

APPENDIX 3.7-D: SUPPLEMENTAL SPECIES HABITAT MODEL DESCRIPTIONS

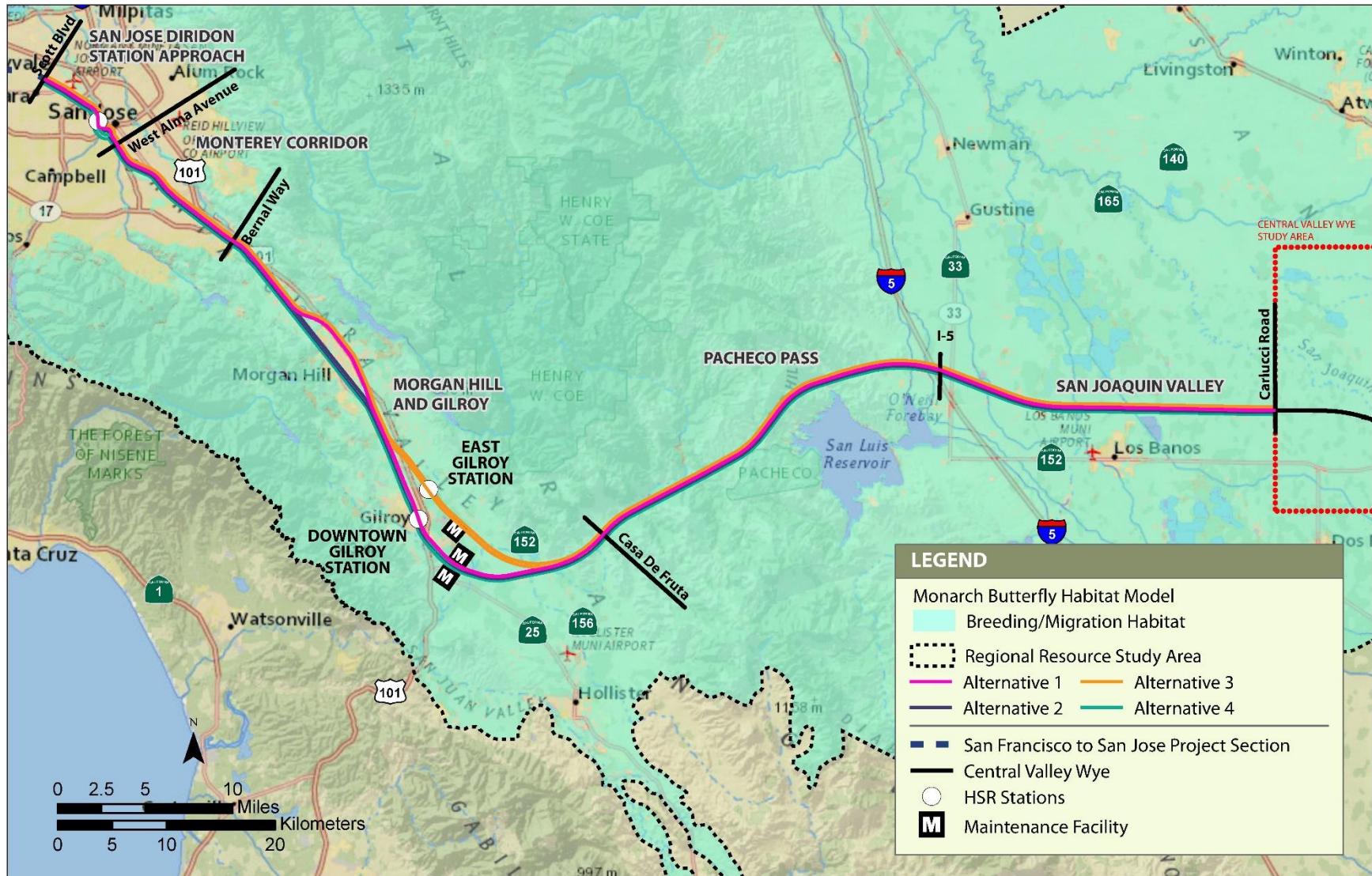
Monarch butterfly (*Danaus plexippus*); Candidate under the FESA

Modeled Habitat Categories and Modeling Parameters	Model Evaluation
<p>The monarch butterfly occurs throughout the United States and southern Canada where milkweed species (<i>Asclepias</i> spp.), their host plants, are present (Pelton et al. 2016; Western Association of Fish and Wildlife Agencies 2019). Breeding habitat contains native milkweeds to provide food for larvae and other flowers to provide nectar for adults but may also include trees or shrubs for shading and roosting and connectivity among these habitat elements. During the spring and summer, adult monarch butterfly spends its 2- to 5-week lifespan mating and nectaring on flowers, with the females searching for milkweed upon which to lay their eggs. Multiple generations are produced over the fall and summer, with the fall generation of adults migrating to overwintering sites and living for 6 to 9 months until the next spring breeding season (Pelton et al. 2016). The western monarch butterfly population breeds west of the Rocky Mountains and largely overwinters in coastal California, while the much larger eastern populations breed east of the Rocky Mountains and overwinter in Mexico (Western Association of Fish and Wildlife Agencies 2019).</p> <p>Monarch butterfly habitat is often described in terms of breeding, migratory, and overwintering sites. Breeding habitat contains native milkweed and other flowers to provide food for larvae and nectar for adults and trees or shrubs for shade and perching (Pelton et al. 2016 Xerces Society for Invertebrate Conservation 2018). There are 15 species of native milkweed in California, which occur in a variety of different habitats (Xerces Society for Invertebrate Conservation 2018), although nine species are rare and restricted in range and distribution (Xerces Society for Invertebrate Conservation 2011). Migratory habitat consists of nectar plants for adults during spring and fall migration. Breeding and migratory habitat are often synonymous since they contain the same key components (i.e., milkweed, nectar sources, roosting structures) (Western Association of Fish and Wildlife Agencies 2019). Overwintering sites in California are found in selected forested areas generally located within 1.5 miles from the Pacific Ocean or San Francisco Bay (Leong et al. 2004). Most overwintering sites occur at low elevations (<300 feet), in shallow canyons (Lane 1993), and on south-, southwest-, or west-facing slopes to maximize solar radiation and shelter from wind (Leong et al. 2004). Suitable grove conditions include temperatures above freezing, high humidity, dappled sunlight, access to water and nectar, and protection from high winds and storms (Western Association of Fish and Wildlife Agencies 2019). Trees commonly used for roosting in California include blue gum eucalyptus, Monterey pine, and Monterey cypress, but clusters have also been observed on red gum eucalyptus, western sycamore, coast redwood, coast live oak, Fremont's cottonwood, and Goodding's willow (Pelton et al. 2016; Western Association of Fish and Wildlife Agencies 2019).</p> <p>The California Natural Diversity Database (CNDDDB) (CDFW 2020) and the Western Monarch Count (Xerces Society for Invertebrate Conservation 2020) does not identify any overwintering sites in the regional study area. The Western Monarch Count displays data from the Xerces Society's Western Monarch Overwintering Sites Database, which contains 400+ overwintering sites from records stretching back to 1970. The database includes historical records, original site surveys as part of the annual Western Monarch Thanksgiving Count (WMTC), and focused survey efforts by Xerces staff. The majority of known large overwintering sites are included in the WMTC to allow comparisons between years and sites and provide an estimate of the size of the monarch population that overwinters in western North America (Pelton et al. 2016). Records of milkweed, adult monarch butterflies, and breeding activity are prevalent throughout the study area (Xerces Society for Invertebrate Conservation 2018).</p>	<p>Prior to distribution for review by agency biologists, California High-Speed Rail Authority biologists knowledgeable about this species evaluated the model results and compared all habitat model types to the distribution of all occurrences in the CNDDDB and Western Monarch Count (CDFW 2020; Xerces Society for Invertebrate Conservation 2020).</p>

Modeled Habitat Categories and Modeling Parameters	Model Evaluation
<p>Breeding/Migration Habitat—Potentially suitable breeding/migration habitat in the regional study area meets the following criteria (see Figure 3.7-D-1).</p> <ul style="list-style-type: none"> ▪ Current range (Pelton et al. 2016; Western Association of Fish and Wildlife Agencies 2019) ▪ The following land cover types coincide with the habitat for milkweed (Xerces Society for Invertebrate Conservation 2011, 2018): all herbaceous-dominated land cover types, all tree-dominated land cover types, all aquatic land cover types, all agricultural land cover types, rock outcrop, constructed basin, and constructed watercourse. 	

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Figure 3.7-D-1 Monarch Butterfly Habitat

Mountain lion (*Puma concolor*); Candidate under the CESA (Southern California/Central Coast Evolutionarily Significant Unit)

Modeled Habitat Categories and Modeling Parameters	Model Evaluation
<p>Mountain lions occur broadly throughout the United States. In California, mountain lions occur in nearly all habitats (Zeiner et al. 1990). They require large areas of relatively undisturbed habitats with adequate connectivity to allow for dispersal and gene flow for population persistence (Center for Biological Diversity 2019). Wilmers et al. (2013) found that mountain lions were generally attracted to shrub, forest, and water; they were deterred by grasslands. Although this study shows that tree- and shrub-dominated habitat types are preferred over grasslands and human-disturbed areas during the day, nocturnal movement patterns showed that mountain lions utilize a broader range of habitats as they travel through their home ranges and hunt (Dickson et al. 2005; Wilmers et al. 2013). Mountain lions tend to avoid intensively developed suburban or urban areas, especially for denning and breeding (Dickson and Beier 2002; Wilmers et al. 2013). Dens are located in rocky terrain or in dense vegetation that provides cover (Zeiner et al. 1990; Wilmers et al. 2013).</p> <p>In June 2019, the Southern California/Central Coast evolutionarily significant unit (ESU) of mountain lion was petitioned for listing under the California Endangered Species Act (CESA). The California Department of Fish and Wildlife evaluated the petition, and the California Fish and Game Commission published a notice of findings on May 1, 2020, to list the Southern California/Central Coast population ESU as a candidate for listing under CESA. Six subpopulations comprise the ESU: (1) Santa Ana Mountains, (2) Eastern Peninsular Range, (3) San Gabriel/San Bernardino Mountains, (4) Central Coast South (Santa Monica Mountains), (5) Central Coast North (Santa Cruz Mountains), and (6) Central Coast Central. The boundaries of the ESU include areas generally south of the San Francisco Bay and Interstate (I-) 80, west of I-5 to the intersection of I-5 and State Route (SR) 58, south of SR 58 to I-15, south of I-15 from the SR 58 intersection to the California-Nevada border, and south to the California-Mexico border. The mountain lion habitat distribution model includes all areas of suitable habitat regardless of ESU (the majority of the study area is within the ESU); however, only animals within the ESU are candidates for listing under CESA.</p> <p>The mountain lion habitat distribution model is based on the assumption, as presented in both Burdett et al. (2010) and Wilmers et al. (2013), that anthropogenic factors modify mountain lion habitat suitability. Wilmers et al. (2013) found that human development has a stronger habitat selection pressure on denning behavior than nonreproductive behaviors, thus requiring a large setback from human development for breeding habitat. Furthermore, Wilmers et al. (2013) also found that mountain lions were more deterred by human development that provides more varied sources of human interferences (i.e., residences would be more strongly avoided than arterial roads) and give those areas a wider berth. Although mountain lions will use moderately disturbed areas as they travel and hunt (Wilmers et al. 2013; Gray et al. 2016), occupancy is lower in developed areas, and they are more likely to use developed areas if they border open spaces (Wilmers et al. 2013; Wang et al. 2015). Thus, mountain lions require a habitat mosaic that provides sufficient distance from human-disturbed areas for breeding and is connected to expansive, intact, heterogeneous habitats (Dickson and Beier 2002; Dickson et al. 2005; Kertson et al. 2011; Zeller et al. 2017). Wilmers et al. (2013) found that the influence of housing density on movement behavior was most effective when based on density of the surrounding area out to a distance of 150 meters and likewise on denning behavior based on a density calculated from a 600-meter search.</p> <p>Breeding and Foraging Habitat—Potentially suitable breeding and foraging habitat in the regional study area meets the following criteria (Figure 3.7-D-2).</p>	<p>Prior to distribution for review by agency biologists, California High-Speed Rail Authority biologists knowledgeable about this species evaluated the model results. In response to the review, the rationale, model names, and the description of how the Wilmers et al. (2013) data was used to inform the breeding and foraging habitat model were revised for clarity.</p>

Modeled Habitat Categories and Modeling Parameters	Model Evaluation
<ul style="list-style-type: none"> ▪ Current range (Zeiner et al. 1990) AND ▪ All tree-dominated and shrub-dominated natural landcover types (Authority 2016) AND ▪ Areas having a dwelling density (within Santa Clara County only) less than 0.04 units per acres¹ 	
<p>High-Priority Foraging and Dispersal Habitat—High-priority foraging and dispersal habitat in the regional study area meets the following criteria (Figure 3.7-D-2).</p> <ul style="list-style-type: none"> ▪ Current range (Zeiner et al. 1990) AND ▪ All herbaceous, shrub, woodland, and forested natural land cover types (Authority 2016) AND ▪ Within areas of high movement value² AND ▪ Does not meet the conditions of breeding and foraging habitat (as defined in the above model description). 	

¹ Dwelling density is calculated using address points acquired from Santa Clara County. Density is calculated within a radius of 600 meters (1,968 feet) consistent with Wilmers et al. (2013). Within the regional study area and the species range, for the purposes of this analysis, it is assumed that dwelling density is only high enough to alter breeding habitat within Santa Clara County. For the portions of the regional study area outside Santa Clara County, dwelling density is assumed to be sufficiently low such that all suitable land cover types will be considered breeding habitat.

² Movement values were calculated as inputs to the local permeability modeling performed under the *Wildlife Corridor Assessment Report* (Authority 2020, Appendix C) in which landscape permeability is based on a calculated Habitat Suitability Index (HSI), which is a function of ranked land cover, road density, and topographic conditions. Areas having an HSI value higher than 50 (1–100 scale) (i.e., higher score indicated a greater potential for use as a movement corridor) were included in the high-priority foraging and dispersal habitat model.

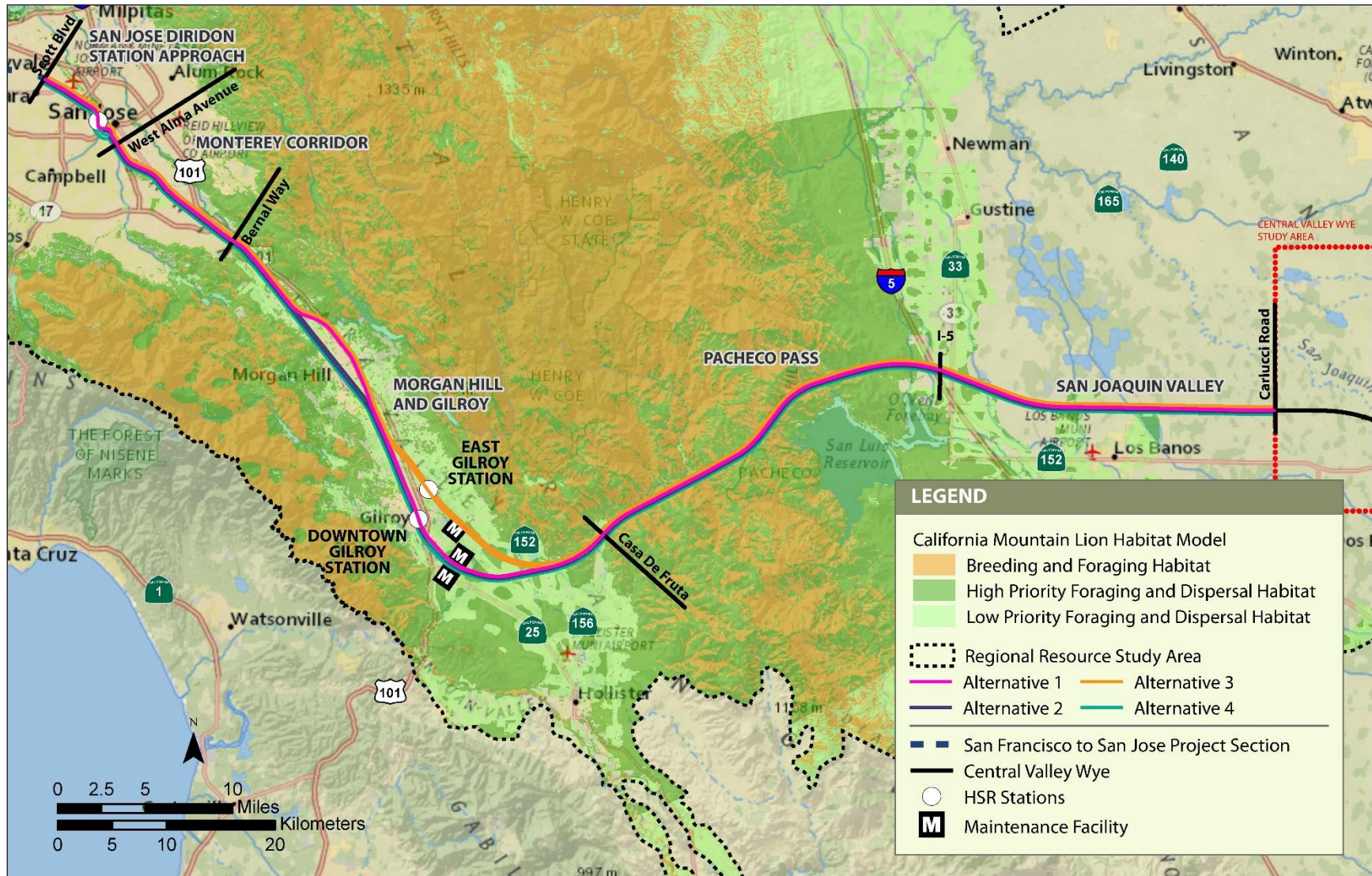
Modeled Habitat Categories and Modeling Parameters	Model Evaluation
<p>Low-Priority Foraging and Dispersal Habitat—Low-priority foraging and dispersal habitat in the regional study area meets the following criteria (Figure 3.7-D-2).</p> <ul style="list-style-type: none"> ▪ Current range (Zeiner et al. 1990) AND ▪ All herbaceous, shrub, woodland, and forested natural land cover types (Authority 2016) AND ▪ Within areas of low movement value³ AND <p>Does not meet the conditions of breeding and foraging habitat (as defined in the above model description).</p>	

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³ Movement values were calculated as inputs to the local permeability modeling performed under the *Wildlife Corridor Assessment Report* (Authority 2020, Appendix C) in which landscape permeability is based on a calculated Habitat Suitability Index (HSI), which is a function of ranked land cover, road density, and topographic conditions. Areas having an HSI value less than 50 (1–100 scale) (i.e., lower score indicated a low potential for use as a movement corridor) were included in the low-priority foraging and dispersal habitat model.

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Figure 3.7-D-2 Coastal Mountain Lion Habitat