameda counties (USFWS 2010a).

Habitat Requirements

California seablite is generally restricted to the margins of coastal salt marshes and sandy salt marsh habitats, which are nearly extirpated from the San Francisco Bay area (USFWS 2010a).

Occurrence and Available Habitat within the Work Areas

Within the MAD counties, **this species is only known to occur at the Emeryville Crescent State Marine Reserve in Alameda County** (Peter Baye pers. comm. September 2013), which supports tidal habitat proposed for potential mosquito source reduction activities.

5.4.2 Soft Bird's Beak

Status and Distribution

Soft bird's beak (*Chloropyron molle* ssp. *molle*) is listed as an endangered species under the ESA. This species is endemic to the high marsh/upland transition zone of tidal marshes within Suisun Marsh and the North Bay of the San Francisco Estuary (Grewell 2005). Critical habitat is designated within Fagan Marsh in Napa County.

Habitat Requirements

This species exists in the marsh/upland transition zone of coastal tidal marshes, in association with *Distichlis spicata*, *Salicornia virginica*, and *Frankenia salina*.

Occurrence and Available Habitat within Work Areas

Documented CNDDB occurrences and critical habitat for soft bird's beak is designated within Fagan Slough in Napa County (USFWS 2009), within and/or adjacent to proposed MAD work areas. Soft bird's beak has been documented in Solano County in areas outside of proposed MAD work areas. Two occurrences are documented by CNDDB near MAD work areas in Solano County, but these populations are now assumed extirpated. The species also previously occurred in Petaluma Marsh in Sonoma County (CNDDB 2013).

6 Project Actions Effects Assessment

In this section, we describe potential effects of the proposed project actions on species and/or critical habitat (CH) that may occur within potential mosquito source reduction work areas. Factors considered in this assessment include: proximity of the proposed action to known occurrences/populations, as well as the duration of the activity, time of year, frequency of disturbance, and the general nature of the potential effects of these actions. Based upon this assessment, measures that may be implemented to reduce or avoid impacts associated with project actions to federally listed species are provided.

WWR did not evaluate individual work areas, nor did we perform site visits. Therefore, in preparing this assessment we assumed that implementation of these measures would occur in work areas that support potential habitat and/or a documented species occurrence(s).

The following species were evaluated:

Fish: Delta smelt, steelhead, green sturgeon (CH), and longfin smelt.

Birds: Ridgway's rail, western snowy plover, and California least tern.

Mammals: Salt marsh harvest mouse is the only federally listed wildlife species with potential to occur in tidal marsh work areas.

Plants: California seablite and soft bird's beak.

The proposed project actions and associated potential impacts are listed in Table 1. The environmental conditions that would trigger each project action and the potentially affected species are also included in the table.

Table 1. Mosquito Source Reduction Actions and Associated Potential Impacts to ESA Species

Project Action	Conditions Requiring Project Action	Potential Impacts	Potentially Affected Species
1) Water control structure repair	Poorly functioning or non-functioning water control structure resulting in poor circulation/tidal exchange and/or ponding	a) Release of sediments causing increased turbity b) Release of degraded quality water into adjacent waterways c) Wetland vegetation removal d) Noise	I) Fish (SH, DS, LS, GS) II) Birds (SNPL, CLRA, LETE) III) Mammals (SMHM) IV) Plants (CS, SBB)
2) Vegetation removal in/adjacent to ditches	Plants growing in or partially obstructing ditches degrade hydrologic function and result in deposition of trapped sediments which contributes to reduced circulation, decreased access for fish, and ponding of water. Plants in ditches provide shelter for mosquitoes. Dense growth of plants obscures/hides smaller order ditches resulting in safety issues for staff.	a) Release of sediments causing increased turbity b) Wetland vegetation removal c) Noise d) Release of heavy metals/toxics already present in soils e) Vegetative debris buildup from removal	I) Fish (SH, DS, LS, GS) II) Birds (SNPL, CLRA, LETE) III) Mammals (SMHM) IV) Plants (CS, SBB)
3) Dredging of existing ditches	Build-up of sediments resulting in poor water circulation, impaired fish access, and ponding of water	a) Release of sediments/increased turbidity b) Wetland vegetation removal c) Noise d) Release of heavy metals/toxics present in soils	I) Fish (SH, DS, LS, GS) II) Birds (SNPL, CLRA, LETE) III) Mammals (SMHM) IV) Plants (CS, SBB)
4) Fill of non-functioning ditches	Poor water circulation, decreased native wetland plant vigor with increased establishment of nonnative/weedy plants species, ponding, and decreased hydrologic functioning of other ditches within a wetland and/or the overall wetland site.	a) Wetland vegetation removal b) Crushed plants c) Noise d) Altered drainage/hydrology	I) Fish (SH, DS) II) Birds (SNPL, CLRA, LETE) III) Mammals (SMHM) IV) Plants (CS, SBB)
5) Ditch excavation	Stagnant water/pools, buildup of sediment resulting in poor water circulation, impaired fish access, and ponding of water	a) Colonization of dredge spoils by nonnative plants b) Wetland vegetation removal c) Release of heavy metals/toxics present in soils d) Crushed plants	I) Fish (SH, DS, LS, GS) II) Birds (SNPL, CLRA, LETE) III) Mammals (SMHM) IV) Plants (CS, SBB)
6) Site Access	Sites only accessible by roads adjacent to marsh habitats, and/or berms/levees that may serve as upland refugia. Also includes access through marsh sites by foot or all terrain vehicle (ATV)	a) Noise b) Crushed nests/burrows c) Crushed birds/mammals d) Crushed plants	I) Birds (SNPL, CLRA, LETE) II) Mammals (SMHM) III) Plants (CS, SBB)

Species Codes

Fish	Birds	Mammals	Plants
SH = Steelhead	SNPL = Western snowy plover	SMHM = Salt marsh harvest mouse	CS = California seablite
DS = Delta smelt	LETE = California least tern		SBB = Soft bird's beak
LS = Longfin smelt	CLRA = California clapper rail		
GS = Green sturgeon			

6.1 Recommended Best Management Practices

The following BMPs are recommended to address potential impacts to federally listed species and their habitat, if present, that could result from implementation of project actions. As appropriate, these measures are referenced in the impact analysis provided in Section 6.2. The conclusions of the impact analysis assume the implementation of these or similar measures.

General

1. MAD workers participating in mosquito source reduction actions shall, prior to commencing work in tidal marsh habitats, receive environmental awareness training given or approved by the USFWS. At a minimum, this training will include an overview of the laws that protect the federally listed species with potential to occur in tidal marsh habitats, identification of these species (including identification of Ridgway's rail calls), suitable habitat types, measures for avoiding or minimizing impacts to marsh habitats during site access and mosquito source reduction activities, and measures to implement if federally listed species are observed or a Ridgway's rail call is detected.

2. The guidelines outlined in *Walking in the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants* (USFWS 2013c) will be implemented by MAD staff while working within tidal marsh habitats.

Federally Listed Fish Species

3. Prior to commencement of work within aquatic habitat, the potential for federally listed fish species to occur within the work area boundaries will be evaluated by a MAD staff member having USFWS approved training in identification of federally listed fish species and of habitats with potential to support such species. Factors to be considered in this evaluation will include, but not be limited to: (1) Are there any barriers (e.g., damaged water control structures) between the work area and locations likely to be used by federally listed fish species? and (2) Are habitat conditions (e.g., dissolved oxygen levels, water depth, water temperature) suitable within the work area to support federally listed fish species with potential to occur in the project area? If it is determined that federally listed fish species do not have potential to occur, then no further fish protection measures will be required.

4. If project actions involving the use of heavy equipment or filling of a channel will occur within an aquatic habitat determined to have potential to support federally listed fish species, then the work area will first be dewatered using NMFS-approved methods. A staff member/biologist, trained in identification and handling of

federally listed species, will be present during initial dewatering, and all fish will be removed and relocated to a suitable location using NMFS-approved methods. A report will be prepared and submitted to NMFS, identifying all fish species captured and relocated, and the methods used during the fish relocation.

Ridgway's rail and salt marsh harvest mouse

5. A MAD staff member that has completed USFWS approved training will be present during work within potential salt marsh harvest mouse and Ridgway's rail habitat.

6. Activities within Ridgway's rail and salt marsh harvest mouse habitat will be avoided within two hours before or after extreme high tides (Mean Higher High Water [MHHW] tidal range), or when the marsh plain is inundated. Exceptions may be made for addressing issues that require immediate attention.

7. Vegetation removal from within Ridgway's rail and salt marsh harvest mouse habitat will be limited to the minimum amount necessary to allow the required project action to be accomplished (e.g. restricted to the immediate ditch excavation area only as necessary to enable excavation and equipment access; removal of vegetation within circulation ditches to improve flow; removal of vegetation where such vegetation otherwise would impede access; and vegetation removal as necessary to discourage wildlife from entering the work area during implementation of project actions).

8. If a salt marsh harvest mouse or Ridgway's rail is observed by MAD personnel while at the work site, BMP Measures will be implemented and the appropriate resource agency (e.g. USFWS, CDFW) will be contacted.

Salt marsh harvest mouse

9. Prior to the commencement of work in areas containing suitable SMHM habitat where such work will involve use of large equipment (e.g. rotary ditcher, low ground pressure excavator, etc.), efforts will be made to ensure that salt marsh harvest mice are not present by first removing suitable marsh vegetation within the immediate area to be affected by such work (as specified in measure 7, above). Clearing of vegetative cover in areas will discourage mice from entering work areas subject to potential impacts.

a. The removal of salt marsh vegetation will not be required if ditch excavation or other work will be accomplished using hand tools, or if the vegetation in the work area is submerged at the time of the disturbance.

b. Where practicable, hand tools will be used for vegetation removal.

c. To the extent practicable, the removal of suitable salt marsh harvest mouse breeding habitat (i.e. dense, pickleweed dominated marsh vegetation) will be limited to the period between December 1 and February 28 (which is outside of the species' breeding season).

10. If work will occur over multiple days, personnel with USFWS appropriate training will be present in the field to walk the work zone to observe for the presence of mice in the work zone prior to commencement of work each workday.

11. The areas beneath vehicles and/or equipment parked in the work area shall be checked for the presence of salt marsh harvest mice before being moved.

Ridgway's rail

12. To the extent feasible, work involving the removal of high marsh vegetation (potential nesting habitat), ditch excavation, and ditch maintenance activities within or adjacent to tidal marshes with potential to support Ridgway's rail will be limited to the time period from September 1 to January 31, which is outside of the Ridgway's rail breeding season.

13. Travel on non-established roads/paths along the edges of tidal channels and sloughs will be minimized, and the removal of native *Spartina* spp. (cordgrass) will be minimized, in order to reduce impacts to vegetation that may be used as Ridgway's rail habitat (e.g., nesting and escape habitat).

Western Snowy Plover and California Least Tern

14. The MADs will coordinate with Napa-Sonoma Marshes Wildlife Area (CDFW), Don Edwards San Francisco Bay National Wildlife Refuge, San Pablo Bay National Wildlife Refuge (USFWS) and the Alameda Wildlife Reserve regarding the locations of any

western snowy plover or California least tern nests located near tidal marsh work areas. Any areas where active nests have been identified will be avoided. All vehicles used for work area access will operate at speeds of 10 mph or less while on access roads/levees that may potentially be used by western snowy plover or California least tern.

Federally Listed Plants

15. The Alameda County MAD will coordinate with the Emeryville Crescent State Marine Reserve regarding the location of the introduced California seablite population, and that area will be avoided.

16. MAD staff working in Napa, Solano, and Sonoma Counties will receive training on the identification of soft bird's beak and its preferred habitat. When possible, project actions to be conducted in areas containing suitable habitat for this species will occur during the time period when soft bird's beak is in bloom and identifiable (July-November), so that any soft bird's beaks plants observed can be avoided and documented. MAD staff will also coordinate with Napa-Sonoma Marshes Wildlife Area (CDFW) and San Pablo Bay National Wildlife Refuge regarding the locations of known soft bird's beak populations, so that these populations can also be avoided. As necessary, flagging will be used to identify the boundaries of known soft bird's beak populations.

6.2 Impact Analysis

6.2.1 Federally Listed Fish Species Potentially Present

As discussed in Section 5.1, the federally listed fish species indicated below have some potential to occur within aquatic habitats in or near MAD tidal marsh work areas. However, work within areas of standing water will be limited to ditches exhibiting conditions that could promote mosquito breeding/production, such as poor water circulation/tidal exchange, impeded flow, and/or ponded or stagnant water. Such ditches, in many cases, may not be physically accessible to federally listed fish species, due to lack of connection to tidal waters or other factors. Even if accessible, conditions in ditches or channels subject to mosquito source reduction actions would generally provide low quality habitat for these species (e.g., low dissolved oxygen levels, high temperatures). These factors limit the potential for the fish species listed below to occur in aquatic project work areas. The potentially occurring federally listed fish species and their documented range within the MAD counties are:

- Delta smelt - Solano County (marshes adjacent to San Pablo Bay and Napa River), Napa County (marshes adjacent to Napa River) **no MAD work areas lie within critical habitat for delta smelt.**
- Steelhead - Alameda County (Alameda Creek, San Lorenzo Creek, and San Leandro Creek watersheds), Marin County (Novato Creek and Miller Creek watersheds), Napa County (Napa River watershed), San Mateo County (San Mateo Creek and San Francisquito Creek watersheds), Solano County (Delta and its tributaries), and Sonoma County (Petaluma River and Sonoma Creek watersheds)
- Longfin smelt **–** Alameda County (San Francisco Bay, small tidal channels [incidental]), Marin County (San Francisco Bay, San Pablo Bay, small tidal channels [incidental]), (San Pablo Bay, Napa River Watershed, small tidal channels [incidental]), San Mateo County (South San Francisco Bay, small tidal channels [incidental]), Solano County (Suisun, Delta and its tributaries), and Sonoma County (San Pablo Bay, small tidal channels[incidental]). They typically occur in mid-water habitats or near the bottom in open bays, **and are not expected to occur in the small tidal channels associated with mosquito source reduction work areas.**
- Green sturgeon – not expected to be present in MAD work areas; however, critical habitat has been designated in San Francisco Bay and San Pablo Bay, and the lower portions of larger creeks entering the bays. Green sturgeon are expected to occur mainly in the bays (San Pablo Bay and San Francisco Bay), and may venture near project work areas, **but are not expected to occur in rivers, creeks, and tidal channels**.

Types of Impacts

Proposed mosquito source reduction actions could result in direct and/or indirect impacts to delta smelt, steelhead, and longfin smelt, should these species be present in or near the work areas. As discussed above, the potential for these species to occur within work areas is limited, due to the typically marginal habitat conditions that trigger the need for mosquito source reduction actions. However, as it was not possible to evaluate each aquatic habitat work area for the purposes of this analysis, it must be assumed that delta smelt, steelhead, and longfin smelt have some potential to occur in tidal marsh work areas located within the areas described in Section 5.1.

Direct Impacts to aquatic habitats could occur from the repair of water control structures, maintenance of existing ditches, fill of non-functioning ditches, and potentially other actions that would require the dewatering of channels or work within standing water. In the relatively low likelihood event that delta smelt, steelhead, or longfin smelt are present, these activities could result in the harm of individual fish. The implementation of avoidance and minimization measures 1, 3, and 4 (described in Section 6.1 above) would prevent the harm of federally listed fish species during work within aquatic habitats.

The potential for indirect impacts on fish resulting from water control structure repairs would vary, based on the conditions that rendered the repair necessary, and the duration of those conditions. The repair of non-functioning water control structures that have impounded water for a long duration could lead to releases of poor quality water (i.e. water having low dissolved oxygen [DO], high salinity, high temperature, contaminants) into adjacent waterways. Similarly, such repairs could have potential to create a flush of built-up sediments and associated high turbidity to adjacent waters. If federally listed fish are present in adjacent waterways during a period of release of poor quality water associated with water control structure repair, they may be adversely affected. These effects are generally expected to be short in duration and extent, and primarily contained within the immediate vicinity of the release of impounded waters.

Short-term changes in water quality may preclude fish from using habitats adjacent to work areas, and, depending on the extent of water quality effects, could prevent fish from accessing or migrating to or from upstream habitats. These effects are not expected to result in directly lethality or injury to federally listed fish species, and would be of short duration. Releases of contaminants, if present in sediments, could result in acute adverse effects to listed fish species, but would be limited to those fish present within close proximity of the point of release. In the unlikely event that a listed fish species is in close proximity to the point of contaminant release, acute contaminant toxicity could occur and potentially result in mortality or sublethal effects increasing the likelihood of predation for small fish such as delta smelt and longfin smelt (Baxter et al. 2010).

Project actions to improve water circulation in non-functioning or poorly functioning tidal channels are expected to result in beneficial effects for fish by enhancing habitat conditions and, potentially, access to marsh habitats. As a result of mosquito source reduction actions, delta smelt, steelhead, and longfin smelt may receive the positive benefits of access to previously inaccessible tidal ditches/channels for foraging, and/or of improved detrital/food exports to adjacent tidal waters via reconnected tidal networks.

Short-term and long-term direct and indirect impacts are not expected to affect designated critical habitat for green sturgeon.

6.2.2 Federally Listed Bird Species Potentially Present

As discussed in Section 5.1, the following federally listed bird species have potential to occur within or near MAD tidal marsh work areas:

- Ridgway's rail - Alameda County, Marin County, Napa County, San Mateo County, Solano County, Sonoma County

- Western snowy plover (not expected to occur in tidal marsh MAD work areas but could occur on roads/levees used to access work areas) - Alameda County, Marin County, Napa County, San Mateo County, Sonoma County
- California least tern (not expected to occur in tidal marsh MAD work areas but could occur on roads/levees used to access work areas)- Alameda County, Napa County

Types of Impacts

Proposed mosquito source reduction actions could result in direct and/or indirect impacts to Ridgway's rail, western snowy plover, and California least tern. However, of these species, only Ridgway's rail has potential to occur within or adjacent to MAD tidal marsh work areas. Most project actions would occur within pickleweed marsh dominated areas, and would very rarely occur within taller vegetation. Taller vegetation, 0.75 meters or higher above the marsh plain, is considered suitable nesting habitat for Ridgway's rail (Swanson et al. 2013). Therefore, any disturbance related impacts would be associated primarily with work area access, when such access required travel through taller vegetation.

Potential direct impacts to federally listed bird species could occur as a result of site access and vegetation removal activities. MAD staff entering work areas on foot or in mechanized vehicles could disturb marsh habitats potentially used by Ridgway's rail. Repeated access to the marsh via the same paths can wear trails in the marsh and degrade habitat along those trails. However, the guidelines outlined by the USFWS in *Walking In the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants* will be implemented to avoid degrading habitat along existing trails and creating new trails (see BMP Measure 2, above).

Site access through the marshes and vegetation removal activities could also result in the disruption of Ridgway's rail breeding activity or the abandonment of a breeding territory or nest. BMP Measures 5, 6, 7, 8, 12 and 13 (see Section 6.1 above) will be implemented to prevent the disruption of Ridgway's rail nesting behavior. Current MAD staff members have been trained to recognize Ridgway's rails and their calls, and to identify preferred Ridgway's rail habitat. The recommended BMP Measures include training new MAD staff and refresher training for existing staff to identify Ridgway's rails (including their calls and habitat); procedures should a Ridgway's rail be seen or heard; restrictions on activities during periods of extreme high tide or marsh inundation; minimizing tidal marsh vegetation removal; limiting vegetation removal and construction activities during the Ridgway's rail breeding season; and minimizing disturbance of vegetation types likely to contain active nests or to be used as refugia/escape routes.

Potential indirect impacts to Ridgway's rail include degradation of habitat resulting from the inadvertent spread of non-native plant species (e.g., perennial pepperweed) via site access or

maintenance activities; creation of trails through the marsh, thereby giving predators easier access to the marsh; and noise-related disturbances that could result in the disturbance of nesting activities. These potential indirect impacts will be addressed through implementation of BMP Measures 1, 2, and 13 (see Section 6.1 above) and continued implementation of the MAD's current invasive plant management and control measures.

As described in Section 5.1, both western snowy plover and California least tern have been documented nesting near several MAD tidal marsh work areas. While these species are not expected to nest within MAD work areas due to the lack of suitable nesting substrate, both species could nest in nearby areas used by MADs for work site access, including on existing access roads and/or levees. The nesting locations of these species in the vicinity of MAD tidal marsh work areas are well documented and monitored, and these areas will be avoided during the nesting season (see BMP Measure 14, above).

6.2.3 Federally Listed Mammal Species Potentially Present

Salt marsh harvest mouse is the only federally listed mammal species with potential to occur within or near MAD tidal marsh work areas (Section 5.1). This species could occur in MAD tidal marsh work areas in Alameda County, Marin County, Napa County, San Mateo County, Solano County, and Sonoma County.

Types of Impacts

Proposed mosquito source reduction actions could result in direct and indirect impacts to salt marsh harvest mouse if present in work areas. MAD staff entering work areas on foot or in mechanized vehicles could disturb marsh habitats used by salt marsh harvest mouse. Repeated access to the marsh via the same paths can create trails in the marsh, and degrade habitat along those trails. The guidelines outlined by the USFWS in *Walking In the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants* will be implemented to avoid degrading habitat along existing trails and to avoid creating new trails (see BMP Measure 2, above). Additionally, measures currently undertaken by the MADs to avoid unnecessary impacts to vegetation by mechanical equipment (as defined under the BCDC issued permit) will be continued. These measures include: reducing turns by track-type vehicles, taking a minimum number of passes with equipment, varying points of entry, driving vehicles at low speeds, avoiding driving on open mud and areas of other soft substrate, and using hand (as opposed to mechanical) ditching methods as much as possible.

Actions involving vegetation removal also have potential to affect salt marsh harvest mice. The proposed mosquito source control actions do include clearing of the preferred vegetation cover type (i.e., pickleweed), but the loss of habitat will be limited to the minimum amount necessary

to achieve the mosquito abatement goals (See BMP Measure 6, above). Further, many of the tidal marsh work areas provide low quality habitat for salt marsh harvest mouse because the ponding of water results in dead or dying pickleweed - the proposed mosquito source reduction actions will restore circulation in these areas and allow the subsequent reestablishment of healthy pickleweed. Any vegetation removal performed in salt marsh harvest mouse habitat will be conducted in accordance with BMP Measures 5 and 7, which will prevent the harm of salt marsh harvest mice that may be present during vegetation removal. These measures include restrictions on activities during periods of extreme high tide or marsh inundation; vegetation removal done by hand tools to the extent practicable; observation for the presence of mice in work areas; and limiting tidal marsh vegetation removal during the species' breeding season.

Potential indirect impacts to salt marsh harvest mouse include degradation of habitat via the inadvertent spread of non-native plant species (e.g., perennial pepperweed) by MAD staff during site access or maintenance activities; and creation of trails through the marsh that may give predator's easier access to the marsh. These potential indirect impacts will be addressed through implementation of BMP Measure 2 (see above) and of the MAD's current methods of invasive plant management and control.

6.2.4 Federally Listed Plant Species Potentially Present

As discussed in Section 5.1, the following federally listed plant species have potential to occur within or near MAD tidal marsh work areas:

- California seablite - Alameda County
- Soft bird's beak - Napa County, Solano County, Sonoma County

Types of Impacts

California seablite is extremely rare, and is currently known to occur only in one location (where it was reintroduced), which is at the Emeryville Crescent State Marine Reserve in Alameda County. This species has not been documented in Marin, Napa, San Mateo, Solano, or Sonoma Counties. The California seablite population at the Emeryville Crescent State Marine Reserve is located near a potential MAD work area. To avoid incidental harm to this plant population, BMP Measure 15 will be implemented (see above). This measure requires that all MAD staff entering the marsh at the Emeryville Crescent State Marine Reserve will be informed of the location of the population and will avoid that area.

Soft bird's beak has potential to occur in MAD tidal marsh work areas in Napa, Solano, and Sonoma Counties. If this species is present in or near a work area, proposed mosquito source reduction actions could result in potential direct and indirect impacts to the species. Direct impacts to the species could occur as a result of site access (i.e., trampling of plants) and of

actions involving vegetation removal. BMP Measure 16 will be implemented to prevent direct impacts to this species. This measure includes training of staff working in soft bird's beak habitat to identify the species; conducting work in areas containing suitable habitat while the species is in bloom and identifiable (July-November); and avoiding any soft bird's beak plants that are observed. MAD staff will also be kept informed about known locations of soft bird's beak populations, so that those areas can be avoided.

Potential indirect impacts to California seablite and soft bird's beak include degradation of habitat from the inadvertent spread of non-native plant species (e.g., perennial pepperweed) by MAD staff during site access or maintenance activities. This potential indirect impact will be addressed through implementation of the MADs current invasive plant management program actions.

7 Conclusions

Based on the findings of the analyses conducted for this informal biological evaluation, we have determined that four federally listed fish species (delta smelt, steelhead, green sturgeon [CH], and longfin smelt), three bird species (Ridgway's rail, western snowy plover, and California least tern), one mammal species (salt marsh harvest mouse), and two plant species (soft bird's beak and California seablite) have some potential to occur (if suitable habitat is present) within tidal marsh habitats that may require implementation of mosquito source reduction actions by the San Francisco Bay area mosquito and vector control districts (MADs). These findings were determined using documented occurrence records for species that may occur in tidal marsh habitats within MAD counties in the San Francisco Bay Area. Areas of tidal habitats that are proposed for mosquito source reduction actions are, in many cases, expected to be of lower quality due to the poor hydrologic conditions that create suitable habitat for mosquito breeding, and to the associated degradation of native marsh vegetation. Consequently, the likelihood of occurrence of special status species may be further reduced in areas supporting poorly functioning habitats.

The key aim of the San Francisco Bay area MADs' source reduction actions is to reduce breeding habitats for mosquitoes, and thus reduce impacts to public health from vector-borne diseases. Without implementation of species appropriate BMP measures, these actions may introduce potential direct and/or indirect impacts to federally listed species, if they are present. It is our conclusion that implementation of the BMP measures described in this document, many of which are currently implemented by the MADs per agency recommendations and requirements, will reduce or eliminate potential adverse impacts to federally listed species. It should also be noted that mosquito source reduction actions are expected to improve habitat conditions within tidal marsh areas, and thus may provide beneficial effects for federally listed species.

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Appendix A
Proposed Work Areas for Mosquito Source Reduction by District/County

Appendix B
Representative Images of Work Activities

Appendix C
CNDDB Occurrence Maps by District/County

Appendix D
Federally Listed Species, CNDDB Query Species Tables by District/County

Appendix E
Federally Listed Species with Potential to Occur in Tidal Habitats of the San Francisco Bay Area