

APPENDIX E

KEYSTONE AND INDICATOR SPECIES AND LOCALLY RARE AND UNUSUAL PLANTS

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Keystone and Indicator Species

LSA Associates Inc., 2008

An important concept in the discussion of resource management for the East Bay Hills is the idea of keystone species. Keystone species are those that assume especially important roles because many other species are dependent on them (Table 1). Keystone species may modify the habitat or affect other plant and animal populations through predation or herbivory. As a result, keystone species may increase biological diversity. For example predators, such as coyote, great horned owl and red-tailed hawk are considered keystone species in the Study Area because they prey on smaller predators and herbivores. Elimination of these predators may result in an increase in populations of small predators and herbivores, which in turn may have a negative effect on even smaller animals and plants. Conversely, fluctuations in populations of important and abundant keystone prey species in the Study Area such as California vole, Botta's pocket gopher, western fence lizard and Pacific tree frog can affect populations of predators. Some animals are considered keystone species because they provide structural diversity that benefits other species. Large tree cavities created by northern flicker, woody debris piles created by dusky-footed woodrat, and burrows created by Botta's pocket gopher and California vole provide habitat for other animals. These are just a few examples of keystone species. Because ecosystems are complex and the ecological relationships of many species are not well understood, it is difficult to identify many keystone species and the role they play in local communities.

Table 1: Keystone^a Species for the East Bay Hills

	Common Name	Scientific Name	Preferred Habitat
Mammals	Coyote	<i>Canis latrans</i>	Various
	Dusky-footed woodrat	<i>Neotoma fuscipes</i>	Oak-bay and riparian woodland
	Botta's pocket gopher	<i>Thomomys bottae</i>	Grassland
	California vole	<i>Microtus californicus</i>	Grassland
Birds	Red-tailed hawk	<i>Buteo jamaicensis</i>	Oak-bay woodland, eucalyptus and pine plantations
	Great horned owl	<i>Bubo virginianus</i>	Oak-bay woodland, eucalyptus and pine
	Scrub jay	<i>Aphelocoma californica</i>	Forest, woodland, and scrub
	Northern flicker	<i>Colaptes auratus</i>	Oak-bay woodland, eucalyptus and pine plantations
	Nuttall's woodpecker	<i>Picoides nuttallii</i>	Oak-bay woodland
	Scrub jay		Scrub, oak-bay woodland, grassland
Reptiles	Western fence lizard	<i>Sceloporus occidentalis</i>	Grassland, scrub
Amphibians	Pacific treefrog	<i>Pseudacris regilla</i>	Various

^a. "These species are considered to be particularly important in the functioning of the biotic community because so many other species depend upon or interact with them. Like the keystone at the top of an arch that holds the other stones in place, such species are thought to be especially crucial in maintaining the viability of their associated species and ecosystem integrity. It has been proposed that their decline or loss may result in a chain-reaction of declines and even extinctions among their dependent species." Robert C. Stebbins 1996. Biological Survey Studies for the East Bay Municipal Utility District. Guidelines I. Gathering and Recording Wildlife Information. 24 pp. plus Appendices.

Source: LSA Associates Inc. 2008

Another relevant ecological concept is that of indicator species. Indicator species are those that have specialized habitat requirements and are especially sensitive to changes in habitat structure or fragmentation. The presence of these species in a given location can be indicative of the integrity of the local community. Important indicator species occurring in the Study Area are listed in Table 2.

Table 2: Indicator Species^a for the East Bay Hills

	Common Name	Scientific Name	Preferred Habitat
Mammals	Dusky-footed woodrat	<i>Neotoma fuscipes</i>	Oak-bay woodland
	Botta's pocket gopher	<i>Thomomys bottae</i>	Grassland
	Brush rabbit	<i>Sylvilagus bachmanii</i>	Coastal scrub, edge ^b
Birds	Red-shouldered hawk	<i>Buteo lineatus</i>	Eucalyptus, oak-bay woodland, riparian woodland
	Hummingbirds	<i>Various</i>	Eucalyptus
	Nuttall's woodpecker	<i>Picoides nuttallii</i>	Oak-bay woodland
	Hutton's vireo	<i>Vireo huttoni</i>	Oak-bay forest
	Warbling vireo	<i>Vireo gilvus</i>	Riparian woodland
	Chestnut-backed chickadee	<i>Poecile rufescens</i>	Oak-bay forest
	Pygmy nuthatch	<i>Sitta pygmaea</i>	Pine plantations
	Wrentit	<i>Chamaea fasciata</i>	Coastal scrub (xeric)
	California thrasher	<i>Toxostoma redivivum</i>	Scrub
	Cedar waxwing	<i>Bombycilla cedrorum</i>	Eucalyptus
	California towhee	<i>Pipilo crissalis</i>	Open scrub, edge ^b
	Song sparrow	<i>Melospiza melodia</i>	Coastal scrub (mesic)
House finch	<i>Carpodacus mexicanus</i>	Open scrub, edge ^b	
Reptiles	Western fence lizard	<i>Sceloporus occidentalis</i>	Grassland, scrub
	Ringneck snake	<i>Diadophis punctatus</i>	Oak-bay woodland

^a "Indicator species are those presumed to serve as indicators of biological changes and long-term trends on East Bay watersheds." Robert C. Stebbins 1996. Biological Survey Studies for the East Bay Municipal Utility District. Guidelines I. Gathering and Recording Wildlife Information. 24 pp. plus Appendices.

^b "Edge" is the transition or ecotone between plant communities, in these cases between woody vegetation (scrub or woodland) and grassland.

Source: LSA Associates Inc. 2007

Locally Rare and Unusual Plants

Table 3 lists 10 locally rare and unusual plants that have been identified in the Study Area.

Table 3: Locally Rare and Unusual Plants in EBRPD Study Area^a

Species	Habitat Requirement	Region Where Species has been Observed; Specific site
<i>Calycadenia multiglandulosa</i> Sticky western rosinweed	Scrub, tallus, scree	Oakland Hills (north); Skyline serpentine prairie
<i>Cirsium remotifolium</i> Few-leaf thistle	Grassland	Point Molate/Point Richmond;
<i>Cryptantha micromeris</i> Cryptantha	Burn, chaparral, woodland	Oakland Hills (north); Huckleberry Regional Preserve
<i>Dichelostemma multiflorum</i> Many-flower brodiaea	Grassland, scrub, woodland	Point Molate/Point Richmond
<i>Dicondra donnelliana</i> Pony's foot	Scrub, grassland	Point Molate/Point Richmond; Point Molate, Point San Pablo
<i>Elymus glaucus</i> ssp. <i>jepsonii</i> Blue wildrye	Grassland	Berkeley Hills; Strawberry Canyon
<i>Horkelia californica</i> ssp. <i>californica</i> California horkelia	Grassland, scrub	Berkeley Hills; Albany Hill, Claremont Canyon, El Cerrito area
<i>Iris longipetala</i> Coast iris	Grassland, scrub	Berkeley Hills; Wildcat Regional Park
<i>Lupinus variicolor</i> Vari-colored Lupine	Grassland	Berkeley Hills; Claremont Canyon, Strawberry Canyon, Tilden Park, Oakland Hills (south); Anthony Chabot Regional Park
<i>Triphysaria versicolor</i> ssp. <i>faucibarbata</i> Yellow owls-clover	Grassland	Oakland Hills (south); Anthony Chabot Regional Park

^a List of A1 species derived from *Rare, Unusual and Significant Plants of Alameda and Contra Costa Counties*, seventh edition, March 1, 2004, by Dianne Lake, California Native Plant Society, East Bay Chapter. Inclusion of species in the list is based on habitat present in regions within East Bay Regional Park District Study Area.

Source: LSA Associates Inc. 2007