

CHAPTER 12 SUMMARY

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12.1 INTRODUCTION

The alluvial terrace landscape of eastern Merced County, with its geologic diversity, high density and diversity of vernal pools and playa pools, large expanses of undisturbed annual grasslands, rock outcrops, and other unique habitat features, supports a diverse and robust assemblage of native wildlife and plant species. Included within this assemblage are many special-status species, several of which have important remaining population centers within the region. The biological field surveys and reviews conducted for this study identified habitat type, geology, topography, and surface geomorphology as a set of primary interrelated factors influencing the distribution and abundance of wildlife and rare plant species within the study area. This chapter provides a brief discussion of these factors as they relate to the suite of special-status species present in the study area. It discusses some of the bioregional distribution patterns observed among the surveyed ranches, and provides an annotated list of many of the special-status species that have important population centers in the study area.

12.2 HABITAT ASSOCIATIONS OF SPECIAL-STATUS SPECIES

The specific habitat types considered within the context of this study included vernal pools, playa pools, vernal swales/ephemeral drainages, seasonally saturated clay flats, seasonal stock ponds, perennial reservoirs and stock ponds, seasonal creeks, irrigation canals, annual grasslands, rock outcrops, blue oak savanna, and riparian woodland and marsh. Table 12.1 lists the special-status species identified during the ranchland field surveys, and indicates the preferred habitat(s) of each species. Vernal pools, playa pools, annual grasslands, and riparian habitats were found to support the greatest number of special-status species. Rock outcrops supported an intermediate number, and the remaining habitat types supported the lowest number of special-status species.

Vernal pools and playa pools are especially important for vernal pool large branchiopods, amphibians, and a majority of the special-status plant species identified within the study area. Interestingly, a significantly larger number of special-status species are associated with large and/or playa type pools. These pools also support a much higher

proportion of federal and state listed species. These numbers directly correlate with the relative abundance of the pools within the different size classes across the landscape. Of the roughly 30,000 to 40,000 vernal pools estimated to occur within the 45,000-acre ranchland survey area, the large majority are small to medium sized pools, less than ten percent are large pools, and less than one tenth of one percent may be regarded as true playa pools (see discussions in Chapters 2-5 for description of pool class size). The extreme rarity and uniqueness of the playa pools reflect their critical importance as havens for exceptionally rare species, especially the Conservancy fairy shrimp and Orcutt tribe grasses. They also support other special-status large branchiopod, amphibian, and plant species. Large vernal pools also provide preferred habitat for four of the six species of large branchiopods found in the study area, are critical breeding sites for the California tiger salamander and western spadefoot, and support several non-Orcutt special-status plant species. Small vernal pools, due to their relatively short and often intermittent ponding regimes during an average rain year, do not generally provide suitable breeding sites for amphibians nor are they preferred sites for large branchiopods other than the midvalley fairy shrimp and vernal pool fairy shrimp. With regard to plants, all of the vernal pool-associated special-status plant species (excluding the Orcutt tribe grasses) can occupy small vernal pools.

The other seasonal wetland habitat types identified in the study area are associated with far fewer special-status species. Vernal swales and ephemeral drainages occasionally support large branchiopods, such as the California clam shrimp, California fairy shrimp, and vernal pool tadpole shrimp. Amphibian larvae are rarely found within these habitats, and then only those of the more common western toad or Pacific tree frog. Succulent owl's-clover infrequently occurs within swales and drainages, but no other rare plants were observed within these habitats. Perhaps the more important functions of swales and drainages are as hydrologic connections between and among vernal pools, and possibly, as temporary refugia for vernal pool-breeding amphibians during overland migration. The seasonally saturated clay flats, due to their dense clay soils and seasonal saturation, present a unique habitat for two special-status plant species, the shining navarretia and hogwallow starfish. No other

Table 12.1. Occurrences of special-status species by preferred habitat type within the eastern Merced County regional study area, CA. Brackets indicate species assumed present though not observed.

	Vernal Pools (Small)	Vernal Pools (Medium)	Vernal Pools (Large/Playa)	All Vernal Pools	Vernal Swales and Ephemeral Drainages	Seasonally Saturated Clay Flats	Seasonal Stock Ponds	Permanent Reservoirs and Stock Ponds	Seasonal Creeks	Irrigation Canals	Annual Grasslands	Rock Outcrops - Slate	Rock Outcrops - Sandstone	Rock Outcrops - Volcanic Tuff	Rock Outcrops – All Types	Blue Oak Savanna	Riparian Habitat
SPECIAL-STATUS SPECIES																	
PLANTS																	
<i>Listed Species</i>																	
Succulent owl's-clover	X	X	X	X													
Bogg's Lake hedge-hyssop	[X]	[X]	[X]	X													
Colusa grass			X	X			X										
San Joaquin Valley Orcutt grass			X	X													
Hairy Orcutt grass			X	X													
Hartweg's golden sunburst											X						
Greene's tuctoria			X	X													
<i>Other Special-Status Species</i>																	
Henderson's bent grass	X	X		X													
Hoover's calycadenia												X	X	X	X		
Beaked clarkia													X	X	X		
Ewan's larkspur											X						
Dwarf downingia	X	X		X													
Spiny-sepaled button-celery	X	X	X	X	X	X	X										
Stinkbells											X						
Hogwallow starfish						X											
Pincushion navarretia	X	X		X													
Shining navarretia						X											
Merced phacelia											X						
Sanford's arrowhead																	X
Total # Listed Plant Species	2	2	6	6	1	3	1				1		1	2	2		1
Total # Special-Status Plant Species	6	6	7	10	1	3	2				4		1	2	2		1
LARGE BRANCHIOPODS																	
<i>Listed Species</i>																	
Conservancy fairy shrimp			X	X													
Vernal pool fairy shrimp	X	X		X													
Vernal pool tadpole shrimp		X	X	X													
<i>Other Special-Status Species</i>																	
Midvalley fairy shrimp	X			X													
California clam shrimp			X	X	X		X										
California linderiella		X	X	X													
Total # Listed Branchiopod Species	1	2	2	3													
Total # Special-Status Branchiopod Species	2	3	4	6	1		1										

Table 12.1. (cont'd) Occurrences of special-status species by preferred habitat type within the eastern Merced County regional study area, CA. Brackets indicate species assumed present though not observed.

	Vernal Pools (Small)	Vernal Pools (Medium)	Vernal Pools (Large/Playa)	All Vernal Pools	Vernal Swales and Ephemeral Drainages	Seasonally Saturated Clay Flats	Seasonal Stock Ponds	Permanent Reservoirs and Stock Ponds	Seasonal Creeks	Irrigation Canals	Annual Grasslands	Rock Outcrops - Slate	Rock Outcrops - Sandstone	Rock Outcrops - Volcanic Tuff	Rock Outcrops – All Types	Blue Oak Savanna	Riparian Habitat
SPECIAL-STATUS SPECIES																	
TERRESTRIAL INVERTEBRATES																	
<i>Listed Species</i>																	
Valley elderberry longhorn beetle																	
<i>Other Special-Status Species</i>																	
Molestan blister beetle																	
	[X]	[X]	[X]	[X]													X
Total # Listed Terrestrial Invertebrate Species																	
																	1
Total # Special-Status Terrestrial Invertebrate Species																	
	1	1	1	1													1
AMPHIBIANS																	
<i>Listed Species</i>																	
(none)																	
<i>Other Special-Status Species</i>																	
California tiger salamander																	
			X	X			X				X						
Western spadefoot																	
			X	X							X						
Western toad																	
			X	X			X	X	X		X						
Total # Special-Status Amphibian Species																	
			3	3			2	1	1		3						
AQUATIC REPTILES																	
<i>Listed Species</i>																	
(none)																	
<i>Other Special-Status Species</i>																	
Western pond turtle																	
								X	X	X	X						
Total # Special-Status Reptile Species																	
								1	1	1	1						
BIRDS																	
<i>Listed Species</i>																	
Bald eagle (wintering /nesting)																	
								X			X						X
Peregrine falcon (wintering)																	
											X						X
Swainson's hawk (nesting)																	
											X						X
<i>Other Special-Status Species</i>																	
Golden eagle (foraging)																	
											X						X
Northern Harrier (nesting/foraging)																	
											X						X
Ferruginous hawk (wintering)																	
											X						X
Prairie falcon (wintering)																	
											X			X			X
Merlin (wintering)																	
											X						X
White-tailed kite (nesting/foraging)																	
											X						X
Osprey (nesting/foraging)																	
							X				X						X
Short-eared owl (wintering)																	
											X						X
Western burrowing owl (burrow sites)																	
											X		X	X			

Table 12.1. (cont'd) Occurrences of special-status species by preferred habitat type within the eastern Merced County regional study area, CA. Brackets indicate species assumed present though not observed.

	Vernal Pools (Small)	Vernal Pools (Medium)	Vernal Pools (Large/Playa)	All Vernal Pools	Vernal Swales and Ephemeral Drainages	Seasonally Saturated Clay Flats	Seasonal Stock Ponds	Permanent Reservoirs and Stock Ponds	Seasonal Creeks	Irrigation Canals	Annual Grasslands	Rock Outcrops - Slate	Rock Outcrops - Sandstone	Rock Outcrops - Volcanic Tuff	Rock Outcrops – All Types	Blue Oak Savanna	Riparian Habitat
SPECIAL-STATUS SPECIES																	
American bittern (nesting)								X									X
American white pelican (wintering)																	
Greater sandhill crane (wintering)											X						
White-faced ibis (wintering)																	X
Long-billed curlew (wintering)			X	X							X						X
Heron/egret (rookery)																	X
Tricolored blackbird (colony)																	X
Yellow-breasted chat																	X
Loggerhead shrike (nesting/foraging)											X					X	X
California horned lark											X						X
Lawrence's goldfinch																	X
Total # Listed Bird Species								1			2						2
Total # Special-Status Bird Species				1				3			14		2	1	2	1	14
SMALL MAMMALS																	
Listed Species																	
(none)																	
Other Special-Status Species																	
Merced kangaroo rat											X		X	X			
San Joaquin pocket mouse											X						
Total # Special-Status Small Mammal Species											2	1	1	1			
LARGE MAMMALS																	
Listed Species																	
San Joaquin kit fox											X						
Other Special-Status Species																	
(none)																	
Total # Special-Status Large Mammal Species											1						
BATS																	
Listed Species																	
(none)																	
Other Special-Status Species																	
Pallid bat (roosting habitat)													[X]	[X]	[X]		
Townsend's big-eared bat (roosting habitat)													[X]	[X]			
Western mastiff bat (roosting habitat)													[X]	[X]			
Red bat (roosting habitat)																	[X]
Total # Special-Status Bat Species													3	3	1		1
TOTAL # LISTED SPECIES (ALL SPECIES GROUPS)	3	4	6	9	0	0	1	1	0	0	4	0	0	0	0	0	3
TOTAL # SPECIAL-STATUS SPECIES (ALL SPECIES GROUPS)	9	13	14	17	2	3	5	3	2	1	25	0	4	7	8	2	17

special-status species are associated with the clay flats. In fact, the Merced kangaroo rat and San Joaquin pocket mouse are probably unable to occupy these flats since they prefer drier and more friable soils for burrowing. The seasonal creeks in the study area provide breeding habitat for the western toad, which is considered by some biologists to be a special-status species since it is in decline across much of its range, including the San Joaquin Valley (see discussion in Chapter 5). Western pond turtles were observed in a few of the larger seasonal creeks in the study area, all of which had well-developed pools within the creek channels that persisted into summer and fall. The seasonal stock ponds in the study area serve as breeding sites for California tiger salamanders and western toads, and often support California clam shrimps. No other large branchiopods were observed with seasonal stock ponds. Colusa grass occasionally occurs in seasonal stockponds. The perennial stock ponds, reservoirs, and canals in the study area provide potential habitat for western pond turtles and breeding sites for western toads.

The large tracts of undisturbed annual grasslands in the study area support a broad range of special-status wildlife species, including the Merced kangaroo rat, San Joaquin pocket mouse, San Joaquin kit fox, American badger and several grassland-nesting and foraging birds. Several species of wintering and resident special-status raptors occur within the study area, and utilize the grasslands for foraging. Bats can also forage over the grasslands. The California tiger salamander, western spadefoot, and western toad aestivate within the annual grasslands and the western pond turtle lays its eggs within the grasslands. On a broad level, the annual grasslands are less important for special-status plant species as occurrences of these species (Hartweg's golden sunburst, Merced phacelia, Ewan's larkspur, and stinkbells) are highly localized, very limited in extent, and generally associated with very specific soil microhabitats.

Riparian habitat is very limited within the study area, occurring along the Merced River and associated dredge tailings, sparsely along the Chowchilla River and some of the larger creeks, and along some of the human-made canals and reservoirs. This habitat is especially important for nesting and wintering birds. Most of the special-status bird species identified in the study area are

either directly or indirectly dependent on riparian habitat. Dense riparian habitat (primarily along the Merced River) can also support the ringtail, a special-status mammal, and elderberry bushes within the riparian corridors can support the valley elderberry longhorn beetle.

Rock outcrops, while also very limited within the study area, provide unique substrates important for a couple of special-status plant species as well as a unique type of shelter for wildlife species. Hoover's calycadenia is specifically adapted to thrive in the low competition environment of soils cracks and thin soils atop Ione sandstone outcrops. Beaked clarkia appears to take advantage of the thermal protection (shading) provided by steep north-facing rock bluffs. In addition to these special-status plants, numerous other plant species that are common elsewhere are found within the study area almost exclusively in association with rock outcrops. The Valley Springs tuff and Ione sandstone outcrops both provide unique habitats for wildlife. However, due to the different ways in which they weather, they attract somewhat different suites of species. The Valley Springs tuff outcrops often have rain-eroded caves at their bases. These caves, ranging in size from small cavities to large openings that a person can walk into, are used extensively by burrowing owls for shelter and nesting. The larger caves also provide potential roosting sites for bats, and could be used for shelter and nesting by small mammals. As anecdotal evidence, a Merced kangaroo rat released during field trapping was seen retreating into one of these caves. The Ione sandstone outcrops form vertical cracks rather than caves, and so do not provide the same quality of shelter for birds and mammals. Western burrowing owls were rarely seen utilizing these outcrops. The vertical faces, where tall enough, could provide nest and perch sites for raptors and other birds. An active raven's nest was observed on the face of one Ione outcrop during the field surveys. Also, some bat species could utilize these outcrops for roost sites, provided the vertical cracks are of the correct width and depth. Slate outcrops of the Mariposa Formation do not appear to provide especially unique or valuable habitat for plants or wildlife; however they do support outstanding colonies of lichens.

Blue oak savanna is extremely limited within the study area, essentially confined to a few small pockets along the eastern edge of the study area.

As the only non-riparian trees within the rangeland portion of the study area, these trees provide some unique habitat values for wildlife. Special-status raptors probably use these trees as perch or nest sites, as do loggerhead shrikes. Other non-special-status wildlife species were found exclusively within this habitat, including Lewis' woodpecker and the brush mouse.

12.3 INFLUENCE OF GEOLOGY AND TOPOGRAPHY ON SPECIAL-STATUS SPECIES DISTRIBUTION

Geology and topography within the study area have a strong influence on the distribution and characteristics of certain habitat types in the study area, and thus in turn, on the distribution and abundance of certain special-status species, especially those associated with rock outcrop, vernal pool, playa pool, and annual grassland habitats.

Rock outcrops provide the most direct example of geological influences on the distribution of habitat and associated species. The Ione sandstone and Valley Springs volcanic tuff outcrops occur in a narrow band along the eastern edge of the study area. The special-status and other unique wildlife and plant species associated with these outcrops therefore occur only in this portion of the study area.

As discussed in Chapters 2 through 5, the mean density and size (area and depth) of vernal pools vary significantly between the different geologic surfaces present in the study area. This appears to be related primarily to the topographic characteristics of each surface, but also relates to the age and weathering characteristics of the parent material. The Mariposa Formation, occurring intermittently along the eastern margin of the study area, has the steepest topography and therefore supports few vernal pools or their associated special-status species. The Ione and Laguna formations also occur within fairly steep terrain and vernal pools, and are concentrated on flat areas within these formations. Mean pool size is comparatively small and there are few large pools. As a result, these surfaces generally support only those special-status species associated with small- to medium-sized vernal pools, such as the vernal pool fairy shrimp, California fairy shrimp and non-Orcutt tribe plant species. Conspicuously absent or very uncommon

are those species that require larger or deeper pools, including the vernal pool tadpole shrimp, California clam shrimp, California tiger salamander, western spadefoot, western toad and the Orcutt tribe grasses. The highest diversity and abundance of vernal pool special-status species occur on those surfaces with medium to large mean pool sizes, including the Valley Springs, Mehrten, North Merced Gravels, Turlock Lake, Riverbank and Modesto formations. None of the special-status species associated with vernal pools (excluding playa pools) appears to have a high fidelity to any particular geologic surface.

Playa pools, as the most unique and rare type of vernal pool in the study area, require a large area of flat terrain to form. As a result, they are mostly confined to the low-terrace, low-gradient geologic surfaces in the central and southern rangeland portions of the study area. No playa pools were identified north of La Paloma Road where the terrain is generally too hilly for their formation. The highest density of playa pools appears to be in the region between La Paloma Road and Bear Creek and there appears to be a low to moderate density of playa pools south of Bear Creek down to the Chowchilla River. The four species of rare Orcutt tribe grasses known from the study area (Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, and Greene's tuctoria) are associated primarily with playa pools. While these species could occur on a range of geologic surfaces, the large majority of known occurrences are on only three surfaces: Mehrten, North Merced Gravels, and Riverbank. Furthermore, Colusa grass appears to be more commonly found on Mehrten Formation (clay soils), while San Joaquin Valley Orcutt grass appears to be more commonly found on the North Merced Gravels and Riverbank surfaces (non-clay gravelly and/or sandy soils). The Conservancy fairy shrimp, the only special-status aquatic wildlife species found exclusively in playa pools, is known to occur only on the Mehrten Formation within the study area. Apparently, this species prefers playa pools on this surface due the turbidity imparted by the clay soils.

With annual grasslands, the distributions of many of the associated special-status species are influenced by geology and topography, especially special-status plants. The Hartweg's golden sunburst is closely associated with a specific type of mima mound topography on north-facing slopes on the Valley Springs and, occasionally, Ione formations.

(As discussed in Chapter 3, the known occurrences of this species in the study area are mapped on Ione Formation. However, the Marchand geologic maps used for the analysis often mis-map the Valley Springs Formation as other geologic surfaces and so most occurrences are probably on the Valley Springs Formation. Previous studies have indicated that all known occurrences of the species just north of the study area in Stanislaus County are on Amador soils of the Valley Springs Formation.) Therefore, the potential and known distribution of this species is restricted to a narrow band along the eastern edge of the study area where these formations exist. The Merced phacelia, while poorly understood, appears to be associated with the clay soils of the Merchten Formation. Given this association and the large areas covered by the Merchten Formation within the study area, it is unclear why this species appears to be locally restricted to the Highway 140 region. With regards to wildlife species, geology appears to influence the distribution and abundance of some special-status species due to differences in soil friability and associated vegetation density. Though overall trapping density was low, which made analysis of results difficult, it appears that the Merced kangaroo rat is more commonly associated with sandy soils of the Ione Formation and granitic units of the Riverbank Formation (r2 unit adjacent to the Chowchilla River). The American badger was observed most abundantly at the ranches in the southern portion of the study area (Flynn and Knapp) and apparently prefers these more friable soils for den construction. Though no quantitative data were gathered, the density of ground squirrels appeared to be highest in the southern portion of the study area. Since many factors can influence the dynamics of ground squirrel populations (including poisoning), more studies would be needed to determine what role, if any, geology plays in their regional distribution and abundance. This would be an important question to answer since ground squirrels are a keystone species, serving as an important prey base for a broad range of mammal and bird species and providing burrow sites for western burrowing owls and California tiger salamanders.

12.4 BIOREGIONALISM OF SPECIAL-STATUS SPECIES WITHIN THE STUDY AREA

The field surveys conducted for this study focused on five large ranchland blocks or regions as summarized in Table 12.2 (see Chapter 2 for descriptions of these regions). Each of these regions showed a surprising uniqueness in terms of the diversity and abundance of their special-status species. This uniqueness appears to be related primarily to difference in geology and topography, and by correlation, to associated habitat types. Other factors could also be important, such as recent colonization or evolution of species within the study area, patchy species distribution, effects of historic and current land uses, and competition with other species, including non-natives.

Region A (Kelsey and Richards ranches) is located north of the Merced River. It incorporates hilly terrain with a relatively low density of small to medium-sized vernal pools concentrated on flat hilltops and valley bottoms, and a high proportion of the higher terrace geologic surfaces (Table 12.3). This region supports the only known occurrences of the Hartweg's golden sunburst and stinkbells as well as a large proportion of known occurrences of the Hoover's calycadenia in the study area. Other unique biological aspects of the region include a relative abundance of Merced kangaroo rats and western pond turtles as well as large concentrations of wintering bald eagles and other raptors around the Kelsey Reservoir. Also, numerous burrowing owls were observed in the region, utilizing small caves within Valley Springs outcrops for shelter and perhaps nesting.

Region B (Chance and Roduner ranches) is located between the Merced River and La Paloma Road. This region encompasses a significant portion of China Hat Ridge, a unique geologic feature with pronounced mima mound topography. This ridge is thought to be composed of alluvium from one of the earliest glaciations in the Sierra Nevada (see Chapter 2 for a complete discussion). Complexes of small- to medium-sized vernal pools occur across the top of the ridge plateau. These pools support the densest concentration of the succulent owl's-clover observed in the study area as well as the vernal pool fairy shrimp. There are additional pool complexes on the flat terraces formed around the

Table 12.2. Occurrences of special-status species by surveyed ranchlands within the eastern Merced County regional study area, CA. Density rating for individual species occurrences: 1 = low abundance; 2 = moderate abundance; 3 = high abundance. Parentheses indicate species not observed but assumed present.

SPECIAL-STATUS SPECIES	SURVEYED RANCHES																
	Kelsey	Richards	TOTAL REGION A	Chance	Roduner	TOTAL REGION B	Flying M	Ichord	TOTAL REGION C	Butler	Crookham	Cunningham	Nelson	TOTAL REGION D	Flynn	Knapp	TOTAL REGION E
PLANTS																	
<i>Listed Species</i>																	
Succulent owl's-clover	1	1	1	3	3	3	3	2	3	2	1	1	3	3	0	1	1
Bogg's Lake hedge-hyssop	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Colusa grass	0	0	0	0	0	0	3	1	3	0	0	0	0	0	0	0	0
San Joaquin Valley Orcutt grass	0	0	0	0	0	0	3	3	3	0	0	0	0	0	0	0	0
Hairy Orcutt grass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hartweg's golden sunburst	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greene's tuctoria	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0
<i>Other Special-Status Species</i>																	
Henderson's bent grass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hoover's calycadenia	3	3	3	0	0	0	2	0	2	0	2	0	3	3	0	0	0
Beaked clarkia	0	0	0	2	0	2	2	0	2	0	0	0	0	0	0	0	0
Ewan's larkspur	0	0	0	1	1	1	0	0	0	1	0	0	0	1	0	0	0
Dwarf downingia	3	2	3	0	0	0	1	0	1	1	0	0	1	1	0	0	0
Spiny-sepaled button-celery	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Stinkbells	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pincushion navarretia	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0
Shining navarretia	0	0	0	0	1	1	[2]	3	3	1	1	1	1	1	0	0	0
Merced phacelia	0	0	0	0	0	0	[1]	1	1	0	0	0	0	0	0	0	0
Sanford's arrowhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total # Listed Plant Species	2	2	2	1	1	1	5	3	5	1	1	1	1	1	0	1	1
Total # All Special-Status Plant Species	5	6	6	4	4	5	12	6	12	5	4	3	5	6	1	2	2
LARGE BRANCHIOPODS																	
<i>Listed Species</i>																	
Conservancy fairy shrimp	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
Vernal pool fairy shrimp	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Vernal pool tadpole shrimp	0	0	0	0	0	0	3	3	3	0	0	0	0	0	3	3	3
<i>Other Special-Status Species</i>																	
Midvalley fairy shrimp	0	0	0	0	1	1	3	3	3	1	1	3	3	3	3	3	3
California clam shrimp	3	1	3	2	2	2	2	1	2	1	2	2	2	2	2	3	3
California linderiella	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Total # Listed Branchiopod Species	1	1	1	1	1	1	3	3	3	1	1	1	1	1	2	2	2
Total # All Special-Status Branchiopod Species	3	3	3	3	4	4	6	6	6	4	4	4	4	4	5	5	5
TERRESTRIAL INVERTEBRATES																	
<i>Listed Species</i>																	
VELB habitat (elderberry bushes)	2	1	2	1	0	1	2	1	2	0	0	1	1	1	0	2	2
<i>Other Special-Status Species</i>																	
(none)																	
Total # Listed TI Species	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0	1	1

Table 12.2. (cont'd) Occurrences of special-status species by surveyed ranchlands within the eastern Merced County regional study area, CA. Density rating for individual species occurrences: 1 = low abundance; 2 = moderate abundance; 3 = high abundance. Parentheses indicate species not observed but assumed present.

	SURVEYED RANCHES																
	Kelsey	Richards	TOTAL REGION A	Chance	Roduner	TOTAL REGION B	Flying M	Ichord	TOTAL REGION C	Butler	Crookham	Cunningham	Nelson	TOTAL REGION D	Flynn	Knapp	TOTAL REGION E
SPECIAL-STATUS SPECIES																	
AMPHIBIANS																	
<i>Listed Species</i>																	
(none)																	
<i>Other Special-Status Species</i>																	
California tiger salamander	1	0	1	1	2	2	1	1	1	2	1	2	3	2	3	3	3
Western spadefoot	0	0	0	0	0	0	0	1	1	[1]	1	2	2	2	3	3	3
Western toad	2	2	2	2	3	3	3	[1]	2	2	2	2	1	2	3	3	3
Total # All Special-Status Amphibian Species	2	1	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
AQUATIC REPTILES																	
<i>Listed Species</i>																	
(none)																	
<i>Other Special-Status Species</i>																	
Western pond turtle	3	2	3	2	1	2	3	[1]	2	0	2	2	3	3	0	0	0
Total # All Special-Status Reptile Species	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0
BIRDS																	
<i>Listed Species</i>																	
Bald eagle (nesting)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
<i>Other Special-Status Species</i>																	
American bittern (nesting)	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Tricolored blackbird (nesting)	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Total # Listed Bird Species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total # All Special-Status Bird Species	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	1	1
SMALL MAMMALS																	
<i>Listed Species</i>																	
(none)																	
<i>Other Special-Status Species</i>																	
Merced kangaroo rat	3	2	3	[1]	[1]	1	[1]	[1]	1	[1]	[1]	[1]	1	1	[2]	3	3
San Joaquin pocket mouse	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]
Total # Special-Status Small Mammal Species	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LARGE MAMMALS																	
(not considered)																	
BATS																	
(not considered)																	
TOTAL # LISTED SPECIES (ALL SPECIES GROUPS)	4	4	4	3	2	3	9	7	9	2	2	3	3	3	2	5	5
TOTAL # SPECIAL-STATUS SPECIES (ALL SPECIES GROUPS)	14	14	15	15	13	17	24	19	25	14	14	14	16	17	11	14	14

Table 12.3. Predominant geologic surfaces of the surveyed ranchlands in the eastern Merced County regional study area, CA.

	SURVEYED RANCHES																
	Kelsey	Richards	TOTAL REGION A	Chance	Roduner	TOTAL REGION B	Flying M	Ichord	TOTAL REGION C	Butler	Crookham	Cunningham	Nelson	TOTAL REGION D	Flynn	Knapp	TOTAL REGION E
ACREAGE	7,500	4,500	12,000	7,600	5,900	13,500	12,000	3,100	15,100	560	1,200	2,100	3,700	6,560	1,250	550	1,800
GEOLOGIC SURFACES																	
Mariposa	X		X														
Ione	X	X	X				X		X		X		X	X			
Valley Springs	X	X	X	X		X	X	X	X	X	X		X	X	X		
Mehrten				X		X	X	X	X	X	X	X	X	X	X		
Laguna (China Hat)				X	X	X											
Laguna (lower unit)	X	X	X	X	X	X	X		X			X	X	X			
North Merced Gravels	X	X	X	X	X	X	X		X	X	X	X	X	X			
Turlock Lake	X	X	X	X		X									X	X	X
Riverbank					X	X	X	X	X		X	X	X	X	X	X	X
Modesto																	
TOTAL # OF SURFACES	6	5	6	6	4	7	6	2	6	3	5	4	6	6	2	2	2

base of the ridge. Other unique habitat elements include the large Valley Springs bluffs overlooking the Merced River valley, and extensive perennial marsh habitat growing adjacent to leaks in the Main Canal at the Chance Ranch. The bluffs support a large population of the beaked clarkia (the only population observed during the field surveys). Caves within the bluff face could provide some of the best potential bat roosting habitat in the study area (other than human-made bridges and barns) as well as shelter for other wildlife species. The perennial marsh habitat supports a high diversity and abundance of bird species, including nesting sites for tricolored blackbirds and the American bittern.

Region C (Flying M/Ichord ranches) is located in the central portion of the study area, north of Bear Creek. It supports the highest number of special-status species among the different regions, including the highest proportion of federal and state listed species. These ranches, in conjunction with some of the immediately adjacent ranches, incorporate what may be the “heartland” of playa pools and their associated rare species in the study area. All three known Conservancy fairy shrimp

occurrences and a large proportion of the study area’s known Orcuttiae grass occurrences are located in this region. Large branchiopod diversity is highest in this region, with both the Flying M and Ichord ranches supporting all six of the large branchiopod species known from the study area. This diversity appears to be due to the fact that they support the full range of pool sizes, including small, large and playa-type pools. The diversity of non-Orcutt grass special-status plant species is also high, especially at the Flying M Ranch, due to the high geologic diversity (Table 12.3). Among the represented species is one of the two known occurrences of the pincushion navarretia within the study area. Lastly, the Ichord Ranch is the only ranch where the San Joaquin kit fox was observed during field surveys and kit fox was also observed here during a previous survey.

Region D (Butler/Crookham/Cunningham/Nelson ranches) is located in the vicinity of the Highway 140 corridor near the eastern edge of the study area. This region has a high geologic diversity since it abuts the foothills and extends westward

across Riverbank and Mehrten surfaces. As a result, the diversity and bundance of special-status plant species is high. There are dense populations of succulent's owl's-clover, sevral populations of Hoover's calycadenia, and one of the two occurrences of pincushion navarretia known from the study area. No Orcuttieae grasses were identified in this region but there is an occurrence of San Joaquin Valley Orcutt grass just west of the Butler Ranch and a few large pools within the region likely to support this or other Orcuttieae species. With regards to special-status wildlife, the region supports four of the six large branchiopod species in the study area, including a relatively high abundance of midvalley shrimp, as well as an abundance of California tiger salamanders and western spadefoots. In contrast to the more northerly regions, this region (as well as Region E) appears to be relatively free of bullfrogs, which can predate upon and compete with native amphibians.

Region E (Flynn/Knapp ranches) is located in the far southern portion of the study area. The terrain is flat and incorporates a section of the broad alluvial terrace (middle unit, Riverbank Formation) deposited adjacent to the Chowchilla River. The geologic diversity is low but, due to the geomorphological characteristics of the terrain (see Chapter 2), this region supports the highest abundance of large vernal pools in the survey area (see Chapter 5). As a result, while the diversity of special-status plant species is very low, there is a great diversity and abundance of large branchiopods and native amphibians, especially vernal pool tadpole shrimp, California tiger salamander, and western spadefoot. Other special-status aquatic species present include vernal pool fairy shrimp, midvalley

fairy shrimp, and western toad. These species often co-occur within pools and several pools on these ranches simultaneously supported five or six different special-status aquatic species. Apparently, geologic diversity is not an important factor for aquatic amphibian or large branchiopod diversity. Some of the highest levels of diversity and abundance for these two groups occurred on ranches with the lowest geologic diversity (Ichord, Flynn, and Knapp) (Table 12.3). In contrast, geologic diversity is an important determinant for the diversity of special-status plant species (especially non-Orcutt tribe species). With regards to mammals, this region supports an abundance of Merced kangaroo rats and American badgers, due at least in part to the prevalence of loose, sandy soils. There was also an abundance of California ground squirrels, which provide critical burrow sites for California tiger salamanders and western burrowing owls. Lastly, and active bald eagle nest was observed in a tree along the Chowchilla River. There are currently few bald eagle nests known from the San Joaquin Valley and this is the only site known from the regional study area.

12.5 SPECIAL-STATUS SPECIES WITH IMPORTANT POPULATION CENTERS IN THE STUDY AREA

Table 12.1 lists 62 special-status species identified within the regional study area. At least 17 of these species (and one species assemblage, the wintering raptors) have population centers within the study area important for their long-term statewide conservation and survival. Table 12.4 provides an annotated list of these species.

Table 12.4. Annotated list of selected special-status species with important population centers in the eastern Merced County regional study area, CA.

SPECIES	COMMENTS
Plants	
Succulent owl's-clover	Study area is the center of known distribution for this species; dense populations recorded on top of China Hat Ridge (Chance and Roduner ranches), Nelson Ranch, and the Smith Trust lands.
Colusa grass	Study area supports a majority of the known remaining occurrences of this species nearly all of which are concentrated in the central ranchland area between La Paloma Road and Bear Creek.
San Joaquin Valley Orcutt grass	Study area supports a large majority of the known remaining occurrences of this species most of which are concentrated in the central ranchland area between La Paloma Road and Bear Creek; there are some occurrences further south.

Table 12.4. (cont'd) Annotated list of selected special-status species with important population centers in the eastern Merced County regional study area, CA.

SPECIES	COMMENTS
Hartweg's golden sunburst	Study area supports approximately ¼ of the known occurrences of this species all of which are concentrated in the northeastern portion of the study area (Kelsey and Richards ranches).
Greene's tuctoria	Study area supports all known remaining occurrences of this species in the San Joaquin Valley, distributed within the central and southern rangeland area.
Hoover's calycadenia	Study area constitutes the center of the known range of this species and supports a majority of known occurrences; distributed intermittently along the eastern margin of the study area.
Pincushion navarretia	Study area supports two of the four known occurrences of this species; occurrences located at the Flying M Ranch and Butler Ranch near the eastern edge of the study area.
Shining navarretia	Study area supports a disjunct population of this species which otherwise is known only from the interior Central Coast Ranges; dense populations at the Ichord Ranch and Smith Trust lands.
Merced phacelia	All known occurrences of this species are located within the study area in the vicinity of Highway 140.
Large Branchiopods	
Conservancy fairy shrimp	Study area supports three of the approximately 19 known occurrences of this species; regarded as the third most important region for the species after Vina Plains and Jepson Prairie (see Chapter 4); all three occurrences in the study area are in the central rangeland area between La Paloma Road and Bear Creek.
Vernal pool fairy shrimp	Study area supports an exceptionally large, dense and robust population of this species.
Midvalley fairy shrimp	Study area supports one of two known population centers for this species (the other is in the Solano/Sacramento County region) with a majority of known occurrences; distributed across the central and southern rangeland portions of the study area.
Vernal pool tadpole shrimp	Study area supports perhaps the largest population of this species in the San Joaquin Valley; distributed along the western margin of the rangelands in the central and southern portion of the study area.
Amphibians	
California tiger salamander	Study area supports an exceptionally large and robust population of this species important for its long-term conservation in the San Joaquin Valley; the densest populations are located on rangelands south of Highway 140, especially just north of the Chowchilla River; there are scattered occurrences north of Highway 140.
Western spadefoot	Study area supports an exceptionally large and robust population of this species important for its long-term conservation in the San Joaquin Valley; all but one of the known occurrences are located on rangelands south of Highway 140, with an especially dense concentration in the far southern portion of the study area.
Birds	
Wintering raptors	The study area supports diverse assemblage of wintering raptors that utilize the large tracts of unfragmented annual grasslands for foraging.
Bald eagle (nesting)	A bald eagle nest was observed near the Chowchilla River. Since there are currently few documented bald eagle nests in the northeastern San Joaquin Valley, the study area could be important for the long-term re-establishment of resident bald eagles.
Small Mammals	
Merced kangaroo rat	Study area is the center of known distribution for this species and supports a large majority of the known occurrences; probably occurs throughout much of the rangeland portion of the study area though it could occur more densely in areas with sandy soils, such as the Knapp and Flynn ranches and portions of the Kelsey Ranch.

