

FAMILY	Common Name	Scientific Name	Host plant
TRUE BUGS - <i>Miridae</i>		Not identified to species	Host plants are unknown or n/a for this species
TRUE BUGS - <i>Anthocoridae</i>		Not identified to species	Host plants are unknown or n/a for this species
CICADAS, HOPPERS, AND APHIDS - <i>Cercopidae</i>		Not identified to species	Host plants are unknown or n/a for this species
CICADAS, HOPPERS, AND APHIDS - <i>Cicadellidae</i>		Not identified to species	Host plants are unknown or n/a for this species
CICADAS, HOPPERS, AND APHIDS - <i>Aphididae</i>		Not identified to species	Host plants are unknown or n/a for this species
CICADAS, HOPPERS, AND APHIDS - <i>Margarodidae</i>		Not identified to species	Host plants are unknown or n/a for this species
CICADAS, HOPPERS, AND APHIDS - <i>Aleyrodidae</i>		Not identified to species	Host plants are unknown or n/a for this species
CICADAS, HOPPERS, AND APHIDS - <i>Psyllidae</i>		Not identified to species	Host plants are unknown or n/a for this species
LACEWINGS - <i>Chrysopidae</i>			
Lacewing		<i>Chrysoperla</i> sp.	Host plants are unknown or n/a for this species
BEETLES - <i>Carabidae</i>			
	unidentified species		Host plants are unknown or n/a for this species
BEETLES - <i>Cicindelidae</i>			
Western mudflat tiger beetle		<i>Cicindela trifasciata sigmoidea</i>	Host plants are unknown or n/a for this species
BEETLES - <i>Scarabaeidae</i>			
No common name		<i>Serica</i> sp.	Host plants are unknown or n/a for this species
No common name		<i>Diplotaxis</i> sp.	Host plants are unknown or n/a for this species
BEETLES - <i>Coccinellidae</i>			
No common name		<i>Hippodamia convergens</i>	Host plants are unknown or n/a for this species
No common name		<i>Coccinella californica</i>	Host plants are unknown or n/a for this species
BEETLES - <i>Tenebrionidae</i>			
Several species, "stink beetles"		<i>Eleodes</i> sp.	Host plants are unknown or n/a for this species
BEETLES - <i>Oedemeridae</i>		Not identified to species	Host plants are unknown or n/a for this species
BEETLES - <i>Elateridae</i>		Not identified to species	Host plants are unknown or n/a for this species
BEETLES - <i>Cantharidae</i>		Not identified to species	Host plants are unknown or n/a for this species
BEETLES - <i>Curculionidae</i>		Not identified to species	Host plants are unknown or n/a for this species
BEETLES - <i>Chrysomelidae</i>			
No common name		<i>Diabrotica undecimpunctata</i>	Host plants are unknown or n/a for this species
BEETLES - <i>Staphylinidae</i>		Not identified to species	Host plants are unknown or n/a for this species
BEETLES - <i>Melyridae</i>			
No common name		<i>Collops</i> sp.	Host plants are unknown or n/a for this species
MOTHS - <i>Gelechiidae</i>		Not identified to species	Host plants are unknown or n/a for this species
MOTHS - <i>Pyralidae</i>		Not identified to species	Host plants are unknown or n/a for this species

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FAMILY Common Name	Scientific Name	Host plant
MOTHS - <i>Tortricidae</i>	Not identified to species	Host plants are unknown or n/a for this species
MOTHS - <i>Scythridae</i>	Not identified to species	Host plants are unknown or n/a for this species
<i>MOTHS - Arctiidae</i>		
No common name	<i>Estigmene acrea</i>	Host plants are unknown or n/a for this species
<i>MOTHS - Noctuidae</i>		
No common name	<i>Autographa californica</i>	Host plants are unknown or n/a for this species
No common name	<i>Trichoplusia ni</i>	Host plants are unknown or n/a for this species
<i>MOTHS - Sphingidae</i>		
No common name	<i>Hyles lineata</i>	Host plants are unknown or n/a for this species
		Host plants are unknown or n/a for this species
FLIES - <i>Tipulidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Culicidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Chironomidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Bibionidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Ephydriidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Drosophilidae</i>	Not identified to species	Host plants are unknown or n/a for this species
<i>FLIES - Asilidae</i>		
No common name	<i>Stichopogon coquillettii</i>	Host plants are unknown or n/a for this species
FLIES - <i>Bombyliidae</i>		Host plants are unknown or n/a for this species
No common name	<i>Exoprosopa eremita</i>	Host plants are unknown or n/a for this species
No common name	<i>Villa</i> sp.	Host plants are unknown or n/a for this species
FLIES - <i>Syrphidae</i>		Host plants are unknown or n/a for this species
No common name	<i>Eristalis tenax</i>	Host plants are unknown or n/a for this species
No common name	<i>Copistylum mexicana</i>	Host plants are unknown or n/a for this species
FLIES - <i>Coelopidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Tephritidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Dolichopodidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Chloropidae</i>	Not identified to species	Host plants are unknown or n/a for this species
FLIES - <i>Anthomyiidae</i>	Not identified to species	Host plants are unknown or n/a for this species
<i>FLIES - Muscidae</i>		
No common name	<i>Musca domestica</i>	Host plants are unknown or n/a for this species

FAMILY	Common Name	Scientific Name	Host plant
	No common name	<i>Stomoxys calcitrans</i>	Host plants are unknown or n/a for this species
FLIES – <i>Calliphoridae</i>			
	No common name	<i>Phaenicia</i> sp.	Host plants are unknown or n/a for this species
	No common name	<i>Calliphora</i> sp.	Host plants are unknown or n/a for this species
FLIES – <i>Sarcophagidae</i>		Not identified to species	Host plants are unknown or n/a for this species
FLIES – <i>Tachinidae</i>		Not identified to species	Host plants are unknown or n/a for this species
WASPS – <i>Braconidae</i>		Not identified to species	Host plants are unknown or n/a for this species
WASPS – <i>Ichneumonidae</i>		Not identified to species	Host plants are unknown or n/a for this species
ANTS – <i>Formicidae</i>			
ant		<i>Iridomyrmex humilis</i>	Host plants are unknown or n/a for this species
ant		<i>Solenopsis</i> sp.	Host plants are unknown or n/a for this species
WASPS – <i>Pompilidae</i>			
wasp		unidentified species	Host plants are unknown or n/a for this species
WASPS – <i>Vespidae</i>			
Yellow-jacket wasp		<i>Vespa pensylvanica</i>	Host plants are unknown or n/a for this species
wasp		<i>Polistes fuscatus</i>	Host plants are unknown or n/a for this species
WASPS – <i>Sphecidae</i>			
No common name		<i>Bembex comata</i>	Host plants are unknown or n/a for this species
No common name		<i>Ammophila</i> sp.	Host plants are unknown or n/a for this species
No common name		<i>Chalybion californicum</i>	Host plants are unknown or n/a for this species
No common name		<i>Sceliphron caementarium</i>	Host plants are unknown or n/a for this species
No common name		<i>Podalonia</i> sp.	Host plants are unknown or n/a for this species
BEES – <i>Halictidae</i>			
No common name		<i>Agapostemon texana</i>	Host plants are unknown or n/a for this species
BEES – <i>Anthophoridae</i>			
No common name		<i>Anthophora</i> sp.	Host plants are unknown or n/a for this species
No common name		<i>Xylocopa varipuncta</i>	Host plants are unknown or n/a for this species
BEES – <i>Apidae</i>			
European honey bee		<i>Apis mellifera</i>	Host plants are unknown or n/a for this species
Sonora bumblebee		<i>Bombus sonorus</i>	Host plants are unknown or n/a for this species

Table B15. Amphibian and Reptile Species Observed in Big Canyon, 2003 Surveys

Common Name	Scientific name	Native (N) / Introduced (I)
Pacific Treefrog	<i>Hyla regilla</i>	N
African Clawed Frog	<i>Xenopus laevis</i>	I
Southern Alligator Lizard	<i>Elgaria multicarinata</i>	N
Western Fence Lizard	<i>Sceloporus occidentalis</i>	N
Side-blotched Lizard	<i>Uta stansburiana</i>	N
Common Kingsnake	<i>Lampropeltis getula</i>	N
Gopher Snake	<i>Pituophis catenifer</i>	N

Table B 16. Bird Species Observed in Big Canyon, 2003 Suveys

FAMILY and Common name	Scientific Name
PODICIPEDIDAE	
Pied-billed Grebe	<i>Podilymbus podiceps</i>
Eared grebe	<i>Podiceps nigricollis</i>
Western grebe	<i>Aechmophorus occidentalis</i>
PHALACROCORACIDAE	
Double-crested Cormorant	<i>Phalacrocorax auritus</i>
ARDEIDAE	
Great blue heron	<i>Ardea herodias</i>
Great egret	<i>Ardea alba</i>
Snowy egret	<i>Egretta thula</i>
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>
CATHARTIDAE	
Turkey vulture	<i>Cathartes aura</i>
ANATIDAE	
American wigeon	<i>Anas americana</i>
Mallard	<i>Anas platyrhynchos</i>
Blue-winged Teal	<i>Anas discors</i>
Cinnamon teal	<i>Anas cyanoptera</i>
Northern shoveler	<i>Anas clypeata</i>
Northern pintail	<i>Anas acuta</i>
Green-winged Teal	<i>Anas crecca</i>
Lesser scaup	<i>Aythya affinis</i>
Surf scoter	<i>Melanitta perspicillata</i>
Bufflehead	<i>Bucephala albeola</i>
ACCIPITRIDAE	
Osprey	<i>Pandion haliaetus</i>
White-tailed Kite	<i>Elanus leucurus</i>
Northern harrier	<i>Circus cyaneus</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
FALCONIDAE	
American kestrel	<i>Falco sparverius</i>
Peregrine falcon	<i>Falco peregrinus</i>

FAMILY and Common name	Scientific Name
ODONTOPHORIDAE	
California quail	<i>Callipepla californica</i>
RALLIDAE	
Clapper rail	<i>Rallus longirostris</i>
Common moorhen	<i>Gallinula chloropus</i>
American coot	<i>Fulica americana</i>
CHARADRIIDAE	
Killdeer	<i>Charadrius vociferus</i>
RECURVIROSTRIDAE	
American avocet	<i>Recurvirostra americana</i>
SCOLOPACIDAE	
Greater yellowlegs	<i>Tringa melanoleuca</i>
Willet	<i>Catoptrophorus semipalmatus</i>
Spotted sandpiper	<i>Actitis macularia</i>
Long-billed Curlew	<i>Numenius americanus</i>
Marbled godwit	<i>Limosa fedoa</i>
Western sandpiper	<i>Calidris mauri</i>
Least sandpiper	<i>Calidris minutilla</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>
LARIDAE	
Ring-billed Gull	<i>Larus delawarensis</i>
California gull	<i>Larus californicus</i>
Western gull	<i>Larus occidentalis</i>
Caspian tern	<i>Sterna caspia</i>
Forster's tern	<i>Sterna forsteri</i>
COLUMBIDAE	
Rock dove	<i>Columba livia</i>
Mourning dove	<i>Zenaida macroura</i>
TYTONIDAE	
Barn owl	<i>Tyto alba</i>
APODIDAE	
Vaux's swift	<i>Chaetura vauxi</i>
White-throated Swift	<i>Aeronautes saxatalis</i>
TROCHILIDAE	
Anna's hummingbird	<i>Calypte anna</i>
Rufous hummingbird	<i>Selasphorus rufus</i>
Allen's hummingbird	<i>Selasphorus sasin</i>
ALCEDINIDAE	
Belted kingfisher	<i>Ceryle alcyon</i>
PICIDAE	
Downy woodpecker	<i>Picoides pubescens</i>
Northern flicker	<i>Colaptes auratus</i>
TYRANNIDAE	
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>
Black phoebe	<i>Sayornis nigricans</i>
Say's phoebe	<i>Sayornis saya</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Western kingbird	<i>Tyrannus verticalis</i>

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FAMILY and Common name	Scientific Name
CORVIDAE	
Western scrub-jay	<i>Aphelocoma californica</i>
American crow	<i>Corvus brachyrhynchos</i>
Common raven	<i>Corvus corax</i>
HIRUNDINIDAE	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
Cliff swallow	<i>Petrochelidon pyrrhonota</i>
Barn swallow	<i>Hirundo rustica</i>
AEGITHALIDAE	
Bushtit	<i>Psaltriparus minimus</i>
TROGLODYTIDAE	
Bewick's wren	<i>Thryomanes bewickii</i>
House wren	<i>Troglodytes aedon</i>
Marsh wren	<i>Cistothorus palustris</i>
SYLVIIDAE	
California gnatcatcher	<i>Poliophtila californica</i>
TURDIDAE	
Western bluebird	<i>Sialia mexicana</i>
American robin	<i>Turdus migratorius</i>
TIMALIIDAE	
Wrentit	<i>Chamaea fasciata</i>
MIMIDAE	
Northern mockingbird	<i>Mimus polyglottos</i>
California thrasher	<i>Toxostoma redivivum</i>
STURNIDAE	
European starling	<i>Sturnus vulgaris</i>
PARULIDAE	
Yellow-rumped Warbler	<i>Dendroica coronata</i>
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Common yellowthroat	<i>Geothlypis trichas</i>
Wilson's warbler	<i>Wilsonia pusilla</i>
Yellow-breasted Chat	<i>Icteria virens</i>
EMBERIZIDAE	
Spotted towhee	<i>Pipilo maculatus</i>
California towhee	<i>Pipilo crissalis</i>
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>
Chipping sparrow	<i>Spizella passerina</i>
Belding's savannah sparrow	<i>Passerculus sandwichensis beldingi</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Fox sparrow	<i>Passerella iliaca</i>
Song sparrow	<i>Melospiza melodia</i>
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>
CARDINALIDAE	
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
ICTERIDAE	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>

FAMILY and Common name	Scientific Name
Common grackle	<i>Quiscalus quiscula</i>
Great-tailed Grackle	<i>Quiscalus mexicanus</i>
FRINGILLIDAE	
House finch	<i>Carpodacus mexicanus</i>
Lesser goldfinch	<i>Carduelis psaltria</i>
American goldfinch	<i>Carduelis tristis</i>
PASSERIDAE	
House sparrow	<i>Passer domesticus</i>

Table B17. Mammal Species Observed in Big Canyon, 2003 Surveys

Common Name	Species Name	Native (N) / Introduced (I)
DIDELPHIDAE		
Virginia Opossum	<i>Didelphis virginiana</i>	I
SORICIDAE		
Shrew	<i>Sorex sp.</i>	I
LEPORIDAE		
Audubon's Cottontail	<i>Sylvilagus audubonii</i>	N
SCIURIDAE		
California Ground Squirrel	<i>Spermophilus beecheyi</i>	N
GEOMYIDAE		
Botta's Pocket Gopher	<i>Thomomys bottae</i>	N
CRICETIDAE		
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	N
Woodrat	<i>Neotoma sp.</i>	N
CANIDAE		
Coyote	<i>Canis latrans</i>	N
Domestic Dog	<i>Canis familiaris</i>	I
PROCYONIDAE		
Raccoon	<i>Procyon lotor</i>	N
MUSTELIDAE		
Long-tailed Weasel	<i>Mustela frenata</i>	I
FELIDAE		
Domestic Cat	<i>Felis silvestris</i>	I

9.0 LITERATURE CITED

- Arnett, Ross H. Jr. 2000. American Insects: A Handbook of the Insects of America North of Mexico. CRC Press, New York, New York. 1003pp.
- Baldwin, B.G. 2000. Review of name changes in California tarweeds. Jepson Herbarium, University of California, Berkeley.

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- Bossard, C.C., J.M. Randall, and M.C. Hohovsky. 2000. Invasive plants of California's wildlands. University of California Press, Berkeley, California.
- Brown, David E. 1994. Biotic Communities: Southwestern United States and Mexico. University of Utah Press, Salt Lake City, Utah. 342pp.
- Brown, J.W. 1987. The Wandering Skipper; At Home on the Coastal Salt Marsh. *Environment Southwest*. San Diego, California. San Diego Society of Natural History. Winter 1987 (492), p.26
- Brussard, P.F., M.S. Gilpin, J.F. O'Leary, D.D. Murphy, and R.F. Noss 1992. Coastal Sage Scrub Survey Guidelines. Southern California Coastal Sage Scrub Scientific Review Panel.
- Bruyea, Guy P. 2003. Field notes from insect survey conducted at Big Canyon.
- CalFlora. 2003. Records for *Eleocharis parvula* and *E. rostellata*. www.calflora.org
- California Coastal Commission. 1981. Statewide interpretive guidelines: geologic stability; view protection; public trust lands; wetlands; and archeological guidelines. San Francisco, California.
- California Department of Fish and Game (CDFG). 2000. Guidelines for assessing effects of proposed developments on rare and endangered plants and plant communities.
- California Exotic Pest Plant Council. 1999. Exotic pest plants of greatest ecological concern in California.
- California Native Plant Society (CNPS). 2001. Inventory of rare and endangered plants of California (Sixth Edition). Rare plant scientific advisory committee, David P. Tibor, Convening Editor. California Native Plant Society, Sacramento, California.
- California Native Plant Society (CNPS). 2002. Vegetation rapid assessment protocol. CNPS Vegetation Committee, Sacramento, California.
- California Natural Diversity Data Base (CNDDDB). 2002b. List of terrestrial natural communities recognized by the Natural Diversity Data Base. California Dept. of Fish and Game (February).
- California Natural Diversity Data Base (CNDDDB). 2003. Special vascular plants, lichens and bryophytes list. Heritage section, California Department of Fish and Game. (June).
- California Natural Diversity Data Base (CNDDDB). 2002a. Element report: Newport Beach 7.5 minute quadrangle. Heritage section, California Department of Fish and Game.
- Campbell, H. and S. Christman. 1982. Field techniques for herpetofaunal community analysis. In: *Herpetological Communities: A symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League*. N. J. Scott Jr. (ed). U.S. Fish and Wildlife Service, Wildlife Research Report 13.
- CDFG. 2003a. Endangered and Threatened Plants of California. State of California, The Resources Agency, Department of Fish and Game, Natural Heritage Division, Natural Diversity Data Base, January 2003 update.
- CDFG. 2003b. Special Plants List. State of California, The Resources Agency, Department of Fish and Game, Natural Heritage Division, Natural Diversity Data Base, January 2003 update.

- CDFG. 2003c. Endangered and Threatened Animals of California. State of California, The Resources Agency, Department of Fish and Game, Natural Heritage Division, Natural Diversity Data Base, January 2003 update.
- CDFG. 2003d. Special Animals [species of special concern]. State of California, The Resources Agency, Department of Fish and Game, Natural Heritage Division, Natural Diversity Data Base, January 2003 update.
- Community Conservancy International (CCI). 2003. Big Canyon, Orange County, California: A 1"=100' aerial photograph of the Big Canyon area.
- Comstock, J. A. 1930. Studies in Pacific Coast Lepidoptera (continued). *Bull. So. Calif. Acad. Sci.* 30: 88-92
- County of Orange, Environmental Management Agency. 1995. Central and Coastal subregion, NCCP/HCP (Parts 1 and II).
- Culbertson, Adams and Associates. 1992. Draft Program EIR: Upper Newport Bay regional park, General Development Plan. DEIR No. 525. Prepared for the County of Orange, Environmental Management Agency, Environmental Planning Division, Santa Ana, California.
- DeRuff, R. 1999. The plants of Upper Newport Bay.
- EDAW. 1991. Upper Newport Bay regional park: Resource management plan. Prepared for the County of Orange, Environmental Management Agency and Harbors, Beaches, and Parks.
- Emmel, T.C. and J. F. Emmel. 1973. *The Butterflies of Southern California*. Natural History Museum of Los Angeles County, Science Series 26: 1-148.
- Faber, P.M., E. Keller, A. Sands and B.M. Massey. 1989. The ecology of riparian habitats of the southern California coastal region: A community profile. U.S. Fish and Wildlife Service, Biological Report 85(7.27).
- Ferren, W.R. 1985. *Carpenteria salt marsh: Environment, history, and botanical resources of a southern California estuary*. The Herbarium, Dept. of Biological Sciences, University of California, Santa Barbara, Publication No. 4.
- Ferren, W.R. 1989. Recent research on and new management issues for southern California estuarine wetlands. In Schoenherr, A.A. *Endangered plant communities of southern California*. Southern California Botanists, Special Publication No. 3.
- Ferren, W.R. and P. L. Fiedler. 1993. Rare and threatened wetlands of central and southern California. In Keeley, J. (ed.) *Proceedings of the symposium: Interface between ecology and land development in California*. Southern California Academy of Sciences, Los Angeles, California. 119-131.
- Ferren, W.R., P.L. Fiedler, and R. A. Leidy. 1995. Wetlands of the central and southern California coast and coastal wetlands: A methodology for their classification and description. Final report prepared for the U.S. Environmental Protection Agency, Region IX.
- Fisher, Robert N. 2000. Monitoring reptile and amphibians at long-term biodiversity monitoring stations: Nature Reserve of Orange County. Annual Report. U.S. Geological Survey, Department of Biology, San Diego State University, San Diego.

- Gray, J. and D.E. Bramlet. 1992. Habitat classification system. Orange County Natural Resources GIS Project. Prepared for County of Orange EMA.
- Gray, J. and D.E. Bramlet. 1994a. Species of special interest. Orange County Natural Resources GIS Project. Prepared for County of Orange EMA. (Revised)
- Gray, J. and D.E. Bramlet. 1994b. Habitat types of special interest. Orange County Natural Resources GIS Project. Prepared for County of Orange EMA. (Revised)
- Hendrickson, J. 1976. Ecology of southern California salt marshes. *In* Latting, J. (ed.). Plant communities of southern California. Special Publication No. 2, California Native Plant Society, Sacramento, California.
- Hickman, J.C. (ed.). 1993. The Jepson manual: Higher plants of California. University of California Press, Berkeley.
- Hickman, James C. (editor). 1993. The Jepson Manual: Higher Plants of California. University of California Press, Berkeley and Los Angeles.
- Hogue, Charles L. 1974. *Insects of the Los Angeles Basin*. Natural History Museum of Los Angeles County.
- Jones and Stokes. 1993. Methods used to survey the vegetation of Orange County parks and open space areas and Irvine Company property. Prepared for County of Orange, Environmental Management Agency.
- Josselyn, M. (ed.). 1982. Wetland restoration and enhancement in California. Published by the California Sea Grant College System, University of California, La Jolla, California, Report T-CSGCP-007.
- LaRue, D. A. 1990. New California Distribution Records for Two Species of *Cicindela*. *Linnaeus* (Coleoptera: Cicindelidae). *Cicindela*. 22 (4): 49-52.
- Marsh, K.G. 1990. Upper Newport Bay regional park, Existing biological resources. Prepared for EDAW.
- Mason, H.L. 1957. Flora of the marshes of California. University of California Press, Berkeley, California.
- McAuley, Milt. 1996. Wildflowers of the Santa Monica Mountains. Canyon Publishing Company, Canoga Park, California.
- McDonald, K.B. 1977. Coastal salt marsh. *In* Barbour, M.G. and J. Major (eds.). Terrestrial vegetation of California. J. Wildey and Sons, New York.
- Mock, P.J., B.L. Jones, and J. Konecny 1990. California Gnatcatcher Survey Guidelines. Unpublished Report Prepared by Environmental and Energy Services Company, San Diego, CA.
- Munz, P.A. 1974. A flora of southern California. University of California Press, Berkeley, California.
- Munz, Philip A. 1974. A Flora of Southern California. University of California Press, Berkeley, California.
- Nagano, C. D. 1980. Tiger Beetles of the genus *Cicindela* (Coleoptera: Cicindelidae) inhabiting the marine shoreline of southern California. *Atala*, vol. 8, no. 2, pp.33-42.

- Orsak, L. J. 1977. *The Butterflies of Orange County, California*. University of California, Irvine, California.
- Pacific Southwest Biological Services (PSBS) 1991a. Report of a biological assessment of the Upper Newport Bay regional Park. Prepared for Culbertson, Adams and Associates, Aliso Viejo, California. PSBS Report No. B97.
- Pacific Southwest Biological Services (PSBS) 1991b. Biological assessment of the Delhi Channel. Prepared for Culbertson, Adams and Associates, Aliso Viejo, California. PSBS Report No. A28.
- Parker, Robert *et al.* 1999. *Weeds of the West*. The Western Society of Weed Science. Newark, California. 630pp.
- Reed, P.B. 1988. National list of plant species that occur in wetlands: California (Region O). U.S. Fish and Wildlife Service Biology Report 88(26.10).
- Reiser, G.H. 2001. Rare plants of San Diego County. Aquafir Press, Imperial Beach, CA.
- Roberts, F.M. 1990. Rare and endangered plants of Orange County. *Crossosoma* 16(2): 1-12.
- Roberts, F.M. 1998. A checklist of the vascular plants of Orange County, California. Second Edition. F.M Roberts Publications, Encinitas, California.
- Scott, J. A. 1986. *The Butterflies of North America, a Natural History and Field Guide*. Stanford University Press, Stanford, California. 583pp.
- Terp, J.M. 2000. U.S. Fish and Wildlife Service, Draft coordination act report: Upper Newport Bay ecosystem restoration feasibility study, Orange County, California.
- U.S Army Corps of Engineers and County of Orange. 2000. Upper Newport Bay ecosystem restoration feasibility study. Public draft report, Draft Environmental Impact Statement/Report
- U.S. Fish and Wildlife Service 1997. Presence/absence survey protocol for the Coastal California gnatcatcher. July 28, 1997.
- U.S. Fish and Wildlife Service 2001. Presence/absence survey protocol for the Coastal California gnatcatcher. January 19, 2001. http://ventura.fws.gov/SurveyProt/LBV_Guidelines.pdf, July 29, 2003.
- U.S. Fish and Wildlife Service, and County of Orange. 1996. Joint EIR/EIS for take/incidental take and implementation of the County of Orange Central and Coastal Subregion, Natural Community Conservation Plan and Habitat Conservation Plan.
- Vogl, R. 1966. Salt marsh vegetation of Upper Newport Bay. *Ecology* 47: 80-87.
- Vogt, R.C. and R. Hine. 1982. Evaluation of techniques for assessment of amphibian and reptile populations in Wisconsin. In: *Herpetological Communities: A symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League*. N. J. Scott Jr. (ed). U.S. Fish and Wildlife Service, Wildlife Research Report 13.
- Wachtell, J.K. 1978. Soil survey of Orange County and western part of Riverside County, California. U.S. Dept. Agriculture., Soil Conservation Service.

- Zedler, J.B. 1982. The ecology of southern California coastal salt marshes: A community profile. U.S. Fish and Wildlife Service Report No. FWS/OBS-81/54.
- Zedler, J.B. 1984. Salt marsh restoration: A guidebook for southern California. Published by the California Sea Grant College System, Report No. T-CSGCP-009.
- Zedler, J.B. 1993. Restoring biodiversity to coastal salt marshes. *In* Keeley, J. (ed.) Proceedings of the symposium: Interface between ecology and land development in California. Southern California Academy of Sciences, Los Angeles, California. 253-257.
- Zedler, J.B. 1996. Tidal wetland restoration: A scientific perspective and southern California focus. Published by the California Sea Grant College System, University of California, La Jolla, California, Report T-038.
- Zemba, R. 1986. A survey of Belding's savannah sparrows on the Marine Corps Base, Camp Pendleton, CA, 1984-1985. Report to U.S. Navy, Natural Resources Mngt. Branch, San Bruno, CA.
- Zemba, R. 1991. The light-footed clapper rail, secretive denizen of the lower marsh shadows. *Western Tanager* 57, No. 8.

APPENDIX BB

Data Collected by Dave Bramlet
June-July 2003

BIG CANYON CREEK:
 HISTORIC TIDAL WETLANDS CONCEPTUAL RESTORATION PLAN

Coastal Bluff Scrub		Species	
CBS-1		Shrubs	
Shrub Cover %	22.0%	<i>Encelia californica</i>	26.0%
Herbaceous Cover %	42.0%	<i>Opuntia littoralis</i>	5.0%
Total Vegetative Cover	54.0%	<i>Eriogonum fasciculatum</i>	5.0%
Litter Cover		<i>Opuntia prolifera</i>	2.0%
Dead Wood		<i>Lycium californicum</i>	2.0%
Bare Ground	46.0%		
Total Non Vegetative Cover		Grasses & Forbs	
		<i>Mesebryanthemum crystallinum</i>	25.0%
		<i>Salsola tragus</i>	1.0%
Species			
Shrubs			
<i>Artemisia californica</i>	15.0%		
<i>Encelia californica</i>	1.0%		
<i>Eriogonum fasciculatum</i>	2.0%		
<i>Lycium californicum</i>	0.1%		
<i>Opuntia littoralis</i>	0.0%		
<i>Opuntia prolifera</i>	0.0%		
<i>Suaeda taxifolia</i>	0.1%		
<i>Arthrocnemum subterminale</i>	3.0%		
Grasses & Forbs			
<i>Brassica nigra</i>	35.0%		
<i>Mesebryanthemum crystallinum</i>	0.1%		
<i>Frankenia salina</i>	5.0%		
<i>Bromus madritensis</i>	0.1%		
Lichens	1.0%		
CBS-2			
Shrub Cover %	35.0%		
Herbaceous Cover %	26.0%		
Total Vegetative Cover	45.0%		
Litter Cover			
Dead Wood			
Bare Ground	55.0%		
Total Non Vegetative Cover	55.0%		

Joaquin Hills, and Upper Newport Bay. During 2003 surveys, California boxthorn was found in coastal bluff scrub and California bush sunflower scrub on the slopes above Big Canyon. A total of seven localities, and 40 shrubs were observed in Big Canyon. It is assumed that additional shrubs occur within Big Canyon, but were overlooked in the observations of these steep slopes.

6.2.13 Coast woolly heads (*Nemacaulis denudata* var. *denudata*)

This spreading, prostrate annual is found in sandy, back dune habitats in localities extending from Los Angeles to San Diego Counties, and into Baja California. There are approximately 16 known localities in San Diego, and a few have a large number of plants. The two localities in Los Angeles County, Long Beach and San Pedro, are historical, but there still is some potential habitat in these areas. In Orange County this species is recorded from several localities in Upper Newport Bay, and from Bolsa Chica. A historical site has also been recorded from the Anaheim Bay region. Although, the coast woolly heads currently occur at several localities within the Bay (Shellmaker Island), this species has not been previously recorded from or observed within the Big Canyon study area, nor was it observed during 2003 surveys here.

6.2.14 Estuary seablite (*Suaeda esteroa*)

This species is restricted to upper salt marsh habitats in the estuaries from Santa Barbara to San Diego Counties and into northern and southern Baja California. It is reported from roughly 12 estuaries in southern California, where it is never very common due to the restricted preferred habitat of this species. Although currently distributed in estuaries along most of the Baja California coast, recent taxonomic revisions may greatly reduce the range of this species.

In Orange County the estuary seablite has been recorded in Upper Newport Bay, Bolsa Chica and Anaheim Bay. The estuary seablite is restricted to the upper intertidal salt marsh, and is an uncommon species within this community. A total of 12 localities were observed during the field surveys and 249 plants were observed in Big Canyon.

6.2.15 Woolly seablite (*Suaeda taxifolia*)

The woolly seablite is found in coastal salt marshes and coastal bluff habitats along the coast of Central and lower (northern Baja) California. This species is found from San Luis Obispo County to Baja California, including the Channel Islands, but is never very common, since it is restricted to the salt marsh or bluff areas. Therefore, it has been placed on the CNPS watch list, since the habitats in which this species occurs are continuing to decline. In Orange County this species is known to occur at Upper Newport Bay, Bolsa Chica, Huntington Beach, Laguna Beach, Dana Point, and other coastal localities within the County. The woolly seablite was found in coastal bluff scrub, alkali grassland, and alkali meadow communities. A total of four localities and 39 plants were observed in Big Canyon. Table 10, below, details special-status plant species in the vicinity of Big Canyon. The species shown in bold were observed in Big Canyon during 2003 surveys. The following categories are used to define status:

Federal Status:

FE - Listed as federally endangered.

SOC - Species of Concern, former Federal Candidate 2 Species

State Status:

SE - endangered by the state of California

ST - threatened by the state of California

California Native Plant Society (CNPS):

List 1A- Plants presumed extinct in California

List 1B - Plants considered rare, threatened or endangered in California and elsewhere

List 2 - Plants rare, threatened or endangered in California but more common elsewhere

List 3 - Plants about which we need more information - A review list

List 4 - Plants of limited distribution - A watch list

Other:

Locally rare - Rare in Orange County (Gray and Bramlet 1994a).

Table B10. Special-Status Plant Species in the Vicinity of Big Canyon

Species	Status:				Habitat	Known Localities and Occurrence in Big Canyon
	Federal	State	CNPS	Other		
<i>Aphanisma blitoides</i> Aphanisma			List 1B		Coastal bluffs	Historically occurred in coastal bluff scrub on the West Bay.
<i>Atriplex coulteri</i> Coulter's saltbush			List 1B	Locally rare	Grassland, Sage Scrub, Alkali meadow?	Newport Beach (north of existing library), San Joaquin Hills.
<i>Atriplex pacifica</i> South coast saltbush	SOC		List 1B	Locally rare	Grassland, Sage scrub, Alkali meadow?	Historically known from coastal Orange County, currently known only from the San Clemente area
<i>Cordylanthus maritimus</i> ssp. <i>maritimus</i> Salt marsh bird's beak	FE	SE	List 1B		Salt marsh	Upper Newport Bay & Anaheim Bay; 15 locations & ~30,000 individuals found in Big Canyon salt marsh habitat during 2003 surveys
<i>Dudleya multicaulis</i> Many-stemmed dudleya			List 1B		Coastal sage scrub	UCI Ecological Reserve San Joaquin Hills
<i>Echinodorus berteroi</i> Upright burhead				Locally rare	Fresh Water marsh	Delhi Channel-Upper Newport Bay, Wintersburg Channel at Bolsa Chica
<i>Eleocharis parvula</i> Little spike-rush				List 4	Coastal salt marsh	Upper Newport Bay
<i>Eleocharis rostellata</i> Beaked spike-rush				Locally rare	Coastal salt marsh Fresh water marsh	Santa Ana River
<i>Centromadia</i> (<i>Hemizonia</i>) <i>parryi</i> ssp. <i>australis</i> Southern tarplant	SOC		List 1B		Alkali meadows, grasslands	Upper Newport Bay west and east mesas, San Joaquin Marsh, UC Irvine, Mason Park, Fairview Park, Mile Square Park, Peters Canyon Channel. Found in 12 locations, over 2,000 individuals found during 2003 surveys
<i>Hordeum intercedens</i> Vernal barley			List 3		Moist grasslands and alkali meadows	Newport Beach (north of existing library), Fairview Park, UCI Ecological Reserve
<i>Juncus acutus</i> ssp. <i>leopardii</i> Southwestern spiny rush			List 4		Salt marsh, brackish marsh	Upper Newport Bay Anaheim Bay Bolsa Chica; 5 locations and 77 individuals found in Big Canyon during 2003 surveys
<i>Lasthenia glabrata</i> ssp. <i>coulteri</i> Coulter's goldfields	SOC		List 1B		Alkali meadows	Los Alamitos, Hellman Ranch Garden Grove Crystal Cove (Historic)

Species	Status:				Habitat	Known Localities and Occurrence in Big Canyon
	Federal	State	CNPS	Other		
<i>Lycium californicum</i> California boxthorn			List 4		Coastal sage scrub	Upper Newport Bay Crystal Cove; 7 locations and 40 individuals found during 2003 surveys
<i>Microseris douglasii</i> var. <i>platycarpa</i>			List 4		Clay grasslands	N. Newport Beach Library UCI Ecological Reserve
<i>Nemacaulis denudata</i> var. <i>denudata</i> Coast woolly-heads			List 2		Coastal dunes, margins of salt marshes	Upper Newport Bay (Shellmaker Island), Bolsa Chica
<i>Senecio aphanactis</i> Rayless ragwort			List 2		Coastal sage scrub	UCI Ecological Reserve
<i>Suaeda esteroa</i> Estuary seablite			List 1B		Salt marsh	Upper Newport Bay, Bolsa Chica; 12 locations and 249 individuals found in Big Canyon during 2003 surveys
<i>Suaeda taxifolia</i> Woolly seablite			List 4		Salt marsh, coastal bluff	Upper Newport Bay, Newport-Laguna Coast, Bolsa Chica; 4 locations and 39 individuals found in Big Canyon during 2003 surveys

6.3 Special-Status Insect Species

This section discusses special-status insect species with a potential to occur, or that were observed, in Big Canyon. Table 11 at the end of this section summarizes special-interest insect species recorded in the vicinity of Big Canyon; those observed in Big Canyon are shown in bold in the Table 11.

6.3.1 Wandering skipper butterfly (*Panoquina errans*)

The wandering skipper is a small (about one-inch wingspread) butterfly is considered a California species of concern. This species occurs in localized colonies along the coast of southern California from the Santa Barbara area southward along both coasts of Baja California, Mexico. It is associated only with its larval host plant, saltgrass, which grows primarily in sandy habitats along beaches, bluffs and estuaries including lower Big Canyon. In southern California, this species is active as an adult during several generations from March to November. Focused surveys for the wandering skipper were not conducted at Big Canyon. However, based on the presence of saltgrass, the results of the present study, and observations reported by Orsak (1978), the wandering skipper butterfly likely still occurs in lower Big Canyon and surrounding areas of Upper Newport Bay. Orsak (1978) additionally reported that Upper Newport Bay might very well support the largest extant colony of this butterfly in Orange County.

6.3.2 Tiger beetles (*Cicindela* sp.)

Approximately 100 species (with many named subspecies) of tiger beetles occur in the United States. About three-fourths of these are in the genus *Cicindela*. Many tiger beetles are brilliantly colored, and others are well camouflaged to blend in with their surroundings. Most tiger beetles are less than 0.5 inch in length, and are predominately found in open sandy habitats, mud flats, beaches, along streams, and near other wetland areas. Tiger beetle presence or absence can be an important indicator of wetland habitat quality.

Larval and adult tiger beetles are voracious predators. The larvae live in burrows in hard-packed or damp sand from which they capture with their large mandibles other small insects that pass by. Adults actively search for prey by rapidly running and flying over their beach or dune habitats. These agile beetles are quick

to take flight, and observers rarely have the opportunity to get very close to them making field identification difficult or not possible without actively collecting them with the aid of nets. Tiger beetles can be found year round, but most species are primarily active on warm sunny days in the late spring and early summer months.

Several special-status tiger beetles are known from southern California, including Western Mudflat Tiger Beetle (*Cicindela trifasciata sigmoidea*), Sandy Beach Tiger Beetle (*Cicindela hirticollis gravida*), Frost's Tiger Beetle (*Cicindela senilis frosti*), Sand Dune Tiger Beetle (*Cicindela latesignata*), and Gabb's Tiger Beetle (*Cicindela gabbii*). Special-status tiger beetle species potentially occurring at or near Big Canyon are inhabitants of sandy beaches (*C. hirticollis gravida* and *C. latesignata*) or dark-colored mud and salt flats in estuaries and salt marshes (*C. senilis frosti*, *C. gabbii*, and *C. trifasciata sigmoidea*) along the coast of southern California. These species (especially the first four) have been extirpated from many historical southern California localities due to development, habitat fragmentation, and other anthropogenic disturbances.

Two other tiger beetles that may occur on or near Big Canyon, *C. haemorrhagica* and *C. oregona*, are widespread and highly vagile and are not considered to be special-status by agencies or entomologists. *C. trifasciata sigmoidea* is also fairly widespread and extremely vagile (LaRue, 1990), but is much less common than *C. haemorrhagica* and *C. oregona*. Due to the lack of sandy beaches on the subject property, no suitable habitat exists for *C. hirticollis gravida* and *C. latesignata*. It is possible that *C. senilis frosti* exists or formerly occurred on the mud and salt flats west of Backbay Drive. However, GPB's survey period did not include this species' spring and fall activity periods, and none were observed during the present study. Additional focused surveys for *C. senilis frosti* should be conducted on sunny, warm days during the spring (March–April) or fall (September–October) months to determine whether this rare tiger beetle is present at Big Canyon.

C. trifasciata sigmoidea was observed commonly during the survey on the mud flats just west of the kiosk and Backbay Drive. On the July 14 survey, hundreds of individuals were observed, especially later in the afternoon as the low tide exposed more mud flats and suitable tiger beetle habitat increased. No *C. gabbii* were encountered during the present study, but this uncommon species has been documented from areas with similar habitat in the vicinity of Seal Beach, approximately twelve to fifteen miles north of Big Canyon (Nagano, 1980). *C. gabbii* was observed on mud flats north of Imperial Beach in San Diego County on July 13, 2003, but they were uncommon and may only be in the early stages of their annual flight period as of that date (personal observation, Guy Bruyey). In addition, *C. gabbii* is very agile and wary of human approach and is therefore not as easily identified or collected as other tiger beetle species.

The more widespread *C. haemorrhagica* and *C. oregona* may also be present at the mud flats west of Backbay Drive, but none were observed during the present study. *C. haemorrhagica* was observed in the Seal Beach area in mid-July 2003 (personal observation, Guy Bruyey), and is known from several other locations along coastal southern California. *C. oregona* is active during the spring and fall only. Additional surveys in October may detect this species.

6.3.3 Other Special-Status Insect Species

Species presently considered rare and/or declining in coastal southern California in the vicinity of Big Canyon are summarized in Table 11. Only one of these was found at Big Canyon, although, as mentioned above, other tiger beetles may also occur here. Species shown in bold were observed in Big Canyon during 2003 surveys. "Range" indicates whether or not Big Canyon is within known historical range and has sufficient natural resources (habitat, host plants, etc.) of indicated taxon. "Status" denotes species that are federally endangered (FE), a species of concern (C), or have a highly restricted and/or declining range (R).

Though the monarch butterfly is probably not at risk currently, its overwintering, or nesting, sites should be protected. Also note that the El Segundo flower-loving fly is known historically from El Segundo dune complex and was presumed extinct since 1957. In 2001, a small colony was rediscovered near Palos Verdes Peninsula. The related Delhi sands flower-loving fly (ssp. *abdominalis*) is federally endangered.

Table B11. Special-Status Insects in the Vicinity of Big Canyon

Common Name	Scientific Name	Status	Range*
Quino Checkerspot	<i>Euphydryas editha quino</i>	FE	No
El Segundo Blue	<i>Euphilotes battoides allyni</i>	FE	No
Palos Verdes Blue	<i>Glaucoopsyche lygdamus palosverdesensis</i>	FE	No
Wandering Skipper	<i>Panoquina errans</i>	C	Yes
Monarch Butterfly	<i>Danaus plexippus</i>	¹	Yes
Mormon Metalmark Butterfly	<i>Apodemia mormo</i> (El Segundo ecotype)	R	No
Busck's Gall Moth	<i>Carolella busckana</i>	C	No
Henne's Eucosman Moth	<i>Eucosma hennei</i>	R	No
Ford's Sand Dune Moth	<i>Psammobotys fordii</i>	R	No
Globuse Dune Beetle	<i>Coelus globosus</i>	C	No
Dorothy's Dune Weevil	<i>Trigonoscuta dorothea</i>	C	No
Lange's El Segundo Weevil	<i>Onychobaris langei</i>	R	No
Sandy Beach Tiger Beetle	<i>Cicindela hirticollis gravida</i>	C	No
Western Mudflat Tiger Beetle	<i>Cicindela trifasciata sigmoidea</i>	R	Yes
Sand Dune Tiger Beetle	<i>Cicindela latesignata</i>	R	No
Gabb's Tiger Beetle	<i>Cicindela gabbii</i>	R	Yes
Frost's Tiger Beetle	<i>Cicindela senilis frosti</i>	R	Yes
El Segundo Flower-loving Fly	<i>Rhaphiomidas terminatus terminatus</i>	²	No
Belkin's Dune Horsefly	<i>Brennania belkini</i>	R	No
Jerusalem Cricket	<i>Stenopelmatus new species</i>	R	No
Sand Roach	<i>Arenivaga new species</i>	R	No

Legend for Table 11:

*Indicates whether Big Canyon is within known historical range and has sufficient natural resources (habitat, host plants, etc.) of indicated taxon. (bold=observed during study)

FE=Federally endangered, C=Species of Concern, R=Highly restricted range and/or declining (No status)

¹ Overwintering (or nesting) sites should be protected, butterfly probably not at risk currently

² Known historically from El Segundo dune complex and presumed extinct since 1957; a small colony was rediscovered in 2001 near Palos Verdes Peninsula. The related Delhi sands flower-loving fly (ssp. *abdominalis*) is federally endangered.

6.4 Special-Status Herpetological Species

No special-status herpetological species were located during the 2003 surveys. However, Big Canyon supports potential habitat, albeit marginal, for two special-status species, further described below. Several additional special-status species are known from the project vicinity; these are included in Table 12 at the end of Section 6.6.

6.4.1 Southwestern pond turtle (*Clemmys marmorata pallida*)

The southwestern pond turtle is a California reptile Species of Special Concern with a relatively continuous distribution in most Pacific coast drainages from the Columbia River to northern Baja California, although few viable populations occur in Southern California. The pond turtle is normally found in and along riparian areas, although gravid females have been reported up to a mile away from water in search of appropriate nest sites. The preferred habitat for these turtles includes ponds or slow-moving water with numerous basking sites (logs, rocks, etc.), food sources (plants, aquatic invertebrates, and carrion), and few predators (raccoons, introduced fishes, and bullfrogs). The pond at Big Canyon offers some habitat for this species, but no southwestern pond turtles were trapped during the two-night trapping period. Water temperatures were too warm for this species, and potential predators including twenty-five crayfish (*Procambarus clarkii*) and sixteen African clawed frogs were trapped, and a large number of these species were observed in the system during the nocturnal survey. Therefore, no southwestern pond turtles are expected to occur in Big Canyon in its current condition, though there is potential to restore this species to the canyon.

6.4.2 San Diego horned lizard (*Phrynosoma coronatum blainvilli*)

The horned lizard is a California reptile species of Special Concern. It occurs along the southern California coast from Santa Barbara south to northern Baja, Mexico. It is found in a wide variety of habitats including coastal sage scrub, chaparral and riparian woodland, in loose fine soils with high sand content. Potential habitat for this species is limited in Big Canyon, and collecting, human disturbance and potential predators likely limit the potential for its occurrence.

6.5 Special-Status Avian Species

Three species listed as endangered or threatened (light-footed clapper rail, California gnatcatcher and Belding's savannah sparrow) and several other special-status bird species were observed during 2003 surveys in Big Canyon. These are discussed below. Table 12, at the end of Section 6.6, summarizes information for these and other special-status bird species that may occur in Big Canyon.

6.5.1 California brown pelican (*Pelicanus occidentalis californicus*)

The California brown pelican is federally and state-listed as an endangered species. It is observed primarily in the open ocean and beaches but is also common in estuaries, tidal rivers, rocky coasts, breakwaters, and islands. Breeding locations along the west coast of California are limited to the Channel Islands. During the late 1960's and early 1970's, the brown pelican population suffered a widespread and dramatic decline linked to egg shell thinning due to DDT, first noted in 1962. The population is now recovering well. Brown pelicans do not breed on the mainland but are frequent inhabitants of Upper Newport Bay and other southern California estuaries and harbors. No pelicans were observed during surveys in Big Canyon but they are known to forage in the open water west of Big Canyon.

6.5.2 Light-footed clapper rail (*Rallus longirostris levipes*)

The light-footed clapper rail is federally and state-listed as endangered. It is one of three subspecies of clapper rails that occur as residents in coastal salt marshes from Bahia de San Quintin, Baja California north to Carpinteria Marsh, Santa Barbara County (Zemba and Massey 1981, Zemba 1991). Light-footed clapper rails occupy tidal habitats dominated by cordgrass and pickleweed. Nests are typically built of cordgrass and attached to living cordgrass stems so that they float with the rise and ebb of the tide. Radio-telemetry

studies at Upper Newport Bay indicate that rail pairs maintain territories averaging two acres in size (Zemba 1991). Although the majority of the light-footed clapper rail population at Upper Newport Bay occurs on the west side of the bay, light-footed clapper rails were observed during 2003 surveys at Big Canyon and likely breed as well in cordgrass habitat west of Big Canyon. Annual surveys for this species in Upper Newport Bay and other areas are conducted by Dick Zemba with the Orange County Water District. In 2003, twelve pairs were present on Middle Island just west of Big Canyon in 2003 (Zemba, pers. comm.), and one male was observed just north of the bend in Back Back Drive on the south side of Big Canyon, just south of the parking lot. On the north side of Big Canyon, near the bridge, another pair occurs in freshwater marsh habitat, and there is occasionally a pair north of the pond overflow area. Finally, two pairs occur on Upper Island in the northern portion of Big Canyon near the creek outflow west of Back Bay Drive (Zemba, pers. comm.).

6.5.3 *California least tern (Sterna antillarum browni)*

California least tern is federally- and state-listed as endangered. A migratory species, it nests from April through August along the coast of California from San Francisco south to Baja California. It presumably winters in Central America or northern South America, although the specific location of its wintering range is unknown. California least tern population is now estimated at over 4,000 pairs, up from approximately 600 when it was listed in the early 1970's. Least terns breed on sparsely vegetated sandy beaches, salt flats, and dredge spoil in colonies of up to several hundred nesting pairs. Many nesting sites are located adjacent to estuaries, which are used for foraging (feeding) for small fish. California least terns are known to nest at 35 to 38 sites in California, including the northern portion of Upper Newport Bay. No potential nesting habitat is present at Big Canyon, although least terns were observed foraging in open water channels of the salt marsh at Big Canyon during surveys.

6.5.4 *White-tailed kite (Elanus leucurus)*

The White-tailed Kite is a year-round resident and a California Special Animal, a designation pertaining to species that are of concern. Populations have fluctuated widely in the past; however, Southern California birds appear to be in a long-term decline at this time. White-tailed kites nest in well-developed woodlands and forage primarily in grasslands. This species was observed foraging in Big Canyon during 2003 surveys but likely does not breed here due to human disturbance.

6.5.5 *Cooper's hawk (Accipiter cooperii)*

The Cooper's hawk is a medium-sized hawk and a California Species of Special Concern. It is an uncommon but perhaps increasing breeder in Southern California, where it is found mainly in well-developed oak and willow woodlands. Cooper's hawks were observed in Big Canyon during 2003 surveys and may nest in the riparian woodland of Big Canyon; they are becoming more common in residential areas.

6.5.6 *Sharp-shinned hawk (Accipiter striatus)*

The sharp-shinned hawk is smaller than Cooper's hawk but otherwise looks very similar and has similar foraging habits. It is also a California Species of Special Concern. It was observed during 2003 surveys and likely forages occasionally to frequently in Big Canyon during the winter months. However, it would not nest in Big Canyon as does not breed in coastal southern California.

6.5.7 *Peregrine Falcon (Falco peregrinus)*

Like the brown pelican, the peregrine falcon suffered a population decline in the 1960's and 1970's because of DDT-induced eggshell thinning, and the species was listed as endangered by the state of California and the federal government in the early 1970's but was delisted by the federal government in June 1999; it is still state-listed as endangered. It was once a fairly common permanent resident along the coast of California, taking various species of birds as prey. Coastal wetlands offer important foraging habitat for

peregrine falcons because of large congregations of shorebirds and waterfowl that are favored prey. In more recent years, the California population has recovered to nearly its former numbers, and pairs are known to nest in urban environments as well as more natural habitats. For example, one pair occupies the Long Beach City Hall and forages on the rock doves (commonly called pigeons) that frequent city streets. One peregrine falcon was observed flying over Big Canyon during surveys; the species likely forages occasionally in Big Canyon, particularly in the salt marsh habitat, but no suitable breeding habitat is present in Big Canyon for peregrine falcon.

6.5.8 *Merlin (Falco columbarius)*

Although not known to breed in California, sightings of the merlin, a California Species of Special Concern and formerly a fairly common winter visitor and migrant, have declined drastically, along with populations throughout the United States and Canada. Because population reductions are believed to be related to DDE contamination and falconry rather than to a loss of breeding habitat, the merlin was designated a California Species of Special Concern. No observations of merlin occurred during 2003 surveys in Big Canyon, but it likely occurs here occasionally during migration

6.5.9 *Coastal California gnatcatcher (Polioptila californica)*

The California gnatcatcher, federally listed as threatened, is a small, insectivorous bird endemic to southern California and Baja California, Mexico. It occurs in a variety of sage scrub habitats and uses adjacent chaparral, grassland and riparian habitats. Its habitat has become highly fragmented as the result of development of the valleys and foothills of southern California. Focused surveys for California gnatcatcher were conducted in Big Canyon in 2003, as described in Section 3.4.2. One pair of California gnatcatchers was found during surveys, primarily using the saltbush scrub adjacent to Back Bay Drive. Potential for restoration exists in Big Canyon for this species, as it was formerly more numerous in this area.

6.5.10 *Least Bell's vireo (Vireo belli pusillus)*

The Least Bell's vireo, federally and state-listed as endangered, is a small, migratory songbird listed as endangered by both federal and state resource agencies. The Least Bell's Vireo once nested commonly throughout much of lowland California, but during the mid-1900's its breeding range became reduced to a relatively small number of major riparian systems in Southern California. The decline was attributed to widespread loss and degradation of riparian habitat, combined with brood parasitism by the Brown-headed cowbird (*Molothrus ater*). Aggressive recovery efforts, including cowbird trapping and restoration of high-quality riparian habitat areas across coastal Southern California, brought encouraging results during the 1990's, with the species recolonizing several riparian systems in Orange County. Riparian woodlands at Big Canyon are marginally suitable for nesting Least Bell's vireos; however, no birds were detected during the focused surveys.

6.5.11 *California horned lark (Eremophila alpestris actia)*

The California horned lark is a California Species of Special Concern that occupies grasslands and crop lands from Humboldt County south to northwestern Baja California. Populations are declining across much of this range, particularly in coastal California, due to conversion of grasslands and agricultural fields to housing and other uses. The species is considered uncommon and very localized in Orange County. It was not observed during 2003 surveys and may occur as a migrant, but the open habitats at Big Canyon are likely too disturbed and overrun with potential predators for this species to successfully breed at Big Canyon.

6.5.12 *Loggerhead shrike (Lanius ludovicianus)*

The Loggerhead shrike is a California Species of Special Concern that is an uncommon but widespread resident of Southern California. This species typically occupies open habitats with scattered trees. As with the horned lark, because such habitats are becoming more scarce in Southern California, loggerhead shrike is a

California Species of Special Concern (CDFG 1992). No loggerhead shrikes were observed during surveys; however, the species may use Big Canyon on a seasonal basis.

6.5.13 California yellow warbler (Dendroica petechia morcomi)

The California yellow warbler is a California Species of Special Concern. This colorful songbird breeds in a variety of woodland habitats and is fairly common and widespread during migration. In Southern California, the breeding population has declined due to habitat loss, habitat degradation and parasitism by Brown-headed cowbirds. In Orange County, yellow warblers now nest primarily in well-developed riparian woodlands of the higher mountains, though a few possible breeders are also found each year in expansive riparian woodlands of the foothills and lowlands. The riparian habitat of Big Canyon is likely not well-developed enough to support breeding yellow warblers, although the species may occur occasionally during migration.

6.5.14 Yellow-breasted chat (Icteria virens)

The yellow-breasted chat is a large warbler designated a California Species of Special Concern. It nests in well-developed riparian woodlands, often adjacent to upland scrub habitats. California breeding populations, particularly those in the southern half of the state have declined significantly, probably resulting from a combination of habitat loss, habitat degradation and brood parasitism by the brown-headed cowbird. The yellow-breasted chat is a rare to uncommon nesting species in the lowlands and foothills of Orange County. The riparian habitat of Big Canyon is likely not well-developed enough to support breeding yellow-breasted chats, although the species may occur occasionally during migration.

6.5.15 Belding's savannah sparrow (Passerculus sandwichensis beldingi)

The Belding's savannah sparrow is listed as threatened by the state of California. It occurs from Morro Bay south to El Rosario, Baja California in coastal salt marshes and coastal estuaries where pickleweed, sea-blite, salt bush, and salt grass are dominant plant species. Diet includes a variety of crustaceans as well as seeds of pickleweed and they have been observed foraging in habitats adjacent to coastal salt marsh and are capable of drinking salt water. Nests are built low in pickleweed in middle to upper portions of salt marshes, or in non-tidal seepage areas dominated by pickleweed. Predators include red fox (*Vulpes vulpes*), striped skunk (*Mephites mephites*), raccoon (*Procyon lotor*), and domestic cat. The population of Belding's savannah sparrow population has declined over the past century due to destruction of suitable salt marsh habitat by filling for housing, industrial use and marina development. Potential habitat for Belding's savannah sparrow occurs in Big Canyon, and focused surveys in 2003, as discussed in Section 3.4.4, revealed an estimated eight territories (pairs) of Belding's savannah sparrows.

6.6 Special-Status Mammal Species

No potential habitat for special-status mammal species was located during the surveys. Thus, no mammal species are discussed in more detail in this section, no focused surveys were conducted for special-status mammals in Big Canyon, and none were located during general surveys. Special-status mammals that may occur in the project vicinity, and the reasons they are not expected to occur in Big Canyon, are summarized in Table 12. Table 12 details all special status wildlife species observed or potentially present in Big Canyon. Species shown in bold were observed in Big Canyon during 2003 surveys. The following categories from the Department of Fish and Game at (<http://www.dfg.ca.gov/whdab/html/lists.html>) were used to indicate status:

FE -	Federally listed Endangered	FC -	Federal Candidate. Sufficient biological information to support a proposal to list the species as Endangered or Threatened
FT -	Federally listed Threatened	FSC -	Federal Species of Concern
SE -	State listed Endangered	CSC -	California Species of Special Concern
ST -	State listed Threatened		
FP -	State Fully Protected		

Table B12. Special-Status Wildlife Species Observed or Potentially Present in Big Canyon

Species	Federal Status	State Status	Preferred Habitat	Potential for Occurrence
Arroyo toad <i>Bufo microscaphus californicus</i>	FE	CSC	Oak woodland, riparian habitats	None; habitat in Big Canyon too disturbed with non-native predators.
Southwestern pond turtle <i>Clemmys marmorata pallida</i>	FSC	CSC	Reservoirs; deep pools in riparian habitats; adjacent upland habitats for breeding	Very low; pond too shallow and warm; potential predators including African clawed frog.
San Diego horned lizard <i>Phrynosoma coronatum blainvillei</i>	FSC	CSC	Sandy openings in coastal sage scrub and chaparral	Low; degraded and disturbed habitat, presence of feral cat and other predators.
California brown pelican <i>Pelicanus occidentalis</i>	FE	SE	Nearshore ocean, estuaries, bays	Observed foraging in channels west of salt marsh at Big Canyon
Light-footed clapper rail <i>Rallus longirostris levipes</i>	FE	SE	Coastal salt marsh dominated by cordgrass	Upper Newport Bay supports the largest population of this species; several pairs occur in salt marsh of Big Canyon
Least Bittern (<i>Ixobrychus exilis</i>)			Freshwater marsh with cattails	Known to nest in Harbor Lake and El Dorado Park; no current breeding records in Orange County. Potential habitat exists in Big Canyon but not expected due to human disturbance.
Western Snowy Plover <i>Charadrius alexandrinus nivosus</i>	FT	CSC	Breeds on sandy beaches and salt flats	Known to nest at Bolsa Chica but suitable nesting habitat is lacking at Big Canyon and the rest of Upper Newport Bay; may forage occasionally on mudflats
California least tern (<i>Sterna antillarum browni</i>)	FE	SE	Nests on sandy beaches and salt flats; forages in ocean, estuaries, freshwater	Known to nest at north end of Upper Newport Bay; no potential nesting habitat at Big Canyon but forages in salt marsh channels and possibly in freshwater marsh
Cooper's hawk <i>Accipiter cooperii</i>		CSC	Nests in woodlands, forages in many habitats in winter and migration.	Observed foraging during 2003 surveys; may nest in Big Canyon.
Sharp-shinned hawk <i>Accipiter striatus</i>		CSC	Forages in many habitats, in winter and migration	Observed foraging during 2003 surveys; does not nest in coastal So. Calif.
White-tailed kite <i>Elanus leucurus</i>	FSC	CSC FP	Nests in woodlands and ruderal habitats, forages in many habitats	Observed foraging during 2003 surveys; not expected to nest in Big Canyon.
Northern Harrier <i>Circus cyaneus</i>		CSC	Open fields, coastal salt marshes	Observed foraging over the salt marsh during 2003 surveys; not expected to nest in Big Canyon.
Osprey <i>Pandion haliaetus</i>		CSC	Nests in tall trees or cliffs on freshwater lakes and rivers and along seacoast; feeds on fish.	Observed during 2003 surveys; not expected to breed in Big Canyon; occasional forager at Upper Newport Bay.

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Species	Federal Status	State Status	Preferred Habitat	Potential for Occurrence
Merlin <i>Falco columbarius</i>		CSC	Uses many habitats in winter and migration including woodlands and open habitats	Moderate; occurs in local area in low numbers during migration and winter. Does not nest in California.
Peregrine falcon <i>Falco peregrinus</i>	Delisted ³ FSC, FS	CE	Known to forage in canyons and foothills.	Observed during 2003 surveys flying high over Big Canyon; not expected to breed but will forage, esp. for shorebirds in salt marsh.
Long-eared owl <i>Asio otus</i>		CSC	Roosts and nests in oak and willow riparian woodland.	Not expected to occur; very rare now in coastal So. Cal. And very sensitive to human disturbance.
Burrowing owl <i>Speotyto cunicularia</i>	FSC	CSC	Grasslands & ruderal habitats with friable soils or and existing squirrel burrows	Some potential habitat but human disturbance limits its occurrence; nearly extirpated from Orange County.
Vaux's Swift <i>Chaetura vauxi</i>	FSC	CSC	Mature old growth forests; riparian woodlands	Moderate; observed during survey; migrant foraging above Big Canyon salt marsh; not likely to nest
Southwestern willow flycatcher <i>Empidonax traillii extimus</i>	FE	SE ⁴	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	Not expected to occur; riparian habitat in Big Canyon not suitable for breeding; may occur occasionally as a migrant.
Loggerhead shrike <i>Lanius ludovicianus</i>	FSC, MNBMC	CSC	Nests in tall shrubs & dense trees, forages in grasslands, and ruderal habitats.	Moderate; appropriate habitat present in Big Canyon, may nest trees and shrubs in Big Canyon.
California horned lark <i>Eremophila alpestris actia</i>		CSC	Open habitats, ruderal areas agricultural areas	May occur during migration but habitat at Big Canyon likely too disturbed to support nesting.
Least Bell's vireo <i>Vireo belli pusillus</i>	FE	SE	Breeds in riparian woodlands, particularly those dominated by willows	Not observed during 2003 surveys; habitat has limited potential due to disturbance; may occur as a migrant.
Coastal cactus wren <i>Campylorhynchus brunneicapillus couesi</i>		CSC	Nests and forages in large cactus patches within coastal sage scrub and chaparral	Low, some cactus in Big Canyon but not in patches it typically prefers; may occasionally forage in Big Canyon. Known from other areas of Newport Bay.
Coastal California gnatcatcher <i>Polioptila californica californica</i>	FT	CSC	Forages and nests in coastal sage scrub	One pair observed during 2003 surveys in saltbush scrub. Big Canyon previously supported a higher population.
California yellow warbler <i>Dendroica petechia brewsteri</i>		CSC	Breeds in riparian woodlands dominated by willows and cottonwoods.	Habitat not suitable; not expected to breed in Big Canyon; may occur a migrant.
Yellow-breasted chat <i>Icteria virens</i>		CSC	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	Low; not expected to breed in riparian habitat of Big Canyon but may occur as a migrant.
Southern California rufous-crowned sparrow		CSC	Breeds & forages in coastal sage scrub and chaparral	Very low; potential habitat in Big Canyon too sparse and isolated from other potential habitat.

³ Delisted as endangered or threatened by the USFWS on August 25, 1999

⁴ The entire species, not just the subspecies, is listed by the State of California

Species	Federal Status	State Status	Preferred Habitat	Potential for Occurrence
<i>Aimophila ruficeps canescens</i>				
Belding's savannah sparrow <i>Passerculus sandwichensis</i>		ST	Coastal salt marsh dominated by pickleweed	Occurs throughout Upper Newport Bay; 8 territories observed in the salt marsh of Big Canyon during 2003 surveys
San Diego black-tailed jackrabbit <i>Lepus californicus benettii</i>		CSC	open chaparral, coastal sage scrub	Low; degraded and disturbed habitat, presence of feral cat and other predators
Pacific pocket mouse <i>Perognathus longimembris pacificus</i>	FE		loose, sandy soils in relatively open scrub habitats.	Not expected to occur in Big Canyon; previously documented in San Joaquin Hills, Spyglass Hill, but thought to be extinct from this locale since the 1970's due to development. The nearest known extant population occurs on the Dana Point Headlands.
Los Angeles pocket mouse <i>Perognathus longimembris brevinasus</i>		CSC	ruderal habitat (with fine sands)	None; habitat (fine sands) not present
Dulzura pocket mouse <i>Chaetodipus californicus femoralis</i>		CSC	chaparral, coastal sage scrub (sandy soils)	Low; degraded and disturbed habitat, presence of feral cat and other predators.
Southern grasshopper mouse <i>Onychomys torridus Ramona</i>		CSC	chaparral, oak woodland, coastal sage scrub	Low; degraded and disturbed habitat, presence of cats and other predators limits its occurrence in Big Canyon.
San Diego desert woodrat <i>Neotoma lepida intermedia</i>		CSC	coastal sage scrub	Low; degraded and disturbed habitat, presence of cat and other predators limits its occurrence in Big Canyon.
Pallid bat (<i>Antrozous pallidus</i>)		CSC	Forages over many habitats; roosts in buildings, rocky outcrops & crevices in mines & Et	Moderate; likely to forage occasionally over Big Canyon.
Spotted bat <i>Euderma maculatum</i>	FSC	CSC	all native habitats	Low; possible occasional forager over the riparian areas of Big Canyon.

7.0 NON-NATIVE AND INVASIVE SPECIES OF CONCERN

7.1 Non-Native and Invasive Plant Species

The exotic, invasive plant species known to occur in California have been noted by the California Exotic Plant Pest Council (CEPPC 1999), and by Bossard et al. (2000). Invasive plant species generally known to occur in Upper Newport Back Bay were addressed in the biological resource documentation for the Upper Newport Bay Regional Park (Marsh 1990, EDAW 1991). The following section will note some of the most invasive, exotic plant species noted in the Big Canyon study area.

7.1.1 Brazilian pepper (*Schinus terebinthifolius*)

This invasive tree species has developed into a monotypic riparian forest within the middle section of Big Canyon creek, and scattered trees and found throughout the riparian habitat within the creek.

7.1.2 Unknown Saltbush (*Atriplex* sp.)

This unknown, introduced saltbush shrub (subshrub), has developed into a separate community in the southwestern section of Big Canyon. There is a high potential for this species to continue to spread into the coastal sage and annual grassland communities within Big Canyon.

7.1.3 Iceplants

Iceplants (including the species *Carpobrotus edulis*, *Mesembryanthemum crystallinum*, *M. nodiflorum* and *Malephora? crocea* and additional species) now cover large areas of the slopes of the canyon and in disturbed, open areas on the canyon floor. The species within large infested sites need to be identified, and the procedures for removing the larger infestations should be developed.

7.1.4 Spanish sunflower (*Pulicaria paludosa*)

This species is found scattered within most of the riparian herb, and margins of the riparian scrub community found in Big Canyon. It also occurs on the margins of some of the alkali meadows found within Big Canyon.

7.1.5 Statice (*Limonium ramosissimum?*)

This naturalized statice still needs to be identified. However, the mats formed by this perennial herb are found in alkali meadows, alkali grassland, and ruderal habitats. It appears to be rapidly spreading into wetland habitats within the canyon.

7.1.6 Glaucous-leaved saltbush (*Atriplex glauca*)

This species is found spreading throughout the annual grassland found in the southwest corner of Big Canyon, and other localities within the canyon.

7.1.7 Myoporum (*Myoporum laetum*)

Scattered myoporum shrubs were found scattered in the riparian habitat and on the slopes within Big Canyon.

7.1.8 Castor bean (*Ricinus communis*)

At least one fairly large stand of this invasive weedy species, was noted in Mexican elderberry woodland, and sage scrub habitats in the northwest portion of the canyon.

7.1.9 Pampas grass (*Cortaderia selloana*)

A few individuals of this highly invasive grass species were noted adjacent to riparian habitats in the upper Big Canyon creek drainage and scattered in several other localities within the drainage.

7.1.10 Evergreen (Shamel) ash (*Fraxinus uhdei*)

Several stands of the evergreen ash (identification needs to be verified) were noted in the willow riparian scrub in the northeast portion of Big Canyon.

7.1.11 Italian thistle (*Carduus pycnocephalus*)

Stands of Italian thistle were noted in grasslands within the northeast section of Big Canyon.

7.1.12 Tocalote (*Centaurea melitensis*)

Tocalote is found in all of the annual grasslands of Big Canyon, and in some localities forms relatively dense stands.

7.1.13 Black mustard (*Brassica nigra*)

Dense stands of black mustard were noted on the slopes of the bluffs of the southwestern portion of Big Canyon, and in other annual grasslands found within the canyon.

7.1.14 Garland chrysanthemum (*Chrysanthemum coronarium*)

To date this species is limited to alkali grasslands found along Backbay Drive.

7.1.15 *Pride of Madera (Echium candicans)*

Pride of Madera was noted in at least one stand on the slopes of the canyon. It was not determined if these were planted or adventive, however, there is the potential of this species spreading into areas of the canyon.

7.1.16 *Acacia (Acacia longifolia, A. retinodes, plus additional species)*

Acacias have been used for landscaping along the margins of the canyon, and these species have the potential to escape into natural habitats. At least one golden wattle shrub was noted in the riparian habitats of Big Canyon Creek.

7.1.17 *Five-hook bassia (Bassia hyssopifolia)*

The five hook bassia is relatively common in disturbed alkali habitats.

7.1.18 *Purple false brome (Brachypodium distachyon)*

Patches of this species were noted in annual grasslands in the southeast portion of Big Canyon.

7.1.19 *Tree tobacco (Nicotiana glauca)*

This weedy shrub was uncommonly noted in some of the disturbed habitats in Big Canyon.

7.1.20 *Sweet fennel (Foeniculum vulgare)*

Sweet fennel is found occasionally in annual grassland, coastal sage scrub, and the margins of riparian scrub habitats.

7.1.21 *Poison hemlock (Conium maculatum)*

Poison hemlock was uncommonly noted in riparian herb and riparian scrub communities in the northeastern section of Big Canyon.

7.1.22 *Bull thistle (Cirsium vulgare)*

This species was uncommonly found in some of the riparian herb, and alkali meadow communities within Big Canyon.

7.2 *Non-Native and Invasive Insect Species*

Argentine ants (*Linepithema humile*) are small ants often present in great numbers. They are known to forage 24 hours a day. The Argentine ant is now permanently established in California and parts of the southern United States, including Georgia and Florida. These ants are most commonly encountered in urban areas and along the coast. Argentine ants are usually found on trees or shrubs, in flowerbeds, in and around mulch, and in trash heaps. Argentine ants are a serious threat to the ecosystem. They may eat nestling birds. They out-compete native ants and other native insects for food and habitat, thus reducing prey and displacing predators on native insects such as lizards, snakes, and spiders.

Other predators on native insects include non-native sow bugs (*Porcellio laevis*), expected to occur in Big Canyon, and earwigs (*Forficula auricularia*), observed in Big Canyon during surveys. Giant whitefly (*Aleurodicus dugesii*) may also be present on some of the ornamental trees and shrubs above Big Canyon, especially hibiscus. This insect has become a serious pest of plants in recent years from coastal San Diego to Los Angeles County.

7.3 *Non-Native and Invasive Herpetological Species*

African clawed frog and non-native crayfish are non-native species commonly found in freshwater marshes and streams in southern California, and both were observed in Big Canyon (see Section 3.2.1). These species are known to reduce the populations of native amphibians and fish species, sometimes to the point of extirpation, by consuming their eggs.

7.4 Non-Native and Invasive Avian Species

Several non-native bird species common to southern California are also found in Big Canyon, including the European starling (*Sturnus vulgaris*) and house sparrow (*Passer domesticus*). Both are species native to Britain that were introduced into the United States during the early- to mid-1900's. Both species take over nesting habitat of native species, thereby reducing the populations of native species, and both were observed in Big Canyon. Native species that are a problem for other native birds include the American crow (*Corvus brachyrhynchos*) and brown-headed cowbird (*Molothrus ater*). American crows are very well adapted for living in residential areas, and they prey heavily on native bird species. During surveys for Belding's savannah sparrow in Big Canyon, several crows were observed foraging within the pickleweed marsh, likely searching for garbage washed up during high tide as well as for eggs of native nesting birds of the coastal salt marsh. Brown-headed cowbirds are nest parasites that locate and remove eggs from nests of native birds, replacing them with their own. The native birds typically do not recognize the foreign eggs and raise the young as if they were their own, thus producing no offspring of their own. No brown-headed cowbirds were observed in Big Canyon during 2003 surveys but they are known to occur in the area.

7.5 Non-Native and Invasive Mammal Species

Non-native and invasive mammal species in the vicinity of Big Canyon include feral cats, a widespread problem in many areas of southern California, as they consume native bird, reptile and mammal species. Another non-native species is the red fox (*Vulpes vulpes*), which is very well adapted to human modified habitats and frequently resides in open space areas such as the borders of coastal salt marshes. Red foxes prey on native species, and substantial reductions in reproductive success as well as in populations of special-status bird species. For example, prior to an intensive trapping program during the late 1980's that removed red foxes from the Anaheim Bay marsh at the Seal Beach Naval Weapons Station, red foxes had succeeded in extirpating light-footed clapper rails from the area. The clapper rail population there has since recovered and is doing well. No red foxes were observed at Big Canyon during the 2003 surveys, and it is likely that coyotes in the area, which prey on red foxes, keep the population in check.

8.0 SPECIES LISTS

Table B13. Plant Species Observed in Big Canyon, 2003 Surveys

FAMILY Common Name	Scientific Name	Native (N)/ Introduced (I)
AXOLLACEAE mosquito fern		
Pacific mosquito fern	<i>Azolla filiculoides</i>	N
GYMNOSPERMS		
Pines	<i>Pinus spp.</i>	I
DICOTS DICOTYLEDONES		
AMARANTHACEAE amaranth		
Tumbling pigweed	<i>Amaranthus albus</i>	I
AIZOACEAE carpet weed		
Hottentot fig	<i>Carpobrotus edulis</i>	I
Crystal ice plant	<i>Mesembryanthemum crystallinum</i>	I
Small-flowered ice plant	<i>Mesembryanthemum nodiflorum</i>	I
Iceplant	<i>Mesembryanthemum spp.</i>	I
ANACARDIACEAE sumac		
Lemonade berry	<i>Rhus integrifolia</i>	N
Brazilian pepper	<i>Schinus terebinthifolius</i>	I
Poison oak	<i>Toxicodendron diversilobum</i>	N

FAMILY Common Name	Scientific Name	Native (N)/ Introduced (I)
APIACEAE carrot		
Common celery	<i>Apium graveolens</i>	I
Poison hemlock	<i>Conium maculatum</i>	I
Sweet fennel	<i>Foeniculum vulgare</i>	I
APOCYNACEAE dogbane		
Oleander	<i>Nerium oleander</i>	I
Blue periwinkle	<i>Vinca major</i>	I
ARALIACEAE ginseng		
English ivy	<i>Hedra helix</i>	I
Algerian ivy	<i>Hedra canariensis</i>	I
ASTERACEAE sunflower		
Western ragweed	<i>Ambrosia psilostachya</i>	N
California sagebrush	<i>Artemisia californica</i>	I
Mugwort	<i>Artemisia douglasiana</i>	N
Emory's baccharis	<i>Baccharis emoryi</i>	N
Coyote brush	<i>Baccharis pilularis</i>	N
Mulefat	<i>Baccharis salicifolia</i>	N
Italian thistle	<i>Carduus pycnocephalus</i>	I
Tocalote	<i>Centaurea melitensis</i>	I
Common pineapple weed	<i>Chamomilla suaveolens</i>	I
Garland chrysanthemum	<i>Chrysanthemum coronarium</i>	I
Bull thistle	<i>Cirsium vulgare</i>	I
Flax-leaved horseweed	<i>Conyza bonariensis</i>	I
Common horseweed	<i>Conyza canadensis</i>	N
Common sand aster	<i>Lessingia filaginifolia</i>	N
Australian brass buttons	<i>Cotula australis</i>	I
African brass buttons	<i>Cotula coronopifolia</i>	I
California bush sunflower	<i>Encelia californica</i>	N
Western goldenrod	<i>Euthamia occidentalis</i>	N
Narrow-leaved filago	<i>Filago gallica</i>	I
Gazania	<i>Gazania linearis</i>	I
Bi-colored cudweed	<i>Gnaphalium bicolor</i>	N
Weedy cudweed	<i>Gnaphalium leteo-album</i>	I
Southern tarplant	<i>Centromadia parryi ssp. australis</i>	N
Fascicled tarweed	<i>Deinandra fasciculata</i>	N
Telegraph weed	<i>Heterotheca grandiflora</i>	N
Smooth cat's ear	<i>Hypochaeris glabra</i>	I
Coastal goldenbush	<i>Isocoma menziesii</i>	N
Jaumea	<i>Jaumea carnosa</i>	N
Cliff malacothrix	<i>Malacothrix saxatilis</i>	N
African daisy	<i>Osteospermum fruticosum</i>	I
Bristly ox tongue	<i>Picris echioides</i>	I
Marsh fleabane	<i>Pluchea odorata</i>	N
Pulicaria paludosa	Spanish sunflower	I
Common Groundsel	<i>Senecio vulgaris</i>	I
Milk thistle	<i>Silybum marianum</i>	I

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FAMILY Common Name	Scientific Name	Native (N)/ Introduced (I)
Prickly sow thistle	<i>Sonchus asper</i>	I
Common sow thistle	<i>Sonchus oleraceus</i>	I
Tall wreath plant	<i>Stephanomeria virgata</i>	N
Cocklebur	<i>Xanthium strumarium</i>	N
BATACEAE		
saltwort		
American saltwort	<i>Batis maritima</i>	N
BIGNONIACEAE –		
Cape honeysuckle	<i>Tecomaria capensis</i>	I
BORAGE –		
BORAGINACEAE		
Common fiddleneck	<i>Amsinckia menziesii</i>	N
Common cryptantha	<i>Cryptantha intermedia</i>	N
Pride of Madera	<i>Echium candicans</i>	I
Alkali heliotrope	<i>Heliotropium curassavicum</i>	N
BRASSICACEAE		
mustard		
Black mustard	<i>Brassica nigra</i>	I
Field mustard	<i>Brassica rapa ssp. sylvestris</i>	I
Shepherd's purse	<i>Capsella bursa-pastoris</i>	I
Lesser wart cress	<i>Coronopus didymus</i>	I
Western tansy mustard	<i>Descurania pinnata</i>	N
Summer mustard	<i>Hirshfeldia incana</i>	I
Sand peppergrass	<i>Lepidium lasiocarpum</i>	N
Shining peppergrass	<i>Lepidium nitidum var. nitidum</i>	N
Sweet alyssum	<i>Lobularia maritima</i>	I
Wild radish	<i>Raphanus sativa</i>	I
Water cress	<i>Rorippa nasturtium-aquaticum</i>	I
London rocket	<i>Sisymbrium irio</i>	I
Hare's ear cabbage	<i>Sisymbrium orientale</i>	I
CACTACEAE		
cactus		
Coastal prickly pear	<i>Opuntia littoralis</i>	N
Coastal cholla	<i>Opuntia prolifera</i>	N
CAPPARACEAE		
caper		
Bladderpod	<i>Isomeris arborea</i>	N
CAPRIFOLIACEAE		
HONEYSUCKLE		
Japanese honeysuckle	<i>Lonicera japonica</i>	I
Mexican elderberry	<i>Sambucus mexicana</i>	N
CARYOPHYLLACEAE		
pink		
Four-leaved polycarp	<i>Polycarpon tetraphyllum</i>	I
Windmill pink	<i>Silene gallica</i>	I
Salt marsh sand spurry	<i>Spergularia marina</i>	N
CHENOPODIACEAE		
goosefoot		
Parish's pickleweed	<i>Arthrocnemum subterminale</i>	N
Saltbush	<i>Atriplex sp.</i>	I
Fourwing saltbush	<i>Atriplex canescens</i>	N
Glaucous-leaved saltbush	<i>Atriplex glauca</i>	I
Quail bush	<i>Atriplex lentiformis</i>	N
Halberd-leaved saltbush	<i>Atriplex patula var. patula</i>	N

FAMILY Common Name	Scientific Name	Native (N)/ Introduced (I)
Australian saltbush	<i>Atriplex semibaccata</i>	I
Five-hook bassia	<i>Bassia hyssopifolia</i>	I
Garden beet	<i>Beta vulgaris</i>	I
Lamb's quarters	<i>Chenopodium album</i>	I
Mexican tea	<i>Chenopodium ambrosioides</i>	I
Coast goosefoot	<i>Chenopodium macrospermum</i>	N
Nettle-leaved goosefoot	<i>Chenopodium murale</i>	I
Common woody pickleweed	<i>Salicornia virginica</i>	N
Russian thistle	<i>Salsola tragus</i>	I
Estuary sea blite	<i>Suaeda esteroa</i>	N
Woolly sea blite	<i>Suaeda taxifolia</i>	N
CONVOLVULACEAE		
morning glory		
Bindweed	<i>Convolvulus arvensis</i>	I
Alkali weed	<i>Cressa truxillensis</i>	N
Salty dodder	<i>Cuscuta salina</i>	N
CRASSULACEAE		
stonecrop		
Pygmy stone crop	<i>Crassula connata</i>	N
Lance-leaved live-forever	<i>Dudleya lanceolata</i>	N
CUCURBITACEAE		
gourd		
Coyote melon	<i>Cucurbita foetidissima</i>	N
Manroot	<i>Marah macrocarpa</i>	N
EUPHORBIACEAE		
spurge		
Spotted spurge	<i>Chamaesyce maculata</i>	I
Golondrinia	<i>Chamaesyce polycarpa</i>	N
Dove weed	<i>Eremocarpus setigerus</i>	N
Petty spurge	<i>Euphorbia peplus</i>	I
Castor bean	<i>Ricinus communis</i>	I
FABACEAE		
pea		
Blue-leaved wattle	<i>Acacia cyanophylla</i>	I
Golden wattle	<i>Acacia longifolia</i>	I
Blackwood acacia	<i>Acacia melanoxylon</i>	I
Wirilda	<i>Acacia retinoides</i>	I
Arroyo lupine	<i>Lupinus succulentus</i>	N
Bur clover	<i>Medicago polymorpha</i>	I
White sweet clover	<i>Melilotus alba</i>	I
Yellow sweet clover	<i>Melilotus indica</i>	I
FRANKENIACEAE		
alkali heath		
Alkali heath	<i>Frankenia salina</i>	N
GERANIACEAE		
geranium		
Red-stemmed filaree	<i>Erodium cicutarium</i>	I
White-stemmed filaree	<i>Erodium moschatum</i>	I
Carolina geranium	<i>Geranium caolinianum</i>	N
HYDROPHYLLACEAE		
waterleaf		
Common eucrypta	<i>Eucrypta chrysanthemifolia</i>	N

BIG CANYON CREEK:
 HISTORIC TIDAL WETLANDS CONCEPTUAL RESTORATION PLAN

FAMILY Common Name	Scientific Name	Native (N)/ Introduced (I)
LAMIACEAE mint		
Horehound	<i>Marrubium vulgare</i>	I
MALVACEAE mallow		
Cheeseweed	<i>Malva parviflora</i>	I
MYOPORACEAE myoporum		
Myoporum	<i>Myoporum laetum</i>	I
MYRTACEAE myrtle		
Eucalyptus	<i>Eucalyptus spp.</i>	I
NYCTAGINACEAE four-o'clock		
Bouganvillea	<i>Bouganvillea glabra</i>	I
California wishbone bush	<i>Mirabilis californica</i>	N
OLEACEAE olive		
Evergreen ash	<i>Fraxinus udehi</i>	I
ONAGRACEAE eveningprimrose		
Beach evening primrose	<i>Camissonia cheiranthifolia</i>	N
PLATANACEAE sycamore		
Western sycamore	<i>Platanus racemosa</i>	N
PLUMAGINACEAE leadwort		
California marsh rosemary	<i>Limonium californicum</i>	N
Statice	<i>Limonium sp.</i>	I
Perez's sea lavender	<i>Limonium sinuatum</i>	I
POLYGONACEAE buckwheat		
California buckwheat	<i>Eriogonum fasciculatum ssp. fasciculatum</i>	N
Common knotweed	<i>Polygonum arenastrum</i>	I
Willow smartweed	<i>Polygonum lapathifolium</i>	N
Curly dock	<i>Rumex crispus</i>	I
PORTULACACEAE purslane		
Common purslane	<i>Portulaca oleracea</i>	I
PRIMULACEAE primrose		
Scarlet pimpernel	<i>Anagallis arvensis</i>	I
PROTEACEAE protea		
Silk oak	<i>Grevillea robusta</i>	I
ROSACEAE rose		
Toyon	<i>Heteromeles arbutifolia</i>	N
California blackberry	<i>Rubus ursinus?</i>	N?
California wild rose	<i>Rosa californica</i>	
RUBIACEAE madder		
Common bedstraw	<i>Galium aparine</i>	I

FAMILY Common Name	Scientific Name	Native (N)/ Introduced (I)
SALICACEAE willow		
Fremont cottonwood	<i>Populus fremontii</i>	N
Black willow	<i>Salix gooddingii</i>	N
Arroyo willow	<i>Salix lasiiolepis</i>	N
SAURURACEAE lizard-tail		
Yerba mansa	<i>Anemopsis californica</i>	N
SCROPULARIACEAE figwort		
Nuttall's snapdragon	<i>Antirrhinum nuttallianum</i>	N
Salt marsh bird's beak	<i>Cordylanthus maritimimus ssp. maritimus</i>	N
SOLANACEAE nightshade		
Jimson weed	<i>Datura meteloides</i>	N
California box thorn	<i>Lycium californicum</i>	N
Tree tobacco	<i>Nicotiana glauca</i>	I
White nightshade	<i>Solanum americanum</i>	I
TAMARICACEAE tamarisk		
Mediterranean tamarisk	<i>Tamarix ramosissima</i>	I
TROPAEOLACEAE tropaecolum		
Nasturium	<i>Tropaeolum majus</i>	I
URTICACEAE nettle		
Western nettle	<i>Hesperocnide tenella</i>	N
Hoary nettle	<i>Urtica dioica ssp. holosericea</i>	N
Dwarf nettle	<i>Urtica urens</i>	I
VERBENACEAE vervain		
Lantana	<i>Lantana camara</i>	I
Western verbena	<i>Verbena lasiostachys</i>	N
MONOCOTYLEDONES monocots		
AGAVACEAE agave		
Century plant	<i>Agave americana</i>	I
ARECACEAE palm		
Mediterranean fan palm	<i>Chamaerops humilis</i>	I
Mexican fan palm	<i>Washingtonia robusta</i>	I
CYPERACEAE sedge		
Tall umbrella sedge	<i>Cyperus eragrostis</i>	N
Pale spike rush	<i>Eleocharis palustris</i>	N
Olney's bulrush	<i>Scirpus americanus</i>	N
California bulrush	<i>Scirpus californicus</i>	N
Alkali bulrush	<i>Scirpus robustus</i>	N
Coastal bulrush	<i>Scirpus maritimus</i>	N
JUNCACEAE rush		
Southwestern spiny rush	<i>Juncus acutus ssp. leopoldii</i>	N

BIG CANYON CREEK:
HISTORIC TIDAL WETLANDS CONCEPTUAL RESTORATION PLAN

FAMILY Common Name	Scientific Name	Native (N)/ Introduced (I)
Toad rush	<i>Juncus bufonius</i>	I
JUNCAGINACEAE ARROW GRASS		
Arrow grass	<i>Triglochin concinna</i>	I
LEMNACEAE duck weed		
Lesser duckweed	<i>Lemna minor</i>	N
POACEAE grass		
Water bent	<i>Agrostis semiverticillata</i>	I
Slender wild oat	<i>Avena barbata</i>	I
Wild oat	<i>Avena fatua</i>	I
Purple false brome	<i>Brachypodium distachyon</i>	I
Rescue grass	<i>Bromus catharticus</i>	I
Rippgut brome	<i>Bromus diandrus</i>	I
Soft chess	<i>Bromus hordeaceus ssp. hordeaceus</i>	I
Red brome	<i>Bromus madritensis ssp. rubens</i>	I
Pampas grass	<i>Cortaderia sellonana</i>	I
Bermuda grass	<i>Cynodon dactylon</i>	I
Salt grass	<i>Distichlis spicata</i>	N
Barnyard grass	<i>Echinochloa crus-galli</i>	I
Foxtail barley	<i>Hordeum murinum ssp. leporinum</i>	I
Goldentop	<i>Lamarkia aurea</i>	I
Giant wild rye	<i>Leymus condensatus</i>	N
Beardless wild rye	<i>Leymus triticoides</i>	N
Italian ryegrass	<i>Lolium multiflorum</i>	I
English ryegrass	<i>Lolium perenne</i>	I
Small-flowered melic	<i>Melica imperfecta</i>	N
Shore grass	<i>Monanthochloe littoralis</i>	N
Foothill needlegrass	<i>Nassella lepida</i>	N
Sickle grass	<i>Parapholis incurve</i>	I
African fountain grass	<i>Pennisetum villosum</i>	I
Smilo grass	<i>Piptatherum miliaceum</i>	I
Annual blue grass	<i>Poa annua</i>	I
Rabbit's foot grass	<i>Polypogon monspeliensis</i>	I
St. Augustine grass	<i>Stenotaphrum secundatum</i>	I
Foxtail fescue	<i>Vulpia myuros</i>	I
TYPHACEAE cat-tail		
Narrow-leaved cat-tail	<i>Typha domingensis</i>	N
Broad-leaved cat-tail	<i>Typha latifolia</i>	N

Table B14. Insect Species Observed in Big Canyon, 2003 Surveys

FAMILY	Scientific Name	Host plant
Common Name		
<i>Butterflies and Moths: Order Lepidoptera</i>		
SWALLOWTAILS – <i>Papilionidae</i>		
Pale Swallowtail	<i>Papilio eurymedon</i>	<i>Ceanothus spp.</i>
Western Tiger Swallowtail	<i>Papilio rutulus</i>	<i>Salix, Populus, Platanus</i>
Anise Swallowtail	<i>Papilio zelicaon</i>	<i>Foeniculum vulgare, Carrot,, Apiaceae</i>
BRUSH-FOOTED BUTTERFLIES – <i>Nymphalidae</i>		
Gulf Fritillary	<i>Agraulis vanillae incarnata</i>	<i>As above</i>
Lorquin's Admiral	<i>Basilarchia lorquini</i>	<i>Salix, Populus</i>
California Ringlet	<i>Ceonympha tullia californica</i>	<i>Various grasses</i>
Gabb's Checkerspot	<i>Charidryas gabbii</i>	<i>Lessingia filaginifolia, H. grandiflora</i>
Monarch	<i>Danaus plexippus</i>	<i>Asclepias spp.</i>
Buckeye	<i>Junonia coenia</i>	<i>As above</i>
Mourning Cloak	<i>Nymphalis antiopa</i>	<i>As above</i>
West Coast Lady	<i>Vanessa annabella</i>	<i>As above</i>
Red Admiral	<i>Vanessa atalanta</i>	<i>As above</i>
Painted Lady	<i>Vanessa cardui</i>	<i>As above</i>
Virginia Lady	<i>Vanessa virginiensis</i>	<i>As above</i>
WHITES AND SULFURS – <i>Pieridae</i>		
Sara Orange-tip	<i>Anthocharis sara sara</i>	<i>As above</i>
California Dogface	<i>Colias eurydice</i>	<i>Amorpha californica</i>
Alfalfa Sulfur	<i>Colias eurytheme</i>	<i>As above</i>
Nicippe Yellow	<i>Eurema nicippe</i>	<i>Cassia spp.</i>
Cabbage White	<i>Pieris rapae</i>	<i>As above</i>
Checkered White	<i>Pontia protodice</i>	<i>As above</i>
BLUE, HAIRSTREAKS, COPPERS – <i>Lycaenidae</i>		
Pygmy Blue	<i>Brephidium exilis</i>	<i>As above</i>
Bramble Hairstreak	<i>Callophrys perplexa</i>	<i>Lotus scoparius, Eriogonum fasc.</i>
Bernardino Blue	<i>Euphilotes Bernardino</i>	<i>Eriogonum fasciculatum</i>
Southern Blue	<i>Glaucopsyche lygdamus australis</i>	<i>Lotus scoparius</i>
Edward's Blue	<i>Hemiargus ceraunus gyas</i>	<i>Prosopis, Medicago</i>
Acmon Blue	<i>Icaricia acmon</i>	<i>As above</i>
Western Elfin	<i>Incisalia augustinus iroides</i>	
Marine Blue	<i>Leptotes marina</i>	<i>As above</i>
Common Hairstreak	<i>Strymon melinus</i>	<i>As above</i>
METALMARKS – <i>Riodinidae</i>		
Behr's Metalmark	<i>Apodemia mormo virgulti</i>	<i>Eriogonum fasciculatum</i>
SKIPPERs – <i>Hesperiidae</i>		
Field Skipper	<i>Atalopedes campestris</i>	<i>Various grasses, incl. Cynodon</i>
Funereal Duskywing	<i>Erynnis funeralis</i>	<i>As above</i>
Mournful Duskywing	<i>Erynnis tristis</i>	<i>Quercus spp. (lobata, agrifolia)</i>
Fiery Skipper	<i>Hylephila phyleus</i>	<i>As above</i>
Eufala Skipper	<i>Lerodea eufala</i>	<i>As above</i>
Woodland Skipper	<i>Ochlodes sylvanoides sylvanoides</i>	<i>Various grasses</i>
Wandering Skipper	<i>Panoquina errans</i>	<i>Distichlis spicata</i>

BIG CANYON CREEK:
HISTORIC TIDAL WETLANDS CONCEPTUAL RESTORATION PLAN

FAMILY	Common Name	Scientific Name	Host plant
	Umber Skipper	<i>Paratrytone melane</i>	Various grasses, incl. <i>Cynodon</i>
	Sandhill Skipper	<i>Polites sabuleti</i>	<i>Distichlis spicata</i>
	Western Checkered Skipper	<i>Pyrgus communis albescens</i>	As above
Other Insect Orders			
SILVERFISH – <i>Lepismatidae</i>			
	Silverfish	<i>Lepisma saccharina</i>	Host plants are unknown or n/a for this species
BRISTLETAILS – <i>Machilidae</i> Host plants are unknown or n/a for this species			
	Bristletail	<i>Machilinus</i> sp.	Host plants are unknown or n/a for this species
DRAGONFLIES – <i>Aeshnidae</i>			
	Dragonfly	<i>Anax junius</i>	Host plants are unknown or n/a for this species
	Dragonfly	<i>Aeshna multicolor</i>	Host plants are unknown or n/a for this species
DRAGONFLIES – <i>Libellulidae</i>			
	Dragonfly	<i>Libellula saturate</i>	Host plants are unknown or n/a for this species
	Dragonfly	<i>Sympetrum corruptum</i>	Host plants are unknown or n/a for this species
	Dragonfly	<i>Tramea lacerate</i>	Host plants are unknown or n/a for this species
DAMSELFLIES – <i>Coenagrionidae</i>			
	Damselfly	<i>Enallagma</i> sp.	Host plants are unknown or n/a for this species
	Damselfly	<i>Argia</i> sp.	Host plants are unknown or n/a for this species
GRASSHOPPERS – <i>Acrididae</i>			
	Grasshopper	<i>Melanoplus</i> sp.	Host plants are unknown or n/a for this species
	Grasshopper	<i>Trimarotropis</i> sp.	Host plants are unknown or n/a for this species
	Grasshopper	<i>Schistocerca nitens</i>	Host plants are unknown or n/a for this species
GRASSHOPPERS – <i>Gryllidae</i>			
	Grasshopper	<i>Acheta assimilis</i>	Host plants are unknown or n/a for this species
EARWIGS – <i>Forficulidae</i>			
	Earwig	<i>Forficula auricularia</i>	Host plants are unknown or n/a for this species
	PSOCIDS AND LICE – <i>Liposcelididae</i>	Not identified to species	Host plants are unknown or n/a for this species
	THRIPS – <i>Thripidae</i>	Not identified to species	Host plants are unknown or n/a for this species
TRUE BUGS – <i>Pentatomidae</i>			
	No common name	<i>Murgantia histrionica</i>	Host plants are unknown or n/a for this species
TRUE BUGS – <i>Cydnidae</i>			
	No common name	<i>Pangaeus</i> sp.	Host plants are unknown or n/a for this species
TRUE BUGS – <i>Lygaeidae</i>			
	No common name	<i>Geochoris</i> sp.	Host plants are unknown or n/a for this species
TRUE BUGS – <i>Reduviidae</i>			
	No common name	<i>Zelus</i> sp.	Host plants are unknown or n/a for this species

Coastal Sage Scrub

California sagebrush sage scrub

CSS-1

Shrub Cover %	65.0%
Herbaceous Cover %	55.0%
Total Vegetative Cover	75.0%
Litter Cover	5.0%
Dead Wood	
Bare Ground	20.0%
Total Non Vegetative Cover	25.0%

Species

Shrubs

<i>Artemisia californica</i>	55.0%
<i>Encelia californica</i>	2.0%
<i>Atriplex lentiformis</i>	1.0%
<i>Baccharis pilularis</i>	1.0%
<i>Baccharis emoryi</i>	1.0%

Grasses & Forbs

<i>Brassica nigra</i>	30.0%
<i>Centaurea melitensis</i>	10.0%
<i>Hirschfeldia incana</i>	5.0%
<i>Erodium cicutarium</i>	5.0%
<i>Marrubium vulgare</i>	2.0%
<i>Conyza canadensis</i>	1.0%
<i>Camissonia sp.</i>	1.0%
<i>Heterotheca grandiflora</i>	0.01

Coastal Sage Scrub

Coyote bush sage scrub

CBSS-1

Shrub Cover %	53.0%
Herbaceous Cover %	60.0%
Total Vegetative Cover	70.0%
Litter Cover	25.0%
Dead Wood	
Bare Ground	5.0%
Total Non Vegetative Cover	30.0%

Grasses & Forbs

*Mesebryanthemum sp.**Distichlis spicata**Frankenia salina**Bromus rubens**Brassica nigra**Lactuca serriola**Cortaderia sellonana*

Species

Shrubs

<i>Baccharis pilularis</i>
<i>Artemisia californica</i>
<i>Atriplex lentiformis</i>
<i>Isocoma menziesii</i>
<i>Isomeris arborea</i>
<i>Sambucus mexicana</i>
<i>Rhus integrifolia</i>
<i>Baccharis salicifolia</i>

Grasses & Forbs

<i>Brassica nigra</i>
<i>Melilotus indica</i>
<i>Carduus pycnocephalus</i>
<i>Hirschfeldia incana</i>
<i>Frankenia salina</i>
<i>Bromus hordeacues</i>
<i>Picris echioides</i>
<i>Marrubium vulgare</i>
<i>Verbena lasiostachya</i>

Encelia sage Scrub
Coyote bush sage scrub
ESS-1

Shrub Cover %	84.0%
Herbaceous Cover %	16.0%
Total Vegetative Cover	90.0%
Litter Cover	
Dead Wood	
Bare Ground	10.0%
Total Non Vegetative Cover	10.0%

Species

Shrubs

<i>Encelia californica</i>	65.0%
<i>Atriplex canescens</i>	12.0%
<i>Eriogonum fasciculatum</i>	5.0%
<i>Atrémisia californica</i>	3.0%
<i>Opuntia littoralis</i>	2.0%
<i>Opuntia prolifera</i>	1.0%
<i>Lycium californicum</i>	1.0%

Toyon–Sumac Chaparral
TSC-1

Shrub Cover %	90.0%
Herbaceous Cover %	6.0%
Total Vegetative Cover	96.0%
Litter Cover	4.0%
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	4.0%

Species

Shrubs

<i>Rhus integrifolia</i>	80.0%
<i>Heteromeles arbutifolia</i>	1.0%
<i>Baccharis emoryi</i>	1.0%
<i>Schinus terebinthifolius</i>	4.0%
<i>Myoporum laetum</i>	4.0%

Grasses & Forbs

<i>Pilularia paludosa</i>	4.0%
<i>Typha domingensis</i>	1.0%
<i>Ambrosia psilostachya</i>	1.0%

Annual grassland

Ag-1

Shrub Cover %	3.0%
Herbaceous Cover %	62.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	35.0%
Total Non Vegetative Cover	

Species

Shrubs

<i>Isocoma menziesii</i>	3.0%
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Grasses & Forbs

<i>Deiandra fasciculata</i>	45.0%
<i>Bromus madritensis</i>	5.0%
<i>Centaurea melitensis</i>	5.0%
<i>Bromus hordeaceus</i>	1.0%
<i>Melilotus indica</i>	1.0%
<i>Atriplex glauca</i>	1.0%
<i>Centromadia parryi</i> ssp. <i>australis</i>	1.0%
<i>Limonium</i> sp.	0.1%

Ag-2

Shrub Cover %	0.0%
Herbaceous Cover %	95.0%
Total Vegetative Cover	
Litter Cover	2.0%
Dead Wood	
Bare Ground	3.0%
Total Non Vegetative Cover	

Ag-3

Shrub Cover %	0.0%
Herbaceous Cover %	95.0%
Total Vegetative Cover	
Litter Cover	2.0%
Dead Wood	
Bare Ground	3.0%
Total Non Vegetative Cover	

Species

Grasses & Forbs

<i>Brassica nigra</i>	60.0%
<i>Bromus diandrus</i>	15.0%
<i>Carduus pycnocephalus</i>	10.0%
<i>Raphanus sativa</i>	5.0%
<i>Hirschfeldia incana</i>	2.0%
<i>Foeniculum vulgare</i>	2.0%
<i>Marrubium vulgare</i>	1.0%
<i>Amaranthus albus</i>	0.1%
<i>Rumex crispus</i>	0.1%
<i>Solanum americanum</i>	0.1%
<i>Cirsium vulgare</i>	0.1%

Species

Grasses & Forbs

<i>Raphanus sativa</i>	65.0%
<i>Brassica nigra</i>	20.0%
<i>Hirschfeldia incana</i>	5.0%
<i>Conzyna canadensis</i>	2.0%
<i>Rumex crispus</i>	1.0%
<i>Tropaeolum majus</i>	1.0%
<i>Urtica dioica</i>	1.0%
<i>Frankenia salina</i>	1.0%
<i>Marrubium vulgare</i>	0.1%

BIG CANYON CREEK:
HISTORIC TIDAL WETLANDS CONCEPTUAL RESTORATION PLAN

Alkali grassland

Shrub Cover %	0.0%
Herbaceous Cover %	90.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	10.0%
Total Non Vegetative Cover	

Species

Grasses & Forbs

<i>Melilotus indica</i>	40.0%
<i>Centaurea melitensis</i>	40.0%
<i>Brassica nigra</i>	10.0%
<i>Salicornia virginica</i>	5.0%
<i>Bromus madritensis</i>	5.0%
<i>Atriplex glauca</i>	3.0%
<i>Bromus hordeaceus</i>	2.0%
<i>Mesembryanthemum crystallinum</i>	2.0%
<i>Heliotropium curassavicum</i>	1.0%
<i>Frankenia salina</i>	1.0%
<i>Bassia hyssopifolia</i>	1.0%
<i>Centromadia parryi ssp. australis</i>	0.1%
<i>Avena barbata</i>	0.1%
<i>Schismus barbatus</i>	0.1%
<i>Erodium cicutarium</i>	0.1%
<i>Polypogon monspeliensis</i>	0.1%

Alkali meadow 1

Shrub Cover %	0.1%
Herbaceous Cover %	97.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	3.0%
Total Non Vegetative Cover	

Species

Shrubs

<i>Baccharis emoryi</i>	0.1%
Grasses & Forbs	
<i>Distichilis spicata</i>	70.0%
<i>Jaumea carnosa</i>	15.0%
<i>Salicornia virginica</i>	5.0%
<i>Apium graveoloens</i>	5.0%
<i>Pulicaria paludosa</i>	2.0%
<i>Polypogon monspeliensis</i>	1.0%
<i>Typha domingensis</i>	0.1%
<i>Triglochin concinna</i>	0.1%
<i>Scirpus robustus</i>	0.1%
<i>Pluchea odorata</i>	0.1%

Alkali meadow 2

Shrub Cover %	0.0%
Herbaceous Cover %	95.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	5.0%
Total Non Vegetative Cover	

Species**Grasses & Forbs**

<i>Salicornia virginica</i>	90.0%
<i>Heliotropium curassavicum</i>	3.0%
<i>Polypogon monspeliensis</i>	1.0%
<i>Limonium sp.</i>	1.0%
<i>Atriplex glauca</i>	0.1%

Alkali meadow 3

Shrub Cover %	0.0%
Herbaceous Cover %	85.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	15.0%
Total Non Vegetative Cover	

Species**Grasses & Forbs**

<i>Frankenia salina</i>	70.0%
<i>Bassia hyssopifolia</i>	5.0%
<i>Ambrosia psilostachya</i>	5.0%
<i>Melilotus indica</i>	2.0%
<i>Atriplex patula</i>	1.0%
<i>Polypogon monspeliensis</i>	1.0%
<i>Urtica dioica</i>	1.0%
<i>Pulicaria paludosa</i>	0.1%

Alkali meadow 4

Shrub Cover %	0.1%
Herbaceous Cover %	100.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	0.0%
Total Non Vegetative Cover	

Species**Shrubs**

<i>Myoporum laetum</i>	0.1%
Grasses & Forbs	
<i>Salicornia virginica</i>	35.0%
<i>Frankenia salina</i>	30.0%
<i>Disticlis spicata</i>	30.0%
<i>Ambrosia psilostachya</i>	3.0%
<i>Urtica dioica</i>	1.0%
<i>Picris echioides</i>	1.0%
<i>Rumex crispus</i>	0.1%
<i>Polypogon monspeliensis</i>	0.1%
<i>Foeniculum vulgare</i>	0.1%
<i>Pulicaria paludosa</i>	0.1%

Upper Salt Marsh 1

Shrub Cover %	
Herbaceous Cover %	100.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Species

Grasses & Forbs	
<i>Jaumea carnosa</i>	70.0%
<i>Distichlis spicata</i>	12.0%
<i>Salicornia virginica</i>	5.0%
<i>Frankenia salina</i>	5.0%
<i>Moanthochloe littoralis</i>	5.0%
<i>Cressa truxillensis</i>	3.0%

Upper Salt Marsh 2

Shrub Cover %	
Herbaceous Cover %	100.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Species

Grasses & Forbs	
<i>Monanthochloe littoralis</i>	80.0%
<i>Jaumea carnosa</i>	5.0%
<i>Distichlis spicata</i>	5.0%
<i>Frankenia salina</i>	5.0%
<i>Salicornia virginica</i>	3.0%
<i>Limonium californicum</i>	2.0%
<i>Suaeda esteroa</i>	0.1%

Upper Salt Marsh 3

Shrub Cover %	
Herbaceous Cover %	100.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Species

Grasses & Forbs	
<i>Frankenia salina</i>	60.0%
<i>Salicornia virginica</i>	20.0%
<i>Distichlis spicata</i>	14.0%
<i>Monanthochloe littoralis</i>	5.0%
<i>Batis maritima</i>	1.0%
<i>Limonium californicum</i>	0.1%
<i>Suaeda esteroa</i>	0.1%

Upper Salt Marsh 4

Shrub Cover %	
Herbaceous Cover %	100.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Species

Grasses & Forbs	
<i>Batis maritima</i>	75.0%
<i>Salicornia virginica</i>	15.0%
<i>Monanthochloe littoralis</i>	5.0%
<i>Suaeda esteroa</i>	3.0%
<i>Limonium californicum</i>	2.0%

Middle Salt Marsh 1

Shrub Cover %	
Herbaceous Cover %	95.0%
Total Vegetative Cover	
Litter Cover (Algal)	
Dead Wood	
Bare Ground	5.0%
Total Non Vegetative Cover	

Species

Grasses & Forbs

<i>Salicornia virginica</i>	85.0%
<i>Batis maritima</i>	5.0%
<i>Frankenia salina</i>	5.0%
<i>Cuscuta salina</i>	0.1%

Middle Salt Marsh 2

Found on open mud flats, that appear have only a minor vegetative cover, except for the summer months

Shrub Cover %	
Herbaceous Cover %	48.0%
Total Vegetative Cover	
Litter Cover (Algal)	5.0%
Dead Wood	
Bare Ground	47.0%
Total Non Vegetative Cover	

Species

Grasses & Forbs

<i>Salicornia bigelovii</i>	45.0%
<i>Salicornia virginica</i>	3.0%

**BIG CANYON CREEK:
HISTORIC TIDAL WETLANDS CONCEPTUAL RESTORATION PLAN**

Lower Salt Marsh 1

Shrub Cover %	
Herbaceous Cover %	95.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	5.0%
Total Non Vegetative Cover	

Herb Layer

<i>Frankenia salina</i>	60.0%
<i>Salicornia virginica</i>	10.0%
<i>Pulicaria paludosa</i>	5.0%
<i>Heliotropium curassavicum</i>	5.0%
<i>Pluchea odorata</i>	2.0%
<i>Apium graveolens</i>	2.0%
<i>Polypogon monspeliensis</i>	1.0%

Species

Grasses & Forbs

<i>Spartina foliosa</i>	85.0%
<i>Salicornia bigelovii</i>	5.0%
<i>Salicornia virginica</i>	3.0%
<i>Batis maritima</i>	2.0%

Brackish Marsh 1

Shrub Cover %	2.0%
Herbaceous Cover %	93.0%
Total Vegetative Cover	95.0%
Litter Cover	5.0%
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Brackish Marsh 1

Shrub Cover %	2.0%
Herbaceous Cover %	98.0%
Total Vegetative Cover	100.0%
Litter Cover	
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Species

Shrubs

<i>Baccharis emoryi</i>	1.0%
<i>Atriplex lentiformis</i>	1.0%

Grasses & Forbs

Emergent Layer

<i>Scirpus californicus</i>	60.0%
<i>Typha latifolia</i>	5.0%

Species

Shrubs

<i>Baccharis emoryi</i>	2.0%
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Grasses & Forbs

Emergent Layer

<i>Typha domingensis</i>	85.0%
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Herb Layer

<i>Frankenia salina</i>	20.0%
<i>Salicornia virginica</i>	15.0%
<i>Heliotropium curassavicum</i>	5.0%
<i>Pluchea odorata</i>	1.0%

Alkali Marsh 1

Shrub Cover %	
Herbaceous Cover %	90.0%
Total Vegetative Cover	
Litter Cover	5.0%
Dead Wood	
Bare Ground	5.0%
Total Non Vegetative Cover	10.0%

Species**Shrubs***Baccharis emoryi***Grasses & Forbs****Emergent Layer***Scirpus cf robustus* 45.0%**Herb Layer***Jaumea carnosa* 80.0%*Salicornia virginica* 3.0%*Frankenia salina* 2.0%*Cuscuta salina* 0.1%**Freshwater Marsh 1**

Shrub Cover %	
Herbaceous Cover %	100.0%
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Species**Emergent Layer***Typha latifolia* 99.0%*Urtica dioica* 1.0%**Herb Layer***Chenopodium murale* 0.1%*Solanum americanum* 1.0%

BIG CANYON CREEK:
HISTORIC TIDAL WETLANDS CONCEPTUAL RESTORATION PLAN

Riparian Herb 1

Shrub Cover %	
Herbaceous Cover %	
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground (Mud)	5.0%
Open Water	10.0%
Total Non Vegetative Cover	

Grasses & Forbs

<i>Hirschfeldia incana</i>	50.0%
<i>Foeniculum vulgare</i>	10.0%
<i>Apium graveolens</i>	5.0%
<i>Frankenia salina</i>	5.0%
<i>Melilotus alba</i>	5.0%
<i>Typha domingensis</i>	1.0%
<i>Heterotheca grandiflora</i>	1.0%
<i>Sonchus oleraceus</i>	1.0%

Species

Emergent Layer

<i>Typha domingensis</i>	2.0%
<i>Scirpus americanus</i>	0.1%

Herb Layer

<i>Rorippa nasturium-aquaticum</i>	75.0%
<i>Melilotus albus</i>	5.0%
<i>Pulicaria paludosa</i>	2.0%
<i>Atriplex patula</i>	1.0%
<i>Xanthium strumarium</i>	0.1%

Mulefat Scrub

MS-1

Shrub Cover %	65.0%
Herbaceous Cover %	80.0%
Total Vegetative Cover	80.0%
Litter Cover	20.0%
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Willow Scrub

WS-1

Shrub Cover %	85.0%
Herbaceous Cover %	80.0%
Total Vegetative Cover	85.0%
Litter Cover	15.0%

Dead Wood

Bare Ground

Total Non Vegetative Cover

Species

Shrubs

<i>Salix lasiolepis</i>	80.0%
<i>Schinus terebinthifolius</i>	5.0%

Grasses & Forbs

<i>Pulicaria paludosa</i>	60.0%
<i>Rorippa nasturium-aquaticum</i>	10.0%
<i>Apium graveolens</i>	5.0%
<i>Urtica dioica</i>	2.0%
<i>Typha latifolia</i>	2.0%
<i>Pulchea odorata</i>	1.0%

Species

Shrubs

<i>Baccharis salicifolia</i>	63.0%
<i>Salix lasiolepis</i>	1.0%
<i>Encelia californica</i>	1.0%
<i>Isocoma menziesii</i>	0.1%

Schinus Forest**SH-1**

Overstory Tree Cover	85.0%
Shrub Cover %	5.0%
Herbaceous Cover %	5.0%
Total Vegetative Cover	95.0%
Litter Cover	
Dead Wood	
Bare Ground	5.0%
Total Non Vegetative Cover	5.0%

Species**Trees**

<i>Schinus terebinthifolius</i>	84.0%
<i>Myoporum laetum</i>	1.0%
<i>Washingtonia robusta</i>	0.1%

Shrubs

<i>Toxicodendron diversilobum</i>	5.0%
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Grasses & Forbs

<i>Apium graveoloens</i>	5.0%
<i>Cortaderia sellonana</i>	0.1%
<i>Pulicaria paludosa</i>	0.1%
<i>Artemisia douglasiana</i>	0.1%
<i>Ambrosia psilostachya</i>	0.1%

Willow Forest**SH-1**

Overstory Tree Cover	75.0%
Shrub Cover %	5.0%
Herbaceous Cover %	83.0%
Total Vegetative Cover	90.0%
Litter Cover	10.0%
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	10.0%

Species**Trees**

<i>Salix gooddingii</i>	20.0%
<i>Salix lasiolepis</i>	50.0%
<i>Populus fremontii</i>	5.0%
<i>Schinus terebinthifolius</i>	0.1%

Shrubs

<i>Baccharis emoryi</i>	4.0%
<i>Artemisia californica</i>	1.0%

Grasses & Forbs

<i>Salicornia virginica</i>	75.0%
<i>Ambrosia psilostachya</i>	5.0%
<i>Apium graveoloens</i>	1.0%
<i>Picricis echioides</i>	1.0%
<i>Distichlis spicata</i>	1.0%

Mexican elderberry woodland**MEW-1**

Shrub Cover %	100.0%
Herbaceous Cover %	
Total Vegetative Cover	
Litter Cover	
Dead Wood	
Bare Ground	
Total Non Vegetative Cover	

Species**Shrubs**

<i>Sambucus mexicana</i>	40.0%
<i>Ricinus communis</i>	55.0%
<i>Encelia californica</i>	3.0%
<i>Artemisia californica</i>	2.0%
<i>Nicotiana glauca</i>	0.1%

All tables, figures and photos in Appendix C were produced by Coastal Resources Management, unless otherwise noted.

Table C1. Benthic Sampling Station Locations

Date	Time	Station	Latitude	Longitude	Station Description	Depth (ft) MLLW
Benthic Invertebrates						
May 30 2003	1025	BC-1	33 37.853	117 53.189	UNB Channel (south end of Big Canyon (BC), sand over mud	-4.7
May 30 2003	1034	BC-2	33 37.853	117 53.174	UNB Mudflat (south end of BC) sand over mud	-0.8
May 30 2003	1047	BC-3	33 37.887	117 53.205	UNB Channel (centered, on culvert) mud	-4.2
May 30 2003	1056	BC-4	33 37.889	117 53.191	UNB Mudflat (centered on culvert) mud over packed clay	0.3
May 30 2003	1200	BC-5	33 37.910	117 53.218	UNB Channel (north end of BC) sand over clay	-3.8
May 30 2003	1226	BC-6	33 37.911	117 53.209	UNB Mudflat (north end of BC) sand over mud	0.2
May 30 2003	1239	BC-7	33 37.890	117 53.162	BC Channel Entrance gravel/shell/cobble/silt	0.2
May 30 2003	1243	BC-8	33 37.897	117 53.136	Center of BC Channel, mid way to culvert gravel/shell/rock/silt	0.1
May 30 2003	1254	BC-9	33 37.898	117 53.114	Center of BC Channel, 2/3 way to culvert	1.0
May 30 2003	1258	BC-10	33 37.906	117 53.106	BC Mudflat, Mid mudflat on north side of channel, mud	3.0
May 30 2003	1310	BC-11	33 37.898	117 53.110	BC Mudflat, Mid mudflat on south side of channel, algae, sand, mud	2.9
May 30 2003	1319	BC-12	33 37.897	117 53.107	BC Culvert, 10 meters from outlet, soft mud	-4.2
May 30 2003	1416	BC-13	33 37.901	117 53.074	BC Pond before outlet to Bay cobble se	13 MSL
May 30 2003	1510	BC-14	33 37.871	117 53.000	BC Pond, eastern end in BC. mud and algae	15 MSL
Fishes						
July 15 2003	1000	F-1	33 37.853	117 53.189	Beach seine location, deep edge of set, same as BC-1	0.3 to -4.7
July 15 2003	1230	F-2	33 37.890	117 53.162	Beach seine location, BC channel, same as BC-7	0.2 to +2.0
July 15 2003	1400	F-3	33 37.897	117 53.107	Beach seine location, same as BC-12	+2.0 to -4.2

Figure C2. Water Column Salinity

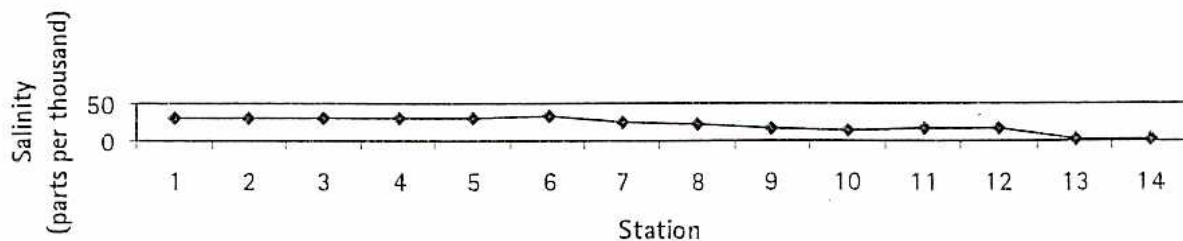


Table C3. Benthic Sampling Station Summary

DATE	STATION	TYPE	Depth (MLLW)	Mean* Number of Species	Mean* Abundance Per Sample	Mean* Density (sq m)	Shannon Wiener Diversity (H')*	Evenness (J')*
5/30/2003	BC-1	Channel	-4.7	11.5	44	5,641	2.06	0.85
5/30/2003	BC-2	Mudflat	-0.8	12	174	22,244	1.67	0.67
5/30/2003	BC-3	Channel	-4.2	13.5	85	10,897	1.94	0.75
5/30/2003	BC-4	Mudflat	0.3	9	67	8,526	1.61	0.73
5/30/2003	BC-5	Channel	-3.8	14	166	21,218	1.90	0.72
5/30/2003	BC-6	Mudflat	0.2	16	355	45,449	1.88	0.68
5/30/2003	BC-7	Channel	0.2	6	91	11,603	0.81	0.48
5/30/2003	BC-8	Channel	0.1	9	155	19,872	1.69	0.77
5/30/2003	BC-9	Channel	1	10.5	92	11,731	1.71	0.73
5/30/2003	BC-10	Mudflat	3	7.5	19	2,436	1.81	0.90
5/30/2003	BC-11	Mudflat	2.9	9	236	30,192	0.95	0.43
5/30/2003	BC-12	Channel	-4.2	6	25	3,205	1.48	0.83
5/30/2003	BC-14	Pond	15	3	15	1,923	0.79	0.81
5/30/2003	BC-13	Pond	13	4	11	1,346	1.02	0.78

* Mean of two replicates per station

Table C4. Benthic Invertebrate Survey Summary

Taxa	Species	% of Total	NIND	% of Total	Density/Sq M
Cnidaria	3	6.3	3	0.1	13.7
Platyhelminthes	1	2.1	10	0.3	45.8
Nemertea	3	6.3	8	0.3	36.6
Nematoda	1	2.1	1	0.0	4.6
Mollusca-Gastropoda	4	8.3	68	2.2	311.4
Mollusca-Bivalva	7	14.6	53	1.7	242.7
Annelida-Polychaeta	17	35.4	1,189	38.8	5,444.1
Annelida-Oligochaeta	1	2.1	515	16.8	2,358.1
Arthropoda-Crustacea	7	14.6	943	30.8	4,317.8
Arthropoda-Insecta	3	6.3	21	0.7	96.2
Phoronida	1	2.1	251	8.2	1,149.3
Total	48	100.0	3,062	100.0	14,020.1

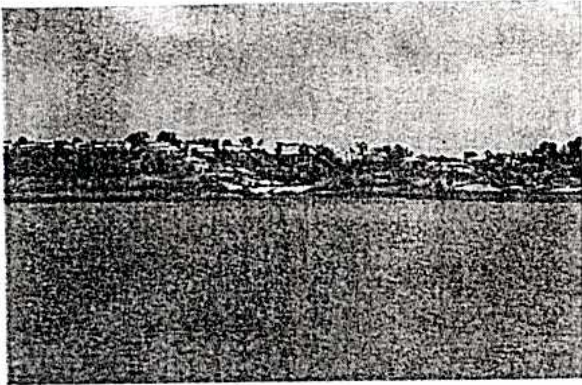
Table C5. Numerically Dominant Infaunal Species

SPECIES	COMMON NAME	TOTAL	% TOTAL	MEAN ABUNDANCE PER SAMPLE	NUMBER OF OCCURRENCES	MEAN DENSITY PER /SQ M
<i>Grandidierella japonica</i>	amphipod	648	21.2	23.1	26.0	2,967.0
<i>Fabricinuda limnicola</i>	polychaete worm	538	17.6	19.2	15.0	2,463.4
Oligochaete	oligochaete worm	515	16.8	18.4	25.0	2,358.1
<i>Monocarophium acherusicum</i>	amphipod	288	9.4	10.3	22.0	1,318.7
<i>Pseudopolydora paucibranchiata</i>	polychaete worm	284	9.3	10.1	17.0	1,300.4
<i>Phoronis</i> spp.	phoronid worm	251	8.2	9.0	12.0	1,149.3
<i>Capitella capitata</i>	polychaete worm	151	4.9	5.4	15.0	691.4
<i>Streblospio benedicti</i>	polychaete worm	110	3.6	3.9	19.0	503.7
<i>Musculista senhousi</i>	mussel (invasive)	41	1.3	1.5	10.0	187.7
<i>Cerithidea californica</i>	horn snail	37	1.2	1.3	5.0	169.4

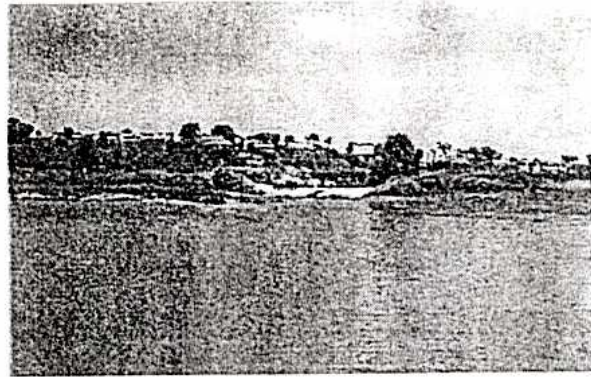
Table C6. Beach Seine Fish Survey-Data Summary

Common Name	Scientific Name	Station F-1 (n=2)	Station F-2 (n=2)	Station F-3 (n=2)	Area Total (n=6)	% Total (fish and inverts)
<u>Fish</u>						
Deepbody Anchovy	<i>Anchoa compressa</i>	1/0.5*	5/2.5	0	6/1	0.4
California killifish	<i>Fundulus parvipinnus</i>	6/3	1/.5	0	7/1.2	0.5
Topsmelt	<i>Atherinops affinis</i>	1,159/579.5	12/6	118/59	1,289/214	96.3
Yellowfin Goby	<i>Acanthogobius flavimanus</i>	0	26/13	1/0.5	27/4.5	2.0
Juvenile goby, unid	Gobiidae, unid (juvenile)	0	4/2	0	4/0.67	0.3
Juvenile croaker, unid.	Scienidae, unid. (juvenile)	0	0	1/0.5	1.16	0.1
<u>Incidental Invertebrates</u>						
Yellow shore crab	<i>Hemigrapsus oregonensis</i>	3/1.5	0	0	3/0.5	0.2
Unid. yellow sponge	Porifera, Unid.	1/0.5	0	0	1/.16	0.1
Fish Abundance		1,166/583	48/24	120/60	1,334/222	
Total Abundance		1,170/585			1,338/223	100.0
Number of Fish Species		3	5	3	6	75.0
Total Number of Species		5	5	3	8	100.0

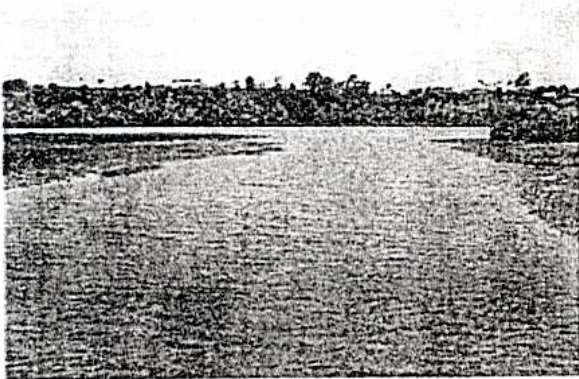
**BIG CANYON CREEK:
HISTORIC TIDAL WETLANDS CONCEPTUAL RESTORATION PLAN**



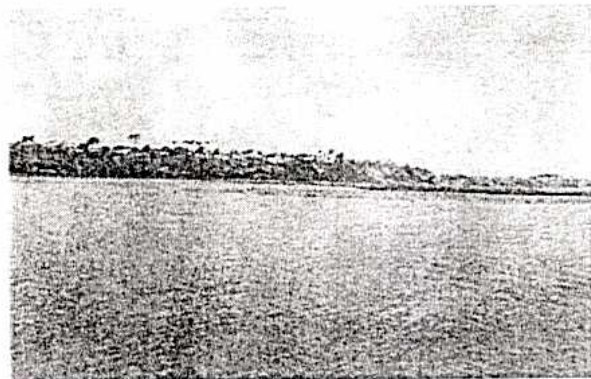
Photograph 1. Big Canyon area and tidal channel leading to Big Canyon, facing east



Photograph 4. Sampling areas BC-3 through BC-7, Upper Newport Bay (North of Big Canyon Channel)



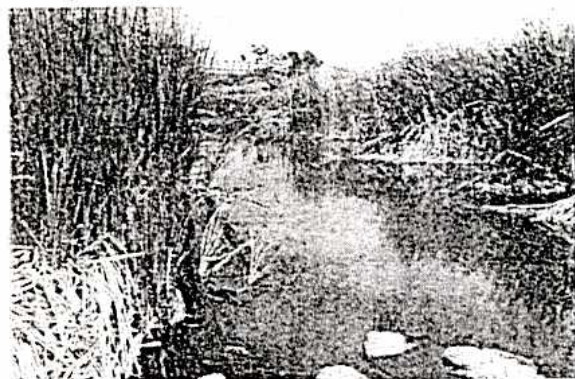
Photograph 2. Tidal channel leading to Big Canyon, facing west



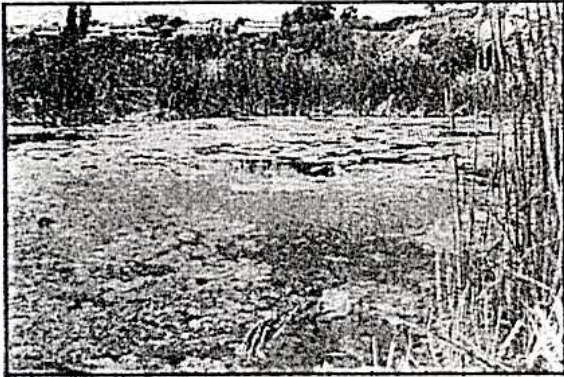
Photograph 5. Stations BC-7 through BC-12, Upper Newport Bay in the tidal channel leading to Big Canyon



Photograph 3. Stations BC-1 and BC-2, and F-1 and F-2, Upper Newport Bay



Photograph 6. Sampling Location BC-13, Big Canyon Pond immediately east of culvert and Back Bay Drive



Photograph 7. Sampling Location BC-14, east side of Big Canyon Pond



Photograph 8. Representative benthic core sample prior to sieving

Table D2: Water Use & Inundation Guidelines for Habitats of Big Canyon

Habitat Zones	Estimated Etc' (total for year)	Inundation	Comments
Open Water			
Freshwater Marsh (FWM) (cattails, bullrushes, rushes)	5.40 ft/year	0.5' -2' continual	FWM grow in areas on the fringe of pond where standing water from 0.5' - to 2'. After 2' depth generally these plants will not grow
Wet Meado (WM) (saltgrass, meadow barley, ragweed)	3.59 ft/yr	seasonal	WM will grow in areas with somewhat saline soils in areas not continually inundated and not deeply shaded. This habitat zone will need saturated soils throughout the winter and spring season with limited standing water.
Willow Riparian (WR) (willow trees, mulefat, mugwort)	4.30 ft/yr	seasonal	WR will grow in areas adjacent to creeks with sufficient seasonal inundation and dry season water flows to support the water needs of the habitat. WR will root to maximum of 16' for groundwater. Particular species of willows require wetter conditions such as black willow, while the arroyo willow grows better with only seasonal inundation.
Mulefat Scrub (MFS) (mulefat, ragweed, saltgrass)	2.87 ft/yr	seasonal	MFS will grow on higher elevation areas between upland habitat areas and wetter zones such as WR or WM Habitat Zones
Saltbush Scrub and Coastal Sage		none	Upland habitat for areas outside of normal seasonal inundation zone. Saltbush scrub will tolerate saline soil conditions
Evapotranspiration (Etc) based on ETo maps of the project area and estimated crop factor.			

Source: Earthworks Construction & Design, October 2003

Table D3: Grading & Inundation Guidelines for Salt Marsh Habitat

Habitat Type	approximate % of total	Elevation midpoint	Elevation Range				
mudflat	10	+0.75 ft	0 - +01.5				
low marsh	15	+2.0	+1.5 - +2.5				
mid marsh	35	+3.25	+2.5 - +4.0				
high marsh	25	+4.25	+4.0 - +4.5	overgrade by 6 inches for topsoil application			
marsh transition	10	+5.5	+4.5 - +6.5	overgrade by 6 inches for topsoil application			
upland buffer	5	>	> +6.5	overgrade by 6 inches for topsoil application			
slope from road:	2: 1 Max 7:1 preferred						

Source: Earthworks Construction & Design, October 2003

Figure D4: City of Newport Beach Sprinkler Consumption

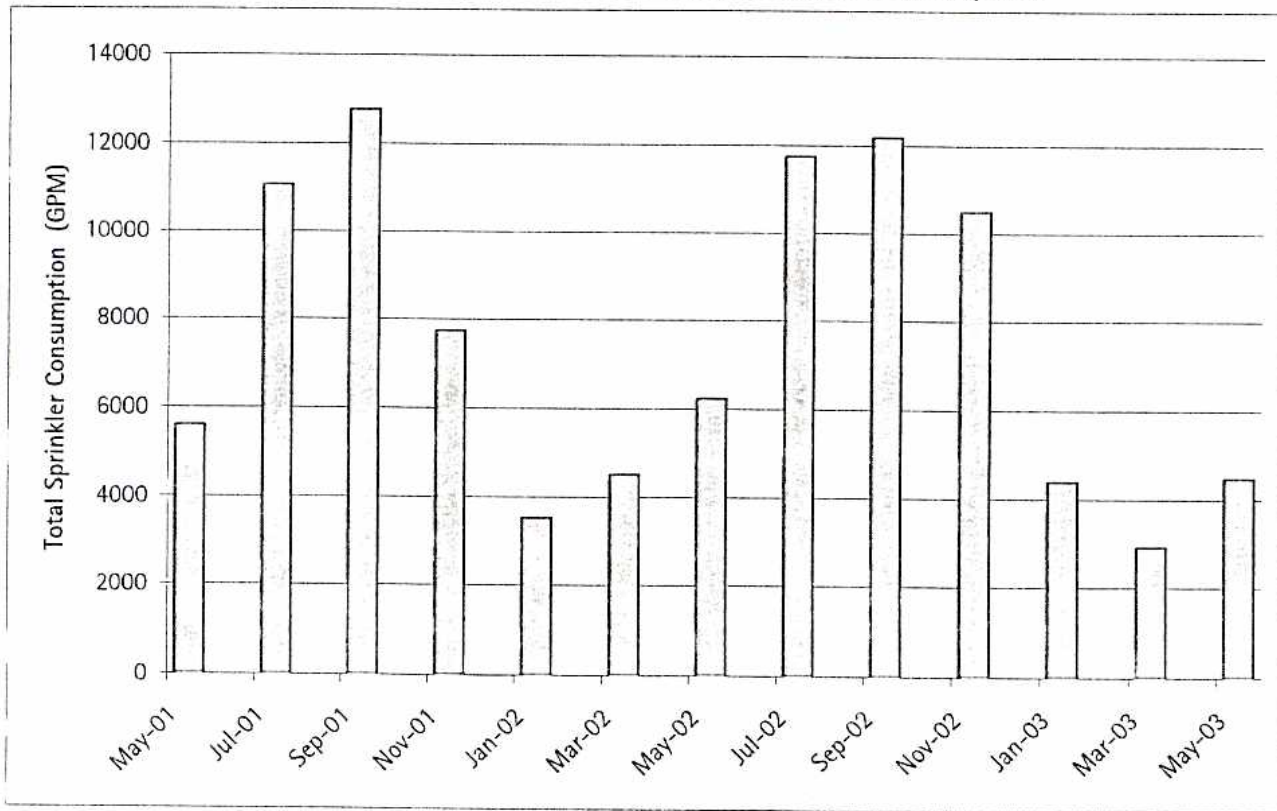


Figure D5: Tidal Curves at Newport Bay (Harbor) Entrance

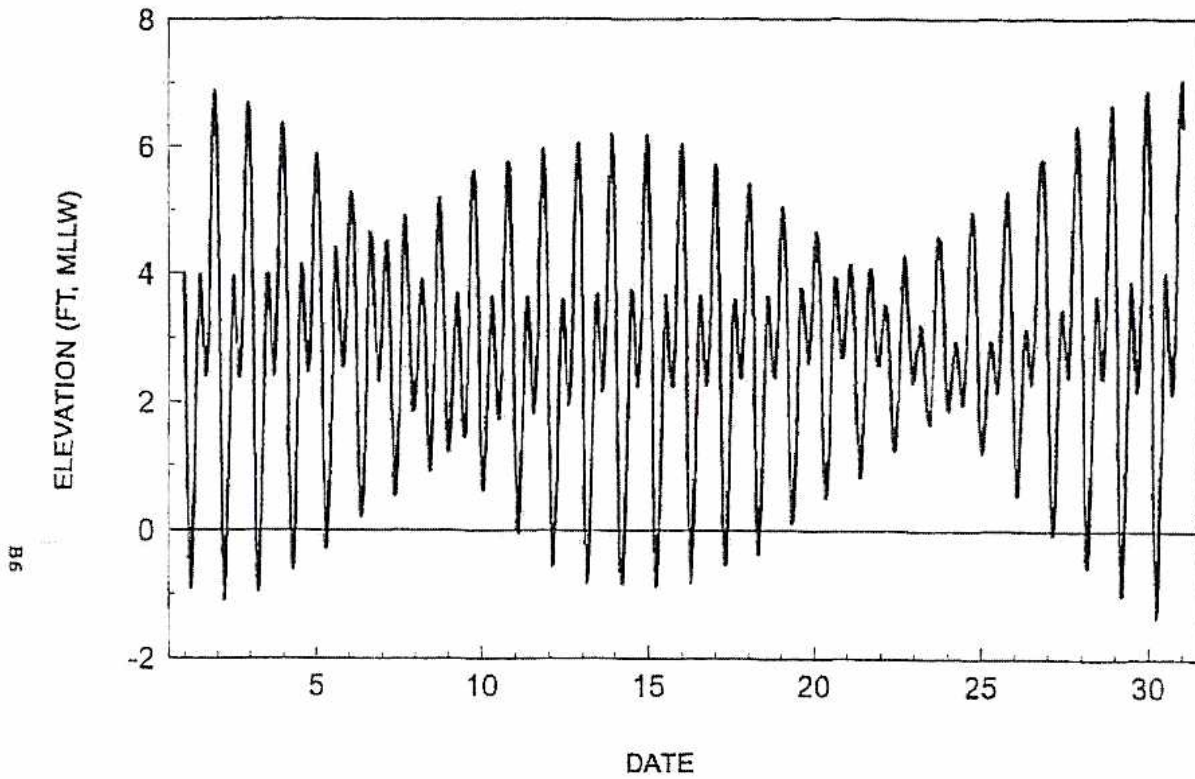


Figure D6: Tidal Curves at Upper Newport Bay Dike

