

SALT MARSH HARVEST MOUSE

Reithrodontomys raviventris

USFWS: Endangered

CDFG: Endangered

Species Account

Status and Description. The salt marsh harvest mouse was listed as a Federally Endangered Species in 1970 (Federal Register 35:16047) and a California state listed Endangered Species in 1971. Salt marsh harvest mice are divided into two subspecies: *R. r. raviventris* in Corte Madera, Richmond and the southern portion of San Francisco Bay and *R. r. halicoetes* in the San Pablo and Suisun bays. The salt marsh harvest mouse is similar to the western harvest mouse, *R. megalotis*, in that it has a long tail, large ears, grooves in the outer surface of its upper incisors, and buff or brownish in color. The underside of the western harvest mouse, including its tail, ranges from white to dark gray. The underside of the salt marsh harvest mouse is quite variable ranging from white to a cinnamon- or rufous-colored belly. The coloration of the other parts of each of these species is buff or brown. The backs and ears of the salt marsh harvest mouse tend to be darker and the tails of the salt marsh species tend to be slightly thicker, less pointed, and more unicolored (USFWS 1999). The western harvest mouse is considered to be the progenitor of the salt marsh harvest mouse (Fisler 1965). Adult salt marsh harvest mice are 118-175 millimeters in length and weigh between 8 and 12 grams.



Range, Populations and Activity. The historic range of the salt marsh harvest mice most likely included much of the marshland in the San Francisco Bay Area. Presently, the mice are found only around small portions of San Francisco, San Pablo and Suisun bays. Because the water in the wetlands and marshes of the Sacramento-San Joaquin Delta was probably too fresh to support the habitat of the salt marsh harvest mouse, the Collinsville-Antioch area marks the eastern limit of their distribution (USFWS 2001).

The northern subspecies *R. r. halicoetes* is presently found on the northern portion of the Marin Peninsula, through Petaluma, Napa, and Suisun Bay marshes, and in northern Contra Costa County. An important refuge for the subspecies is the marsh between Sonoma Creek and Mare Island (USFWS 1984). The southern subspecies *R. r. raviventris* extends from San Mateo County and Alameda County south along both sides of San Francisco Bay to Santa Clara County, and in isolated areas in Marin and Contra Costa counties.

Breeding occurs from spring through autumn. Reproductive activity for females ranges from March to November. Males are reproductively active from April to September. The breeding season for the southern subspecies begins in March, while the northern subspecies breeding season starts two months later in May (Fisler 1965). Females of both subspecies have an average of four young per litter. The southern subspecies may produce two litters each year, while the northern subspecies usually have only one litter per year due to the shorter breeding season (Fisler 1965). Nests are usually small and built of grass and sedge over old birds' nests. The southern subspecies rarely build nests, but may construct loosely organized structures of dry grasses (Fisler 1965, Shellhammer 1982).

The maximum life expectancy in the wild for the salt marsh harvest mouse is approximately one year, but most survive less than eight months. Adults comprise the majority of the population.

The diet of salt marsh harvest mice consists of seeds, grasses, leaves, plant stems, forbs, and insects. Salt marsh harvest mice tend to eat fresh green grasses in the winter and pickleweed and saltgrass during the rest of the year (Fisler 1965). The mice can tolerate high salinities in both their food and drink intake, which can give them a competitive advantage over California meadow mice (*Microtus californicus*) when the salinity of the marsh increases (Geissel *et al.* 1988). The northern subspecies can drink both sea and fresh water, while the southern subspecies usually drinks moderately salty water (Fisler 1965).

Salt marsh harvest mice are primarily nocturnal, but Fisler (1965) under laboratory conditions recorded 15-20% of daily activity during the day, most of which occurred in the afternoon. The southern subspecies can become torpid, particularly in the early morning hours (Fisler 1965). Salt marsh harvest mice are strong swimmers and climbers and hence are able to survive tidal or seasonal flooding (Fisler 1965). Predators include owls (Johnston 1956), hawks, gulls, weasels, and other mammalian predators.

Habitat Use. Salt marsh harvest mice are dependent on dense cover of native halophytes (salt-tolerant plants), and prefer pickleweed-dominated (*Salicornia virginica*) saline emergent wetlands as their habitat (Shellhammer 1977). The mice's most suitable habitat is deep (60-75 centimeters tall) and dense pickleweed, intermixed with fat hen (*Atriplex patula*) and alkali heath (*Frankenia grandifolia*) (Shellhammer 1982). The species requires non-submerged, salt tolerant vegetation to escape the high tide (Shellhammer *et al.* 1982). During these periods of high tides, populations of salt marsh harvest mice tend to concentrate in high marsh level areas of the high marsh zone (Fisler 1965). The salt marsh harvest mouse has also been found in the top zone and transitional zones of tidal marshes which rarely flood. The mice are seldomly found in cordgrass, alkali bulrush, or pure stands of salt grass (Shellhammer *et al.* 1982). The species will also move into adjoining grasslands during the highest winter tides. Grasslands are utilized as habitat only when new grass growth affords suitable cover in spring and summer months (Fisler 1965, Shellhammer 1982).

Population Levels and Occurrence in Plan Area. Within the Plan Area, salt marsh harvest mice are mainly associated with the coastal saltmarsh vegetation within the Coastal Marsh Natural Community. The species is occasionally found in grassland habitats within or immediately adjacent to coastal marsh as well. There are 56 occurrence records for salt marsh harvest mouse in Solano County, one of which is currently considered to be extirpated. All are populations of the northern subspecies of salt marsh harvest mouse that exist along the pickleweed habitat fringing the northern shore of San Pablo Bay (USFWS 1999), Southampton Marsh, and throughout Suisun Marsh.

Dispersal. Young salt marsh harvest mice can disperse considerable distances from their birth sites (Geissel *et al.* 1988). The mice do not disperse to adjacent areas that are bare or developed. A narrow corridor of vegetation is probably needed for dispersal between adjacent, isolated habitats. The species have been found to quickly colonize disturbed areas that have been subject to flooding.

Salt marsh harvest mice will also move from pickleweed marsh to upland grasslands in the spring and summer. These movements are likely to occur daily and do not represent complete shifts in habitats. The mice do not appear to move between marshes (Shellhammer 1977).

Threats to the Species. Historically, the salt marsh harvest mouse was found throughout the San Francisco Bay. Destruction and modification of required habitat by human activities has highly reduced the populations of this species. Only 30,100 acres of the 193,800 acres of tidal marsh that bordered San Francisco Bay in 1850 currently remain (Dedrick 1993). This amount represents an 84 percent reduction from historical conditions. About 30% of the historic tidal marshes of San Francisco Bay remain as diked marshes, with only small, isolated patches supporting populations of salt marsh harvest mice. The loss of pickleweed habitat due to commercial and residential development has been the main cause to the decline of the salt marsh harvest mouse. Past and current threats to the species include the filling and diking of marshes to allow development; changes in salinity, introduction of non-native cordgrass, bulrush, saltgrass and other plant species, predation by non-native red foxes and feral cats, and pollution from urban run-off, industrial discharges, and sewage effluent (Shellhammer 1982, CDFG 2000). Much of the East Bay shoreline from San Leandro to Calaveras Point is rapidly eroding (USFWS 2001). Additionally, an estimated 600 acres of former salt marsh and pickleweed habitat along Coyote Creek, Alviso Slough, and Guadalupe Slough, has been converted to fresh- and brackish-water vegetation, dominated by bulrush and saltgrass. This change in vegetation is largely due to changes in salinity of the marshes brought about by increasing volumes of sewage and freshwater discharge from South Bay wastewater facilities and subsidence-related causes (Wondolleck *et al.* 1976, Shellhammer 1977, USFWS 2001). In addition, many of the marshes in the South Bay are completely submerged during the high tide and lack sufficient upland and escape habitat, likely resulting in population crashes due to nesting failures and high rates of predation.

Conservation Issues. Habitat loss and alteration is the main threat to the salt marsh harvest mouse. Indirect impacts, such as an increase in predation from house cats and other urban-adapted predators such as raccoon, striped skunk and gray fox also affect salt marsh harvest mice.

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