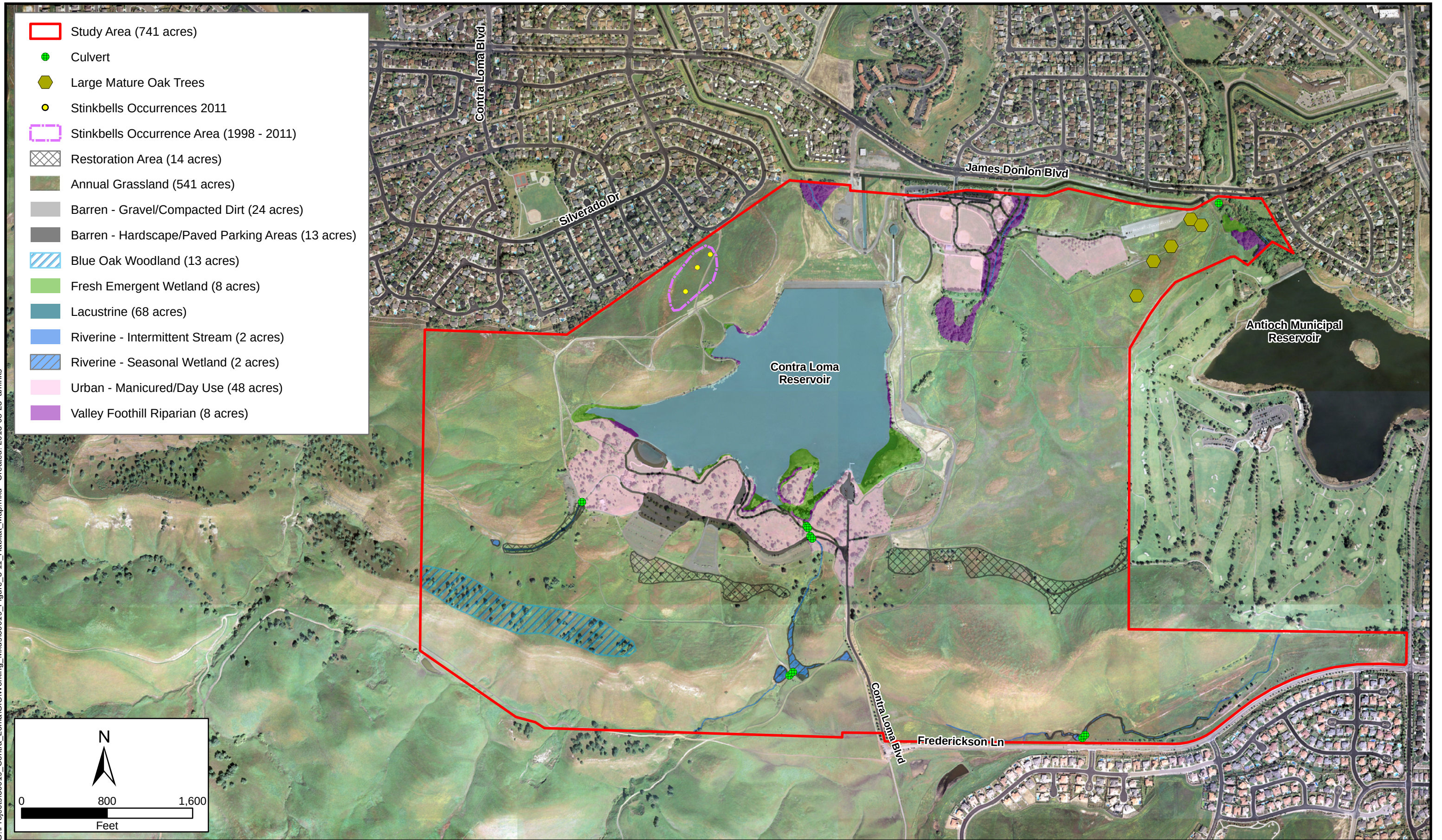


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Blue Oak Woodland Blue oak (*Quercus douglasii*) woodland occurs on the north-facing slope of a hillside in the southwest corner of Contra Loma (Figure 3-11). Blue oak is the dominant tree species in this scattered woodland. Interior live oak (*Q. wislizenii*) is a minor component of this habitat, and the understory is an extension of the surrounding annual grassland. The blue oak woodland within Contra Loma, which covers approximately 1.8 percent of the study area, is contiguous with blue oak woodland that is scattered along the hillslopes to the west and south towards Mount Diablo.

Urban About 6.5 percent of the recreation area is classified as urban. Vegetation communities found in urban settings vary widely and are typically characterized by areas where the native vegetation has been mostly or entirely cleared for residential, commercial, industrial, transportation, or recreational uses. Urban vegetation communities are usually composed of irrigated lawns, ornamental plantings, and trees that have been retained from the original habitat, or planted for landscaping or shade.

The CWHR categorizes urban habitat into five different vegetation structure types: tree grove, street strip, shade tree/lawn, lawn, and shrub cover. Tree groves are often located in urban parks, green belts, and cemeteries. Urban tree groves may vary in tree height, spacing, crown shape, and understory conditions, but generally have a continuous canopy. Street strip vegetation is located along roadsides and typically includes a ground cover of grass. Shade tree/lawn areas are characteristic residential and recreational landscapes and often mimic the appearance of natural savannas. Lawns are composed of a variety of grasses that are continuous and are maintained at a uniform height, irrigated, and fertilized. Shrub cover refers to areas that are commonly landscaped and maintained with hedges, as typically found in commercial districts.

The five types of urban vegetation structure often occur in various combinations, creating habitat complexity, which can be more valuable to wildlife than any one individual unit (California Department of Fish and Game 2011).

At Contra Loma, the urban habitat includes four of the five vegetation structure types: tree grove, street strip, shade tree/lawn, and lawn. All of these vegetation structure types are shown collectively as urban habitat in Figure 3-11. The urban habitat is most prevalent in the picnic areas and sports fields. Native trees that occur within the urban area at Contra Loma include Oregon ash (*Fraxinus latifolia*), black walnut (*Juglans californica* var. *hindsii*), Fremont cottonwood, blue oak, valley oak, and interior live oak. Non-native landscaping trees include fig (*Ficus* sp.) and eucalyptus (*Eucalyptus* sp.) associated with a historic residence.

Barren Barren habitat is defined by a relative absence of vegetation. Any vegetation community with less than 2 percent total herbaceous vegetation cover and less than 10 percent cover by tree or shrub species is considered barren. Contra Loma is approximately 5 percent barren. Barren area can include both urban and ruderal (i.e., disturbed or weedy) settings where the vegetation is sparse, as defined by the percent cover criteria. Two types of barren areas are defined within Contra Loma (Figure 3-11): gravel/compacted dirt, such as that found in gravel and dirt roads and parking areas, and hardscape, such as that found in paved roads and paved parking areas.

Wetland and Aquatic Communities

Three wetland and aquatic habitats occur within Contra Loma: riverine, fresh emergent wetland, and lacustrine. These communities cover approximately 11 percent of the study area, and the location and areal extent of these habitats is shown in Figure 3-11.

Riverine The riverine habitat is typically associated with a linear body of water flowing in a channel with a defined bed and bank. These linear water bodies can flow perennially, intermittently, or ephemerally, depending on water input.

- Perennial streams have flowing water year-round during a typical year, and the water table is located above the streambed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water.
- Intermittent streams have flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water.
- Ephemeral streams depend on precipitation, so they typically only flow during and after rain or other precipitation. Ephemeral streambeds are located above the water table year-round. Groundwater is not an important source of water for ephemeral streams.

Riverine habitat commonly includes hydrophytic (water-loving) vegetation, which can either grow from the stream bottom or along the banks. This vegetation can be sparse when water volume and movement are substantial or can be dense in slower moving waterways where plants can root themselves easily.

A small amount (0.5 percent) of the riverine community within Contra Loma consists of intermittent streams. Portions of these streams have sufficient water flow and scour to discourage the colonization of hydrophytic plants. Flatter stream sections have slow-moving water, which allows water to collect and saturate the soil while promoting the growth of seasonal wetland plants in and along the margins of these drainages. While still classified as a riverine habitat, these areas also exhibit characteristics of seasonal wetland habitat. Both the steeper and the flatter portions of these streams are mapped as riverine in Figure 3-11, with the areas that are more channelized and lacking vegetation sub-classified as intermittent streams and the areas where seasonal ponding occurs sub-classified as seasonal wetlands. Common wetland plants in the riverine habitat include ryegrass (*Lolium* spp.), curly dock (*Rumex crispus*), hyssop loosestrife (*Lythrum hyssopifolium*), Baltic rush (*Juncus balticus*), flowering quillwort (*Lilaea scilloides*), cattails (*Typha* spp.), dallisgrass (*Paspalum dilatatum*), nutsedge (*Cyperus eragrostis*), and cocklebur (*Xanthium* spp.).

Fresh Emergent Wetland The fresh emergent wetland habitat is typically associated with a year-round water source. This habitat is typically dominated by plant species that are erect, rooted, herbaceous, and hydrophytic, and that are adapted to conditions of prolonged inundation. Common plant species present in this vegetative community include perennial wetland species such as cattails and tules (*Scirpus* spp.). In some cases, fresh emergent wetlands can occur in areas with less frequent inundation where they can often support a wider variety of water-tolerant plants. Within Contra Loma, dense fresh emergent wetland vegetation is located along several

sections of the reservoir's southern shoreline. These areas support abundant cattails and tules, as well as several willow species. In the northeast corner of Contra Loma, there is an area that is frequently saturated and that supports fresh emergent wetland vegetation. This wetland is similar in composition to those found around the reservoir shoreline and is composed primarily of cattails, rushes (*Juncus* spp.), tules, and poison hemlock (*Conium maculatum*). Approximately 8 acres of fresh emergent wetland are found in the Contra Loma Recreation Area.

Lacustrine. The lacustrine habitat is characterized by open water that is too deep for emergent vegetation to become established. In Contra Loma, the plant-free portion of the reservoir is lacustrine habitat, and covers approximately 9.2 percent of the area. Eurasian watermilfoil (*Myriophyllum spicatum*) is a non-native aquatic plant which grows along some portions of the reservoir shoreline. Mats of watermilfoil can inhibit recreational use by entangling boat propellers and fishing lines.

Restoration Area. Several vegetation restoration areas are treated as inclusions within the annual grassland habitat (Figure 3-11). These areas are locations where EBRPD has endeavored to cultivate native plants and/or create quail habitat. Native trees and shrubs have been planted just south of the gravel/dirt parking areas on the south side of the reservoir. EBRPD has also placed brush piles adjacent to portions of the restoration area to provide shade and cover for quails. Another plant restoration area has been designated along the intermittent stream located near the southwest corner of the reservoir. At this location, the stream has been fenced off with wire mesh to protect the young plants from damage caused by herbivores such as cows and deer. Typical restoration plantings include young saplings of ash (*Fraxinus* sp.), willow, and oaks. The restoration plantings are treated as inclusions in the annual grassland habitat since they are not yet well established and provide minimal cover.

Special-Status Plant Species

This section discusses special-status plant species that occur in the region and describes the potential for these plants to occur within Contra Loma. For the purpose of this evaluation, special-status plant species include plants that are (1) listed as threatened or endangered under the California Endangered Species Act or the Federal Endangered Species Act; (2) designated as rare by CDFW; (3) state or Federal candidate or proposed species for listing as threatened or endangered; (4) listed by the CNPS as having a California RPR of 1A, 1B, 2A, 2B, or 3; or other special status conveyed by CNPS.

A list of special-status plant species considered in this assessment was compiled by obtaining an official species list from the U.S. Fish and Wildlife Service (USFWS) Sacramento Office for the *Antioch South, California* U.S. Geological Survey (USGS) quadrangle (Fish and Wildlife Service 2013) (Appendix F.2); performing queries for records contained within the California Natural Diversity Database (CNDDDB) for the *Antioch South, California* USGS quadrangle (California Department of Fish and Wildlife 2013a) (Appendix F.3.1) and the CNPS on-line inventory for the *Antioch South, California* USGS quadrangle and eight surrounding quadrangles (California Native Plant Society 2013) (Appendix F.4); by reviewing botanical literature for the region; and by reviewing existing programmatic documents relating to the use and operation of Contra Loma. These efforts identified 59 special-status plant species known to occur in the vicinity of Contra Loma. These plant species were then reviewed to determine the potential for each species to occur within Contra Loma based on the presence or absence of suitable habitat.

EBRPD botanist Wilde Legard was also consulted as part of the review process as he has surveyed and monitored the habitats at Contra Loma for over 13 years (Legard, pers. comm. 2011).

No Federally listed or state-listed plants were determined to have the potential to occur within Contra Loma (Appendix F.5); however, the following five special-status plants were determined to have a low potential to occur within Contra Loma:

- big tarplant (*Blepharizonia plumosa*) (RPR 1B.1);
- round-leaved filaree (*California macrophylla*) (RPR 1B.1);
- Mt. Diablo fairy lantern (*Calochortus pulchellus*) (RPR 1B.2);
- Diablo helianthella (*Helianthella castanea*) (RPR 1B.2); and
- San Antonio Hills monardella (*Monardella antonina* ssp. *antonina*) (RPR 3).

Contra Loma is surrounded by a heavily urbanized community, and professional and lay botanists visit the park regularly. The East Bay Chapter of CNPS has maintained a database of regionally occurring rare plants in Alameda and Contra Costa counties since the 1980s (Lake 2010). The five plant species listed above have been reported during the last 20 years within a few miles of Contra Loma at sites containing habitats that are generally similar to those found within Contra Loma (California Department of Fish and Game 2011); however, the potential for these plants to occur within Contra Loma is considered low because none of these plants have ever been documented as occurring at Contra Loma (California Department of Fish and Game 2011; Legard, pers. comm. 2011). The general habitat requirements of these five plants are listed in Appendix F.5, and these plants are not discussed further in this document.

Only one special-status plant, stinkbells, is known to occur at Contra Loma, and this species has been monitored by EBRPD since 1998 (Legard, pers. comm. 2011). Stinkbells is designated as RPR 4.2 and is ranked as fairly threatened in California (California Native Plant Society 2013). Although a RPR of 4.2 would not typically result in a plant designation of “special status,” the East Bay CNPS has designated stinkbells as an A-ranked rare and unusual plant in Alameda and Contra Costa counties (Lake 2010), hence it is considered a “special status” plant in the RMP/EIS.

Stinkbells is a perennial wildflower that is endemic to California. It grows primarily in grasslands on areas of clay soil. The inflorescence is borne on an erect stem less than 2 feet tall and has several nodding flowers. Stinkbells flower between March and June and have an unpleasant odor. Known threats to this species include development and grazing. On the March 30, 2011 reconnaissance survey, 19 individual stinkbells were observed within three distinct clumps. All are within the area of the mapped populations that have been monitored by EBRPD since 1998 (Figure 3-11). The reported stinkbells population at Contra Loma has averaged about 200 individuals; the apparent decline in 2011 may be caused by more grazing than occurred in 2010 (Legard, pers. comm. 2011).

Invasive Plant Species

Invasive plant species can threaten or disrupt native species and vegetation communities by altering nutrient cycles, increasing fire hazard (including intensity and severity), and altering hydrologic cycles; creating changes in sediment deposition and erosion; dominating habitats and displacing native species; hybridizing with native species; and promoting non-native animal species (Bossard et al. 2000). Invasive plants, once introduced into an area, spread without assistance and can alter the native vegetation community or habitat they have invaded.

For the purposes of this evaluation, invasive plant species are defined as vascular plant species that are (1) rated as an A, B, C, or Q species by the California Department of Food and Agriculture (CDFA) (California Department of Food and Agriculture 2007); and/or (2) rated as a High, Moderate, or Limited for invasive properties by the California Invasive Plant Council (Cal-IPC), which maintains a list of invasive plants that threaten California's wildlands (California Invasive Plant Council 2006). Plants rated by the CDFA as A, B, or C are pests of known economic or environmental detriment. Plants rated as A are either not known to be established in California or are present in a limited distribution that allows for the possibility of eradication or successful containment. Plants rated as B, if present in California, are of limited distribution. Plants rated as C, if present in California, are usually widespread. Plants rated as Q are suspected to be of economic or environmental detriment, but their status is uncertain because of incomplete identification or inadequate information.

Reconnaissance surveys conducted in 2010 and 2011 identified 23 invasive and/or noxious non-native plant species occurring at Contra Loma. None of these plants are listed as noxious weeds in accordance with Section 2814 of the Federal Noxious Weed Act of 1974; however, they are rated as noxious or invasive by either the CDFA or Cal-IPC. The native status of all plants observed at Contra Loma, including CDFA and Cal-IPC noxious weed ratings where appropriate, included in Appendix F.6. Noxious weed species that were observed or that are known to occur at Contra Loma during surveys in 2010 and 2011 are listed in Table 3-6.

Table 3-6. Noxious Weed Species Observed or Known to Occur at Contra Loma

Common Name (Scientific Name)	Cal-IPC¹	CDFA²	Observed³	Known to Occur⁴
slender wild-oat (<i>Avena barbata</i>)	Moderate	n/a	X	X
wild oat (<i>Avena fatua</i>)	Moderate	n/a	—	X
black mustard (<i>Brassica nigra</i>)	Moderate	n/a	X	X
ripgut brome (<i>Bromus diandrus</i>)	Moderate	n/a	X	—
soft brome (<i>Bromus hordeaceus</i>)	Limited	n/a	—	X
red brome (<i>Bromus madritensis</i> ssp. <i>rubens</i>)	High	n/a	X	—
Italian plumeless thistle (<i>Carduus pycnocephalus</i>)	Moderate	C	—	X
yellow star-thistle (<i>Centaurea solstitialis</i>)	High	C	X	X
bull thistle (<i>Cirsium vulgare</i>)	Moderate	n/a	X	X
poison hemlock (<i>Conium maculatum</i>)	Moderate	n/a	X	—
Bermuda grass (<i>Cynodon dactylon</i>)	Moderate	n/a	—	X

Table 3-6. Noxious Weed Species Observed or Known to Occur at Contra Loma

Common Name (Scientific Name)	Cal-IPC ¹	CDFA ²	Observed ³	Known to Occur ⁴
tall fescue (<i>Festuca arundinacea</i>)	Moderate	n/a	—	X
barley (<i>Hordeum murinum</i>)	Moderate	n/a	—	X
Italian ryegrass (<i>Lolium multiflorum</i>)	Moderate	n/a	X	X
hyssop loosestrife (<i>Lythrum hyssopifolium</i>)	Limited	n/a	X	—
alkali mallow (<i>Malvella leprosa</i>)	N/A	C	—	X
California burclover (<i>Medicago polymorpha</i>)	Limited	n/a	—	X
Eurasian milfoil (<i>Myriophyllum spicatum</i>)	High	n/a	X	—
bristly ox-tongue (<i>Picris echioides</i>)	Limited	n/a	—	X
radish (<i>Raphanus sativus</i>)	Limited	n/a	—	X
Himalayan blackberry (<i>Rubus discolor</i>)	High	n/a	X	—
milk thistle (<i>Silybum marianum</i>)	Limited	n/a	X	X
puncture vine (<i>Tribulus terrestris</i>)	N/A	C	—	X

Sources: ¹ California Invasive Plant Inventory (Cal-IPC 2006)

² Encyclopedica (California Department of Food and Agriculture 2007)

³ Observed by NSR biologist in 2010 or 2011

⁴ Wild Plants of Contra Loma Regional Park (East Bay Regional Park District 2003)

Notes: Plants rated as C, if present in California, are usually widespread.

3.10 Wildlife

3.10.1 Existing Conditions

Contra Loma is designated by the EBRPD as an open space habitat area (East Bay Regional Park District 1996) with some focused areas designated for developed recreation. As a result, past management of Contra Loma has been focused on protection of native vegetation communities and the wildlife species that use them, as well as on active and passive recreation.

Habitat Assessment

As discussed in Section 3.9 (Vegetation), vegetation community types and wildlife habitats described in this section are classified based on the descriptions provided in *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer Jr. 1988), which is a component of the CWHR System (California Department of Fish and Game 2011) used by CDFW.

The criteria used for the CWHR query included vegetation community type and geographic area. All vegetation community stages were included, and no community elements were excluded. The query results provide a general index of predicted wildlife species occurrences within the vegetation communities that are present in Contra Loma, which are discussed in detail below. Table 3-5 in Section 3.9 identifies the various vegetation community types and subtypes present at Contra Loma. There is significant overlap in the species expected to occur in some of these vegetation communities because of their close proximity to each other. For this reason, the

precise acreage and percentage of area classified in each vegetation community type is less meaningful for the evaluation of wildlife species that may occur in the area.

Field reconnaissance surveys of the study area were conducted by NSR on October 20 and 22, 2010. The entire area was walked, and field maps were used to gain bearings and aid in classifying habitat types. Observations were made at each distinct habitat unit, and animal species present were recorded. A list of animal species observed within the study area is attached as Appendix F.7. Any habitats able to support special-status species were noted on field maps and documented with photographs. Any wildlife observed was photographed (when possible) to document resident species.

Upland Vegetation Communities

Five upland vegetation communities are present at Contra Loma: annual grassland, valley foothill riparian, blue oak woodland, urban, and barren. Wildlife species found within each of these vegetation communities is described below. Figure 3-11 illustrates the location and areal extent of the corresponding vegetation community types within Contra Loma.

Annual Grassland. Characteristic wildlife species found in annual grasslands include reptiles such as western fence lizard (*Sceloporus occidentalis*), common garter snake (*Thamnophis sirtalis*), and western rattlesnake (*Crotalis viridis*); mammals such as black-tailed jackrabbit (*Lepus californicus*), California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), California vole (*Microtus californicus*), American badger (*Taxidea taxus*), mule deer (*Odocoileus hemionus*), and coyote (*Canis latrans*); and birds such as burrowing owl (*Athene cunicularia*), horned lark (*Eremophila alpestris*), and western meadowlark (*Sturnella neglecta*). Annual grassland also provides important foraging habitat for turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), white-tailed kite (*Elanus leucurus*), and red-tailed hawk (*Buteo jamaicensis*). Wildlife species observed in the annual grassland at Contra Loma during the reconnaissance-level surveys included numerous coyotes and ground squirrels as well as several avian species including turkey vulture, red-tailed hawk, American kestrel, Brewer's blackbird (*Euphagus cyanocephalus*), and mourning dove (*Zenaida macroura*). Approximately 30 cattle were observed in the southwest quadrant of the study area during the surveys.

Valley Foothill Riparian. Valley foothill riparian vegetation communities provide habitat for a wide diversity of wildlife. The presence of water associated with this upland vegetative community attracts numerous mammals, birds, amphibians, and reptiles. Common mammals found in this cover type include mule deer, raccoon (*Procyon lotor*), coyote, striped skunk (*Mephitis mephitis*), deer mouse (*Peromyscus maniculatus*), harvest mouse, and dusky-footed woodrat (*Neotoma fuscipes*). Numerous birds are also typically found in this cover type, including yellow warbler (*Dendroica petechia*), northern flicker (*Colaptes auratus*), white-tailed kite, Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), song sparrow (*Melospiza melodia*), and black-headed grosbeak (*Pheucticus melanocephalus*). Some amphibians and reptiles found in riparian areas include red-legged frog (*Rana draytonii*), Pacific tree frog (*Pseudacris regilla*), sharp-tailed snake (*Contia tenuis*), California alligator lizard (*Elgaria multicarinata multicarinata*), and common garter snake. Wildlife species observed in the riparian vegetation community at Contra Loma during the reconnaissance-level surveys

included northern flicker, red-shouldered hawk, song sparrow, black phoebe (*Sayornis nigricans*), and European starling (*Sturnus vulgaris*).

Blue Oak Woodland. Blue oak woodlands produce acorns which are eaten by a variety of species, including acorn woodpeckers (*Melanerpes formicivorus*), western scrub-jays (*Aphelocoma californica*) and mule deer. Snags and trees containing cavities occur here, providing nesting habitat for birds such as the western bluebird (*Sialia mexicana*), tree swallow (*Tachycineta bicolor*), and northern flicker, as well as potential roost sites for bats. Raptors, including the red-tailed hawk, American kestrel, and great horned owl (*Bubo virginianus*), may also nest in these woodlands. Coyote and gray fox (*Urocyon cinereoargenteus*) may forage here, and wildlife species dominant in annual grassland habitat (see above) flourish beneath the oak canopy. Wildlife species observed in the blue oak woodland vegetation community at Contra Loma during the reconnaissance-level survey included mule deer, western scrub-jay, northern flicker, red-tailed hawk, and western fence lizard.

Urban. Urban land cover, which at Contra Loma consists largely of landscaped areas surrounding the developed park facilities, can provide habitat for several mammal, reptile, and amphibian species and can provide nest, cover, and forage areas for several bird species. Common bird species in urban areas are the house finch (*Carpodacus mexicanus*), northern flicker, rock dove (*Columba livia*), American crow (*Corvus brachyrhynchos*), dark-eyed junco (*Junco hyemalis*), Brewer's blackbird, house sparrow (*Passer domesticus*), bushtit (*Psaltiriparus minimus*), European starling, mourning dove, western scrub-jay, and mockingbird (*Mimus polyglottos*). Common mammals using urban habitat include raccoon, opossum (*Didelphis virginiana*), striped skunk, black-tailed jackrabbit, ground squirrel, and cottontail rabbit (*Sylvilagus audubonii*). Some amphibians and reptiles expected in urban areas would be the California slender salamander (*Batrachoseps attenuates*), Pacific tree frog, alligator lizard, gopher snake (*Pituophis catenifer*), and western fence lizard. Wildlife species observed in the urban areas at Contra Loma during the reconnaissance-level survey included numerous ground squirrels and domesticated waterfowl (ducks and geese), cottontail rabbit and black-tailed jackrabbit, as well as several avian species including western scrub-jay, American robin (*Turdus migratorius*), and Brewer's blackbird.

Barren. Within Contra Loma there are two types of barren land cover: hardscape, which includes roadways and paved parking areas; and gravel/compacted dirt, which includes dirt roads and trails, as well as some unpaved parking areas. These areas provide minimal habitat value for animals in Contra Loma. In some cases, mammals such as ground squirrels can use the gravel and compacted dirt substrates found along roads, trails, and parking lots to help create burrows. The compacted soils associated with these areas allow for stable burrow walls that tend to hold their shape effectively. Ground squirrels can burrow under the adjacent hardscape areas, such as roadways and paved parking areas, which provide additional burrow stability and protection from predators. Sometimes special-status species such as western burrowing owl and San Joaquin kit fox (*Vulpes macrotis mutica*) use abandoned ground squirrel burrows at these locations for breeding purposes. Wildlife species observed in the barren areas during the reconnaissance-level survey at Contra Loma included a grey fox and numerous ground squirrels along the edges of the barren habitat. Several bird species were observed flying overhead or perching in trees along the edges of the barren habitat. Some of the birds observed were white-tailed kite, red-tailed hawk, turkey vulture, and western scrub-jay.

Aquatic Vegetative Communities

Wildlife species that occur in aquatic habitats typically depend on water for all their life processes or significant portions of their life cycles. Three aquatic vegetative communities are present in Contra Loma: riverine, fresh emergent wetland, and lacustrine.

Riverine. Like the riparian and wetland vegetation communities, riverine habitat is important because it provides essential habitat for certain terrestrial and aquatic species. When water is present, many of the animal species that occur in the fresh emergent wetland and riparian vegetative communities can be found in the riverine habitat. In addition, amphibians such as Pacific tree frog, western toad (*Bufo boreas*), and California tiger salamander (*Ambystoma californiense*) and passerine birds such as Brewer's blackbird, red-winged blackbird (*Agelaius phoeniceus*), and brown-headed cowbird (*Molothrus ater*) may be present. During the dry season, a variety of small mammals use riverine areas, including deer mouse, California vole, and long-tailed weasel (*Mustela frenata*). Raptors such as white-tailed kite, northern harrier, and red-tailed hawk may also forage in this habitat. Wildlife species observed in the riverine habitat at Contra Loma during the reconnaissance-level surveys included northern flicker, song sparrow, black phoebe, and mourning dove.

Fresh Emergent Wetland. The fresh emergent wetland vegetation community is important for a wide variety of wildlife species. Representative water birds that forage and rest in permanent wetlands include great blue heron (*Ardea herodias*), great egret (*Ardea alba*), mallard (*Anas platyrhynchos*), American coot (*Fulica americana*), common merganser (*Mergus merganser*), and double-crested cormorant (*Phalacrocorax auritus*). Amphibians and reptiles in this habitat type include bullfrog (*Rana catesbeiana*), red-eared slider (*Chrysemys scripta elegans*), garter snake, possibly western pond turtle (*Emys marmorata*) and red-legged frog. Some of the wildlife species observed at Contra Loma in the fresh emergent wetland habitat during the reconnaissance-level survey were mallard, Canada goose (*Branta canadensis*), western grebe (*Aechmophorus occidentalis*), American coot, red-winged blackbird, great egret, and great blue heron.

Lacustrine. Amphibians such as California red-legged frog and bullfrog and reptiles such as western pond turtle and garter snake can use the lacustrine habitat of the reservoir for foraging. Reservoirs provide important habitat for various ducks, including mallard, green-winged teal (*Anas carolinensis*), cinnamon teal (*Anas cyanoptera*), gadwall (*Anas strepera*), American wigeon (*Anas americana*), and American coot. Shore and wading birds, including double-crested cormorant, great blue heron, great egret, and several gull (*Laridae* spp.), species can also be found in reservoirs. Wildlife species observed in the lacustrine habitat during the reconnaissance-level survey at Contra Loma included double-crested cormorant, Canada goose, western grebe, and common merganser.

Twenty fish species, including eight species of sport fish, are known to be present in Contra Loma Reservoir. Many of these species were introduced into the reservoir from the Contra Costa Canal, which gets its water from the Delta. Primary species found in the reservoir during spring surveys from 2002 through 2011 are largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), threadfin shad (*Dorosoma petenense*), redear sunfish (*Lepomis microlophus*), channel catfish (*Ictalurus punctatus*), white catfish

(*Ameiurus catus*), and rainbow trout (*Oncorhynchus mykiss*). See Section 3.11 (Fisheries) for an expanded discussion of the reservoir fishery.

Special-Status Wildlife Species

For the purposes of this evaluation, special-status wildlife species include those that are (1) designated as threatened or endangered by the state or Federal governments (i.e., “listed species”); (2) proposed for state or Federal listing as threatened or endangered; (3) candidates for state or Federal listing as threatened or endangered; and/or (4) identified by CDFW as species of special concern and/or California fully protected species.

A list of special-status wildlife species considered in this assessment was compiled by obtaining an official species list from the USFWS Sacramento Office for the *Antioch South, California* USGS 7.5-minute quadrangle (Fish and Wildlife Service 2013) (Appendix F.2); performing queries for records contained in the CNDDDB for the *Antioch South, California* USGS 7.5-minute quadrangle (California Department of Fish and Wildlife 2013a; Appendix F.3.1) and the area within a 5-mile radius of Contra Loma (Appendix F.3.2); reviewing biological literature applicable to the Contra Loma region; and reviewing existing programmatic documents relating to the use and operation of Contra Loma. These efforts identified a total of 29 special-status animal species known to occur in the vicinity of Contra Loma. Accordingly, these species were reviewed in depth as part of this assessment to determine the potential for each species to occur within Contra Loma based on the presence or absence of suitable habitat. Based on a review of the habitat requirements, 14 special-status wildlife species have the potential to occur in Contra Loma (Table 3-7). A brief description of the geographic range, habitat requirements, and status for each of these species is provided in the table and a more detailed description of each of these species is provided below.

In addition, an analysis was made of bird species which are subject to the Federal Migratory Bird Treaty Act of 1918 (MBTA, 16 U.S. Code [USC] 703-711) that may be present. Birds protected by the MBTA which are known to be present and may also breed at Contra Loma include great egret, mallard, American coot, great blue heron, double-crested cormorant, Canada goose, western grebe, common merganser, northern flicker, song sparrow, black phoebe, mourning dove, western burrowing owl, white-tailed kite, American kestrel, red-tailed hawk, red-shouldered hawk, turkey vulture, western scrub-jay, American robin, red-winged blackbird, Brewer’s blackbird and various gull species. Many other bird species protected by the MBTA may be present at Contra Loma periodically; however, site surveys or other documented sources have not confirmed the presence of these other species.

Table 3-7. Special-Status Species Potentially Occurring at Contra Loma

Species (Scientific Name/ Common Name)	Status		Habitat Description	Potential Occurrence at Contra Loma	Nearest Recorded Occurrence
	Federal ¹	State ²			
Amphibians					
<i>Ambystoma californiense</i> California tiger salamander	FT	ST	Quiet water in ponds, vernal pools, seasonal wetlands, and streams are used for breeding. Adults emerge from their subterranean burrows for only a few weeks a year during the late winter and early spring after heavy rains. Suitable upland habitat includes woodland and grassland.	Yes. The wetlands that pond seasonally along intermittent streams south of the reservoir provide potential breeding habitat. Suitable upland refuges, especially ground squirrel burrows, are present in the annual grassland adjacent to these wet areas.	Several CNDDDB occurrences are documented along the southern boundary of Contra Loma.
<i>Rana draytonii</i> California red-legged frog	FT	CSC	Marshes, slow parts of streams, lakes, reservoirs, ponds, and other permanent sources of deep water with dense, shrubby or emergent riparian vegetation; requires 11 to 20 weeks of permanent water for larval development. When not breeding, the red-legged frog may be found in damp wooded areas typically adjacent to waterways or seasonal ponds.	Yes. The fresh emergent wetlands within Contra Loma Reservoir provide the necessary habitat components for breeding; however, the presence of sport fish and bull frogs within the reservoir (predators to red-legged frog) make successful breeding less likely.	Nearest occurrence is within Black Diamond Mines Regional Preserve south and west of Contra Loma.
Reptiles					
<i>Emys marmorata</i> Western pond turtle	—	CSC	Permanent or nearly permanent water in a wide variety of habitats; requires basking sites; upland nest sites may be found up to 0.25 mile from water.	Yes. Potential habitat is present in Contra Loma Reservoir. Suitable habitat for the western pond turtle may occur in Contra Loma Reservoir and within the seasonal ponds along several of the intermittent streams south of the reservoir.	Western pond turtle occurrences are recorded in similar habitats throughout Contra Costa County and surrounding counties.

Table 3-7. Special-Status Species Potentially Occurring at Contra Loma

Species (<i>Scientific Name</i> / Common Name)	Status		Habitat Description	Potential Occurrence at Contra Loma	Nearest Recorded Occurrence
	Federal ¹	State ²			
<i>Masticophis lateralis euryxanthus</i> Alameda whipsnake	FT	ST	Northern coastal scrub and chaparral communities, especially when they occur adjacent to ungrazed grassland or oak woodland savanna where rodent populations are high. Rodents are not considered prime prey, but their burrows are favorite retreat areas for this snake. Grasslands are also considered an important habitat component because of their foraging value, and some female whipsnakes have been identified laying eggs in grassy fields. Rock outcrops are considered especially important hunting habitat for this snake. The western fence lizard is the primary prey species and prime habitats have high populations of this lizard. Inhabits south-facing slopes and ravines where shrubs form a vegetative mosaic with oak trees and grasses.	Yes. Coastal scrub or chaparral communities are not present in Contra Loma; however ungrazed grasslands with high rodent populations and burrows do occur. Rock outcroppings also occur in Contra Loma, and western fence lizards were abundant during site visits. The grassland areas of Contra Loma could provide habitat for the snake, especially the south-facing slopes along the southern portion of the study area.	Twenty-four CNDDDB occurrences are documented within 5 miles of the study area. These occurrences support the likelihood that whipsnakes occur in the study area.
Birds					
<i>Circus cyaneus</i> Northern harrier	—	CSC	Marshlands, grasslands, meadows, and desert sinks. Mostly found in flat or hummocky open areas. Nesting occurs on the ground in these habitats.	Yes. Potential nesting and foraging habitat is present in the grasslands and fresh emergent wetlands throughout Contra Loma.	Northern harrier occurs in habitats similar to Contra Loma in Contra Costa County.

Table 3-7. Special-Status Species Potentially Occurring at Contra Loma

Species (<i>Scientific Name</i> / Common Name)	Status		Habitat Description	Potential Occurrence at Contra Loma	Nearest Recorded Occurrence
	Federal ¹	State ²			
<i>Elanus leucurus</i> White-tailed kite	—	SFP	Open grasslands, meadows, or marshes for foraging. Nesting and perching often occurs in isolated, dense-topped trees near foraging areas.	Yes. Potential foraging habitat is present in the grasslands, fresh emergent wetlands, and riverine habitat throughout Contra Loma. Several large, dense-topped trees within the Contra Loma study area could be used as nesting locations.	Observed onsite during the survey.
<i>Agelaius tricolor</i> Tricolored blackbird	—	CSC	Requires open water, preferably emergent wetland for nesting, but will also nest in thickets of willow and other shrubs. Forages in grassland and cropland areas with insect prey.	Yes. Potential nesting habitat is present in the fresh emergent wetlands along the reservoir shoreline. Foraging habitat is present in the grassland habitat surrounding the reservoir.	Tricolored blackbird occurs in habitats similar to Contra Loma in Contra Costa County.
<i>Lanius ludovicianus</i> Loggerhead shrike	—	CSC	Open habitats with sparse shrubs and trees that contain perches for scanning. Fairly dense shrubs and brush are needed for nesting.	Yes. Potential foraging areas are present within the annual grassland and riverine habitat of Contra Loma. Moderate-quality nesting habitat occurs in some of the trees and shrubs associated with the riparian areas adjacent to the grassland habitat.	Loggerhead shrike occurs in habitats similar to Contra Loma in Contra Costa County.
<i>Athene cunicularia hypugaea</i> Western burrowing owl	—	CSC	Open, dry, nearly level grassland, prairie, and desert floor with low-growing vegetation. Subterranean nester that generally uses existing mammal burrows, most notably those of the California ground squirrel.	Yes. Potential nesting and foraging habitat occurs throughout Contra Loma within the grassland habitat. Numerous ground squirrel holes were observed throughout Contra Loma that could be used as nesting sites.	There are 31 known CNDDB occurrences for this species within 5 miles of Contra Loma. This species is highly likely to occur within the study area.

Table 3-7. Special-Status Species Potentially Occurring at Contra Loma

Species (<i>Scientific Name</i> / Common Name)	Status		Habitat Description	Potential Occurrence at Contra Loma	Nearest Recorded Occurrence
	Federal ¹	State ²			
<i>Asio flammeus</i> Short-eared owl	—	CSC	Freshwater and saltwater marsh areas, lowland meadows, and irrigated fields; tall grass and tules used for daytime cover; nests on dry ground concealed by vegetation.	Yes. Potential habitat is present in the fresh emergent wetlands around the reservoir.	Short-eared owl occurs in habitats similar to Contra Loma in Contra Costa County.
Mammals					
<i>Vulpes macrotis mutica</i> San Joaquin kit fox	FE	ST	Annual grasslands or grassy open stages with scattered shrubby vegetation; need loose-textured sandy soils for burrowing and a suitable prey base.	Yes. Potential foraging and denning habitat is available in grassland areas of Contra Loma. Numerous ground squirrels observed in the study area would provide a good prey base. The presence of many coyotes within Contra Loma greatly reduces the likelihood of San Joaquin kit fox breeding within the study area, as coyotes are very aggressive to foxes.	A CNDDB occurrence for this species is documented within Contra Loma.
<i>Taxidea taxus</i> American badger	—	CSC	Herbaceous, shrub, and open stages of most upland habitats with dry, friable soils. May reuse old burrows or dig new ones for dens.	Yes. Potential habitat and an abundant ground squirrel prey base are available in the grasslands of Contra Loma.	There are three recent CNDDB occurrences documented for this species within 5 miles of Contra Loma. It is likely that this species occurs within Contra Loma.
<i>Antrozous pallidus</i> Pallid bat	—	CSC	Open, dry habitats. Roosts in caves, crevices, mines, hollow trees, and buildings.	Yes. Potential foraging habitat present throughout Contra Loma. Roosting habitat could include park facilities and buildings or rock outcrops in the hills west of the reservoir.	Pallid bat occurs in habitats similar to Contra Loma in Contra Costa County.

Table 3-7. Special-Status Species Potentially Occurring at Contra Loma

Species (Scientific Name/ Common Name)	Status		Habitat Description	Potential Occurrence at Contra Loma	Nearest Recorded Occurrence
	Federal¹	State²			
<i>Corynorhinus townsendii</i> Townsend's big-eared bat	—	CSC	Humid coastal regions of northern and central California. Roosting occurs in limestone caves, lava tubes, mines, or buildings where they cling to open areas, hanging from walls or ceilings.	Yes. Potential foraging habitat is present throughout Contra Loma. Roosting habitat could include park facilities and buildings.	Townsend's big-eared bat occurs in habitats similar to Contra Loma in Contra Costa County.

Notes: Federal status¹: September 2011

FE = Listed as endangered under the Endangered Species Act

FT = Listed as threatened under the Endangered Species Act

State status²: January 2011

ST = Listed as threatened under the California Endangered Species Act

CSC = Species of special concern as identified by the California Department of Fish and Game

SFP = Fully Protected by the California Department of Fish and Game

San Joaquin kit fox. San Joaquin kit fox is Federally listed as endangered and state listed as threatened. San Joaquin kit fox is associated with open habitats such as arid grasslands, alkali sinks, and open woodlands of the San Joaquin Valley and the surrounding foothills. San Joaquin kit fox typically forages in grassland areas. Kit fox is usually associated with loosely textured soils that are suitable for excavating dens; badgers and coyotes sometimes initiate the excavation. Dens are typically dug on relatively level slopes, suggesting a preference for deep, friable (easily crumbled) soils. Den entrances are typically 5 to 10 inches in diameter, with 3- to 6-foot ramps of excavated soil. The distribution of San Joaquin kit fox populations is thought to be related to the availability of denning sites, particularly natal denning sites, which are often moved several times throughout the season. Artificial features such as culverts and roadbeds are occasionally used for dens. San Joaquin kit fox prey includes ground squirrels, black-tailed jackrabbit, kangaroo rats, and insects.

Potential foraging and denning habitat is abundant within the annual grassland areas of Contra Loma. The soil is friable, allowing foxes to excavate dens, and there are numerous ground squirrel populations upon which to prey. Ten occurrences of San Joaquin kit fox have been documented by CNDDB within 10 miles of the study area and one occurrence has been recorded within Contra Loma. Most of the records are from the early 1990s while the most recent occurrence was in Contra Loma in 1995 (California Department of Fish and Wildlife 2013a). This record shows that two individuals were observed near the south end of the reservoir near a small drainage in the annual grassland.

Although the habitat at Contra Loma appears viable for use by San Joaquin kit fox, the presence of many resident coyotes in the area greatly reduces the site's suitability for this species. Coyotes are very aggressive towards foxes. For this reason, San Joaquin kit fox is unlikely to breed within the study area. If the species is present in Contra Loma, it is most likely to be transitory, as no natal dens have been found at Contra Loma. Neither San Joaquin kit fox nor sign of kit fox dens, scat, or tracks were observed during the reconnaissance-level surveys.

California tiger salamander. California tiger salamander is both Federally listed and state listed as threatened. California tiger salamanders inhabit grasslands and oak savannas in the valleys and low hills of central and coastal California. Habitat conversion has eliminated the species from much of its former range (Shaffer et al. 1993; Fisher and Shaffer 1996). Adults spend most of their lives underground, typically in the burrows of ground squirrels and other burrowing animals. During winter rains between November and March, adults emerge from underground retreats to feed, court, and breed. Adults migrate up to one mile from burrows to breeding sites. Eggs are deposited in seasonal ponds and hatch into larvae. The ponds must contain water for a minimum of eight weeks to hatch and for metamorphs to leave pools, although it can take considerably longer for larvae to complete their development (Fish and Wildlife Service 2004). Following transformation, juvenile salamanders seek refuge underground where they remain until the next winter rains.

Potential salamander habitat at Contra Loma occurs in intermittent stream corridors with areas of seasonal ponding. Most of these locations are along the southern half of the study area. Specifically, the intermittent stream near the northeast corner of the study area and areas just beyond the southern boundary of the study area contain optimal seasonally wet conditions and are located near adjacent upland grassland habitat with abundant burrows for adult salamanders.

Several CNDDDB occurrences document California tiger salamander observations along these particular waterways. There are 26 CNDDDB records within 5 miles of the study area (California Department of Fish and Wildlife 2013a).

California red-legged frog. California red-legged frog is Federally listed as threatened and is classified by CDFW as a California species of special concern. This amphibian species inhabits quiet pools in streams, marshes, and ponds. This species is typically found near breeding sites, which include coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, and ponded and backwater portions of streams, as well as artificial impoundments, such as stock, irrigation and siltation ponds. Sufficient pond depth (at least 3 feet) and shoreline cover are both critical habitat components because they provide a means of escape from predators. Eggs are typically attached to emergent vegetation in permanent pools. Aestivation habitat, which is required for periods of dormancy, can be up to 300 feet from a stream corridor or pond and includes natural features such as boulders, rocks, trees, shrubs, and logs.

Potential habitat at Contra Loma may occur in the intermittent stream corridors where pools remain inundated long enough for frog metamorphosis to occur. Contra Loma Reservoir contains all of the habitat requirements necessary for successful breeding as well; however, the reservoir contains a large population of predatory fish and amphibian species that would make it very difficult for red-legged frog tadpoles to reach adulthood. Sport fish such as bass, green sunfish (*Lepomis cyanellus*), bluegill, and catfish can decimate tadpole populations. Similarly, the bullfrogs at Contra Loma Reservoir can prey heavily on young frogs. This intense predation typically prevents red-legged frogs from co-existing with species such as bullfrogs and sport fish. No CNDDDB occurrences of red-legged frog are documented within the study area; however, there are 19 recorded occurrences within 5 miles of the study area, the closest being near and within the Black Diamond Mines Regional Preserve, south and west of Contra Loma (California Department of Fish and Wildlife 2013a).

Alameda whipsnake. Alameda whipsnake (*Masticophis lateralis euryxanthus*) is both Federally listed and state listed as threatened. This snake inhabits chaparral and scrub habitats within Alameda, Contra Costa, and possibly western San Joaquin and northern Santa Clara counties. The Alameda whipsnake typically prefers shrub communities, but is also found in adjacent habitats such as grasslands and oak savanna. These snakes are good climbers that can escape into shrubs or trees. They also seek shelter in rock piles, outcrops, or small mammal burrows (Stebbins 1985). This fast-moving, diurnal snake hunts primarily small lizards, especially the western fence lizard, but will also eat frogs, snakes, and birds. Its home range is typically 5 to 21.5 acres in size and can overlap home ranges of many other individuals.

Although coastal scrub or chaparral communities are not present in Contra Loma, the annual grasslands present in the study area contain numerous small mammal burrows in which the snake could take refuge. Additionally, western fence lizards were abundant during site visits, indicating a robust prey base for the snake. For these reasons, the annual grassland areas within the study area could provide adequate habitat for the snake. Twenty-four CNDDDB occurrences are documented within 5 miles of the study area (California Department of Fish and Wildlife 2013a). These occurrences support the likelihood that whipsnakes occur in the study area.

White-tailed kite. White-tailed kite is a state-designated fully protected raptor, and is also on the list of birds protected under the MBTA. It breeds between February and October, and feeds on rodents, small reptiles, and large insects in such habitats as fresh emergent wetlands, annual grasslands, pastures, and ruderal vegetation. Unlike other raptors, kites often roost, and occasionally nest, communally; therefore, disturbance of a relatively small roost or nesting area could affect a large number of birds. Kites tend to nest in large, dense-topped, isolated trees near suitable foraging habitat.

The annual grassland, riverine, and fresh emergent wetland habitats within the study area provide ample foraging ground for this species. Several large, dense-topped trees within the Contra Loma study area could be used as nesting locations. There are abundant small mammals, reptiles, and insects within the study area. Although there are no CNDDDB records within the study area, there are two CNDDDB records within 5 miles of the study area. White-tailed kites were observed within the study area during the reconnaissance surveys (California Department of Fish and Wildlife 2013a).

Western pond turtle. Western pond turtle is listed as a California species of special concern and is found in the quiet waters of ponds, marshes, creeks, and irrigation ditches. This species requires basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. When water temperatures are low and air temperatures are warmer than water temperatures, it frequently basks on logs or other objects out of the water. When air temperatures become too warm, western pond turtles water-bask by lying in the warmer surface water layer with their heads out of the water. In colder areas, the hibernation period is passed underwater in the soft mud on the bottom of the lake or waterway. Mating typically occurs in late April or early May but may occur year-round. Nests are located in upland areas up to 0.25 miles from the aquatic site. Hatchling turtles are thought to emerge from the nest and move to aquatic habitats in the spring.

Suitable habitat for the western pond turtle may occur in Contra Loma Reservoir and within the seasonal ponds along several of the intermittent streams south of the reservoir. Two CNDDDB occurrences are documented within 5 miles of the study area (California Department of Fish and Wildlife 2013a).

Northern harrier. Northern harrier (*Circus cyaneus*) is a California species of special concern, and is also on the list of birds protected under the MBTA. This species is found across most of North America. In California, the northern harrier is found in grasslands, marshes, and other open habitats throughout the state. Nests are built on the ground in areas where long grasses or marsh plants provide cover and protection. Harriers hunt for a variety of prey, including rodents, birds, frogs, reptiles, and insects, by flying low and slow in a traversing manner, and using both sight and sound to detect prey items.

Potential nesting and foraging habitat is present in the annual grasslands and fresh emergent wetlands of Contra Loma. No CNDDDB occurrences of this species are recorded within 5 miles of the study area (California Department of Fish and Wildlife 2013a).

Tricolored blackbird. Tricolored blackbird (*Agelaius tricolor*) is a California species of special concern, and is also on the list of birds protected under the MBTA. It is endemic to the Central

Valley and coastal valleys of California. This species is highly gregarious, forming large flocks in both breeding and non-breeding seasons. Nests are built near or over water and occasionally in agricultural fields. Recently, tricolored blackbirds have displayed increased tendencies toward nesting in patches of blackberry, willows, mustard, thistles, nettles, and even grasses.

The fresh emergent wetland habitat along the margins of Contra Loma Reservoir may provide suitable habitat for this species. Foraging habitat is present in the grassland habitat surrounding the reservoir. No CNDDDB occurrences of this species are recorded within 5 miles of the study area (California Department of Fish and Wildlife 2013a).

Loggerhead Shrike. Loggerhead shrike (*Lanius ludovicianus*) is a California species of special concern, and is also on the list of birds protected under the MBTA. Loggerhead shrike is a common resident in lowlands and foothills throughout California, and prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. The greatest density of this species occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Loggerhead shrikes build well-concealed nests on stable branches in shrubs or trees with dense foliage. The diet of the loggerhead shrike includes small birds, mammals, amphibians, reptiles, fish, carrion, large insects, and various invertebrates. This species forages from a perch that is at least 2 feet above the ground, but is often much higher. Loggerhead shrikes frequently cache prey on thorns, sharp twigs, and wire barbs, or in the forks of branches. The breeding season for loggerhead shrike is from March to August.

Suitable foraging areas are present within the annual grassland and riverine habitat of the study area. Moderate-quality nesting habitat occurs in some of the trees and shrubs associated with the riparian areas adjacent to the grassland habitat. No CNDDDB occurrences of this species are recorded within 5 miles of the study area (California Department of Fish and Wildlife 2013a).

Western Burrowing Owl. Western burrowing owl is a California species of special concern, and is also on the list of birds protected under the MBTA. Burrowing owls are year-round residents in generally flat, open, dry grasslands, pastures, deserts, and shrub lands and in grasses, forbs, and open shrub stages of pinyon-juniper and ponderosa pine habitats. In North America they range from the western Canadian provinces south through southern Mexico. They typically use the burrows of ground squirrels and other small mammals for nesting and cover, but may also use artificial structures such as roadside embankments, levees, and berms. They can exhibit a high degree of site fidelity, often reusing burrows year after year. Occupancy of suitable burrowing owl habitat can be verified at a site by observation of a pair of burrowing owls during their breeding season or, alternatively, by the presence of molted feathers, cast pellets (regurgitated masses of bone, fur, and other indigestible material), prey remains, eggshell fragments, or excrement at or near a burrow.

Suitable habitat for foraging and nesting occurs within the annual grasslands of the study area. Numerous burrows in which the owls could nest occur throughout the grassland areas, with higher concentrations in the southern half of the study area. There are 31 known CNDDDB occurrences for this species within 5 miles of Contra Loma (California Department of Fish and Wildlife 2013a). Due to the presence of suitable habitat for foraging and nesting, this species is highly likely to occur within the study area.

Short-eared owl. Short-eared owl (*Asio flammeus*) is a California species of special concern, and is also on the list of birds protected under the MBTA. In California, short-eared owls nest at only a few of their former breeding locations, and in northwestern California they breed only in coastal areas where conditions are prime. The short-eared owl is a ground nester and lives in open country, including grasslands, wet meadows, and cleared forests. Current threats to short-eared owls include the decline and degradation of marsh and tall grassland habitats resulting from grazing pressure.

Potential nesting and foraging habitat is present in the annual grasslands and fresh emergent wetlands throughout Contra Loma, although nesting is more likely to occur closer to coastal areas. No CNDDDB occurrences of this species are recorded within 5 miles of the study area (California Department of Fish and Wildlife 2013a).

American badger. American badger is a California species of special concern. Badgers are highly specialized fossorial (adapted for burrowing or digging) mammals found throughout almost all of California. They are found in a range of habitats that contain friable soils and relatively open ground, where they dig in pursuit of prey and to create dens for cover and raising of young. Badgers are carnivorous and prey primarily on rodents, including ground squirrels.

Potential habitat occurs within the annual grasslands present in the study area. Soils in these areas are friable and numerous ground squirrels are present throughout the grassland areas. There are three recent CNDDDB occurrences documented for this species within 5 miles of Contra Loma, generally occurring south of the study area (California Department of Fish and Wildlife 2013a). It is likely that this species occurs within the study area boundaries.

Pallid bat. Pallid bat (*Antrozous pallidus*) is a California species of special concern. The pallid bat is a locally common species in low elevations of California and occurs throughout most of the state. This species occupies a wide variety of habitats, including grasslands, shrublands, woodlands, and forests from sea level up into montane, mixed conifer forests. Pallid bat is most common in open, dry habitats with rocky areas for roosting. This species is a year-round resident throughout most of its range. Day roosts include caves, crevices, mines, and occasionally hollow trees and buildings. This species is very sensitive to disturbance of roost sites.

The pallid bat could use any of the vegetative communities present within the study area as foraging habitat. Roosting habitat could include park facilities and buildings, rock outcrops in the hills west of the reservoir, and possibly a few hollow tree cavities observed in some of the riparian areas near the northeast corner of the study area. No CNDDDB occurrences of this species are recorded within 5 miles of the study area (California Department of Fish and Wildlife 2013a).

Townsend's big-eared bat. Townsend's big-eared bat (*Corynorhinus townsendii*) is a California species of special concern. It ranges throughout western North America from British Columbia to the central Mexican highlands. Recent information suggests that this species is declining throughout the west. Townsend's big-eared bat is typically a cave-dwelling species; however, this species is also found in human-made structures such as old mine workings and buildings. Unlike many species that take refuge in crevices, this species only roosts in the open, hanging from walls and ceilings, where it is relatively easily detected, but is also particularly

vulnerable to disturbance (Pierson and Rainey 1998). Maternity roosts and winter hibernacula are restricted to caves, old mines, buildings, and rock ledges.

Suitable foraging habitat is present throughout Contra Loma in any of the vegetative communities present within the study area. Suitable roosting habitat is limited in the study area, but could include some of the park facilities and buildings. No caves are present in the study area. No CNDDDB occurrences of this species are recorded within 5 miles of the study area (California Department of Fish and Wildlife 2013a).

3.11 Fisheries

3.11.1 Existing Conditions

Contra Loma Reservoir is a popular recreational fishing destination. Recreational fishing is allowed all around the reservoir except for the immediate area of the dam and spillway. As described previously, a state fishing license and an EBRPD Fishing Access Permit are required for all anglers 16 and older. Pedestrian access to the reservoir is provided by a network of trails, and anglers may fish from shore, from two floating fishing docks (Figure 1-2), or from boats. There is one boat launch and anglers may launch boats of up to 17 feet provided they pay the boat launch fee and pass a required boat inspection for aquatic invasive species. No gasoline-powered engines are allowed on the reservoir, but electric motors are permitted. Anglers may also use float tubes, but each angler must possess a life jacket and must wear waders or a wetsuit to limit body contact. There is a fish cleaning station at the boat launch facility; however, EBRPD is currently working on relocating this facility further away from the reservoir within the same area as described in Section 3.8.1 (Water Quality). Park hours are set by EBRPD and adjust seasonally to daylight hours. Park curfew is from 10:00 p.m. to 5:00 a.m., however, unauthorized nighttime fishing sometimes occurs.

Because the fishing docks float, their elevations vary with the reservoir level. When the reservoir level is sufficiently low, the angle of the ramps leading from the shore down to the docks becomes too steep for safe passage, and the docks are closed. Sometimes the reservoir level is so low that the docks cannot float and they rest on the sloping shoreline. Anglers sometimes fish from the floating boat dock adjacent to the boat launch, especially when the fishing docks are closed.

CCWD currently has a draft macrophyte (aquatic plants visible with the naked eye) management plan for Contra Loma Reservoir. The goals of this plan are to (1) control problem macrophyte beds in order to ensure boat access, and (2) control non-native plant species in the reservoir. Routine procedures to monitor macrophyte development include annual GPS surveys that document types of species present as well as the approximate location, coverage, and growth of existing macrophyte beds. Control of macrophytes has been limited to herbicide applications to non-native species and specific tule beds along the shoreline (Contra Costa Water District undated). Short-term treatment have included spot treatment with Sonar® to control non-natives and spot treatment with Rodeo® to control tules. No long-term treatment procedures have been developed for Contra Loma Reservoir.

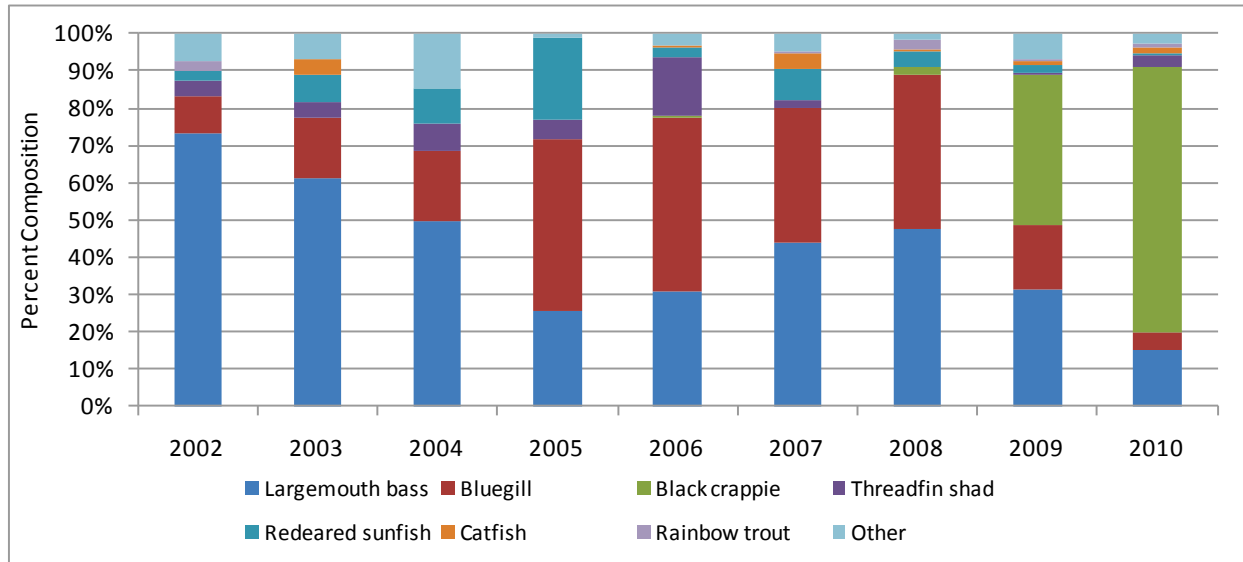
Fisheries Resources

There are currently 20 known fish species, including eight species of game fish, in Contra Loma Reservoir (Table 3-8). Primary species found in the reservoir during spring surveys from 2002 through 2011 were largemouth bass, bluegill, black crappie, threadfin shad, redear sunfish, channel catfish, white catfish, and rainbow trout (Figure 3-12). Other species include bigscale logperch, common carp, Sacramento blackfish, warmouth, green sunfish, white crappie, goldfish, prickly sculpin, and inland silversides (Alexander, pers. comm. 2011). Many of these species occur in small numbers and/or are not self-sustaining in the reservoir.

Table 3-8. Fish Species Occurring in Contra Loma Reservoir

Family	Common Name	Scientific Name
Acipenseridae	White sturgeon	<i>Acipenser transmontanus</i>
Atherinopsidae	Inland silverside	<i>Menidia beryllina</i>
Centrarchidae	Bluegill	<i>Lepomis macrochirus</i>
	Green sunfish	<i>Lepomis cyanellus</i>
	Largemouth bass	<i>Micropterus salmoides</i>
	Redear sunfish	<i>Lepomis microlophus</i>
	Black crappie	<i>Pomoxis nigromaculatus</i>
	White crappie	<i>Pomoxis annularis</i>
	Warmouth	<i>Lepomis gulosus</i>
Clupeidae	Threadfin shad	<i>Dorosoma petenense</i>
Cyprinidae	Common carp	<i>Cyprinus carpio</i>
	Goldfish	<i>Carassius auratus</i>
	Sacramento blackfish	<i>Orthodon microlepidotus</i>
Cottidae	Prickly sculpin	<i>Cottus asper</i>
Ictaluridae	Channel catfish	<i>Ictalurus punctatus</i>
	White catfish	<i>Ameiurus catus</i>
Moronidae	Striped Bass	<i>Morone saxatilis</i>
Percidae	Bigscale logperch	<i>Percina macrolepida</i>
Poeciliidae	Mosquitofish	<i>Gambusia affinis</i>
Salmonidae	Rainbow trout	<i>Oncorhynchus mykiss</i>

Many of the fish species present have been unintentionally introduced from the Delta via the Contra Costa Canal. The recently completed Rock Slough Fish Screen Project at the head of Contra Costa Canal was constructed to prevent the entrainment of Federally protected species such as Delta smelt at the Rock Slough Intake of the Contra Costa Canal. The new screen also minimizes fish entrainment and significantly reduces the potential for fish introductions into Contra Loma Reservoir from the Contra Costa Canal.



Source: Alexander, pers.comm. 2011.

Figure 3-12. Relative fish species composition of Contra Loma Reservoir, spring 2002-2010 during spring surveys conducted between 2002 and 2010.

The most popular game fish in Contra Loma Reservoir is rainbow trout. However, since the reservoir does not provide habitat suitable for self-sustaining, year-round coldwater fish, trout are stocked as part of a mostly seasonal put-and-take sport fishery. This species is planted and caught by anglers when the water is relatively cool (less than 72° Fahrenheit [°F]) from mid-September to mid-June. Hatchery-produced catchable trout are stocked annually through funds derived from EBRPD fishing access permits and to a lesser extent by the CDFW. EBRPD plants rainbow trout that average 1 pound each and the CDFW plants trout that average 1/2 pound each. The stocking records for rainbow trout are provided in Table 3-9.

Although the reservoir is managed as a put-and-take fishery, there is some limited survival and growth as evidenced by the 17.6-pound lake-record rainbow trout caught in April of 2001. Unlike warm water game fish in the reservoir, the rainbow trout fishery is not limited by reservoir operations. The limiting factors for the coldwater fishery are stocking rates and angler harvest. Rainbow trout stocking rates for Contra Loma Reservoir have fluctuated between 10,500 and 17,406 pounds/year over the past ten years, and have had an average stocking rate of 13,950 pounds.

Table 3-9. Stocking Records for Contra Loma Reservoir between 2000 and 2010

Year	Channel Catfish (pounds) ^a			Rainbow Trout (pounds)		
	EBRPD	CDFW	Total	EBRPD	CDFW	Total
2000	3,500	1,500	5,000	7,000	9,200	16,200
2001	1,000	500	1,500	5,500	5,000	10,500
2002	3,750	500	4,250	7,347	6,000	13,347
2003	4,250	1,000	5,250	10,906	6,500	17,406
2004	4,025	500	4,525	7,750	5,500	13,250
2005	5,287	0	5,287	10,250	3,500	13,750
2006	3,005	1,000	4,005	9,750	2,550	12,300
2007	3,962	0	3,962	11,050	1,500	12,550
2008	3,500	0	3,500	8,750	4,000	12,750
2009	3,500	0	3,500	10,649	3,500	14,149
2010	3,050	0	3,050	13,265	4,000	17,265

Source: Source: Alexander, pers. Comm. 2011

Notes: ^aEBRPD trout plants average 1 fish/pound and the CDFW trout plants average 2 fish/pound. Catfish size varies slightly, but is on average 1 fish/pound.

Contra Loma Reservoir supports the highest largemouth bass densities of any EBRPD reservoir (Alexander, pers. comm. 2011). Mark-recapture studies have been conducted annually by EBRPD since 2007 (Figure 3-12) using the Lincoln-Peterson Index estimation method. In the near-shore habitat of the reservoir between 2007 and 2011, the average estimated number of largemouth bass greater than 11 inches in total length has been 662, and has fluctuated from a maximum of 1,235 in 2007 to a minimum of 158 in 2010 (Figure 3-13). Based on the available data, the largemouth bass abundance in Contra Loma Reservoir fluctuates widely; however, during the five available years of data, the population has declined (Figure 3-13). Additionally, the percent composition of bluegill and black crappie has increased during this time period (Figure 3-12). The observed decline of largemouth bass could be a function of numerous factors including, but not limited to, a decrease in successful spawning and recruitment, increased angler harvest, increased competition and/or predation by other fish species (including bluegill and black crappie), or sampling variation.

Based on the maximum fork lengths of largemouth bass captured during annual electrofishing surveys between 2001 and 2011 (Figure 3-14), the average and maximum size of fish has remained relatively stable, with the average bass measuring 9.5 inches with larger fish up to 24 inches (Alexander, pers. comm. 2011). The recent increase in average largemouth bass size indicates that there may be fewer young fish in the population which suggests there has been less successful reproduction or survival over the past few years (assuming equal sampling effort and standardization year-to-year). The maximum size of largemouth bass sampled in the reservoir has increased from 1.9 pounds in 1999 to 12.9 pounds in 2008. The current record largemouth bass is 13.1 pounds and was caught by an angler in 2006.

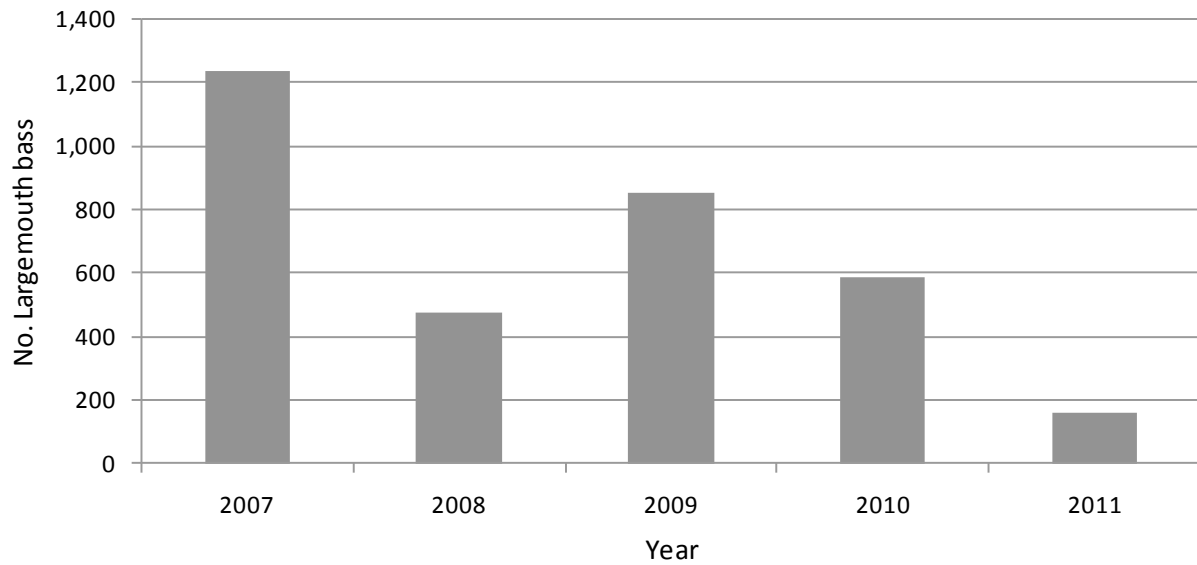


Figure 3-13. Estimated largemouth bass population using Lincoln-Peterson Index method at Contra Loma Reservoir, 2007-2011. (Source: Alexander, pers. Comm. 2011)

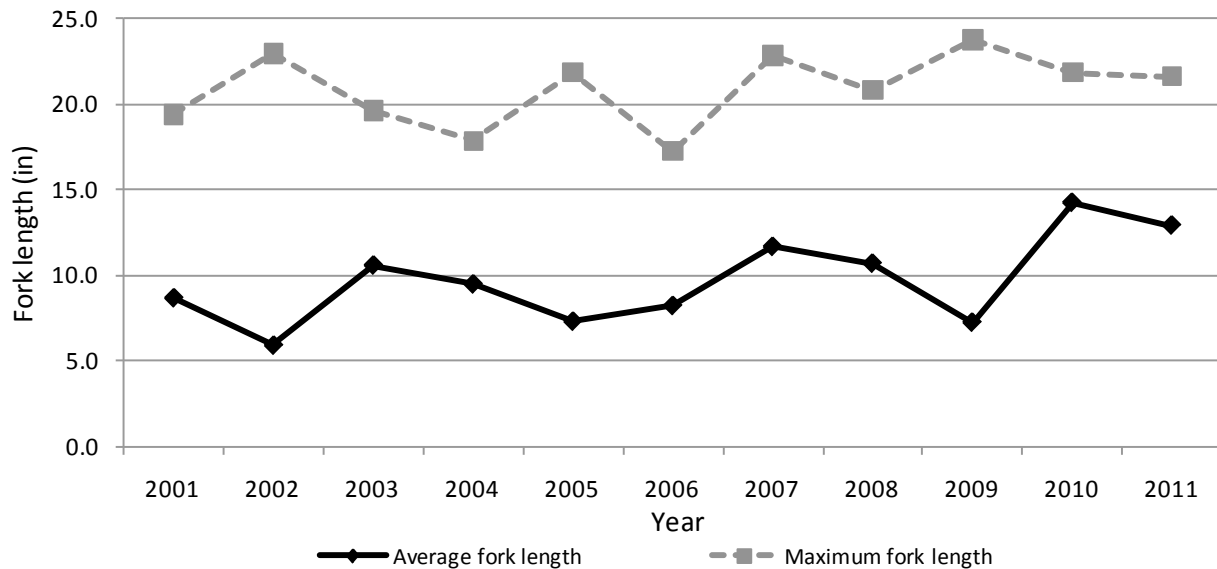


Figure 3-14. Average and maximum fork lengths of largemouth bass captured during annual electrofishing surveys on Contra Loma Reservoir, 2001-2011. (Source: Alexander, pers. comm. 2011)

The reservoir's self-sustaining population of largemouth bass is very popular with a segment of the sport fishing public but is not augmented by planting; therefore, the reproduction and growth of this species of game fish is very important in maintaining a successful fishery. Because the largemouth bass fishery is self-sustaining and is more susceptible to overharvest, EBRPD has

recommended that all bass be released after catching. Largemouth bass and sunfish (such as black crappie and bluegill) spawn during the spring when water temperatures begin to warm. Typically, in this region of California, the prime spawning months for bass and sunfish occurs from late March through early June. Following hatching and initial care by the adults, fry are attracted to the habitat-rich near shore area of the south and west shoreline of the reservoir. These areas are dominated by emergent vegetation such as bulrush and cattail, as well as submerged vegetation such as watermilfoil and pond weed (*Elodea* spp.) that provide a source of food and protective cover.

EBRPD has identified seasonal reservoir fluctuations as a limiting factor for the largemouth bass fishery. EBRPD and CCWD currently have a verbal agreement to limit reservoir fluctuations during the critical spawning period for largemouth bass and other warm water fish; however, water supply and reservoir operation and management take precedence over management for recreation, including fisheries (Alexander, pers. comm. 2011). The magnitude of the reservoir level increases (within 4 to 6 feet) is not expected to be particularly problematic for warm water fish in Contra Loma Reservoir because the change is not likely to be sufficient to reduce water temperatures to less than suitable levels for egg development or to cause nest abandonment. Conversely, daily reservoir decreases of up to 1.6 feet, particularly for several consecutive days, could cause nest abandonment by adult bass, which, in turn, could leave spawning nests susceptible to predation from other fishes, particularly the bluegill and redear sunfish that are abundant in this reservoir. Under extreme drawdown conditions, nests can be left out of the water to desiccate and a substantial portion of that year's reproductive capacity can be lost. Limiting abrupt and/or large decreases in reservoir elevation during the spring and early summer spawning period is one way to minimize risks to largemouth bass spawning success and to ensure a healthy self-sustaining population. Because reservoir operation is outside the scope of the RMP, reservoir level fluctuations would continue with or without the RMP.

Because sunfish typically spawn in the relatively shallow littoral (shoreline) areas of the reservoir, their reproductive success can also be affected by large water fluctuations during the critical months of April and May. As with largemouth bass, large abrupt or sustained fluctuations can disrupt spawning by taking the spawning nests out of the suitable depth and temperature ranges and placing them in water that is too shallow, too deep, or not the right temperature for proper egg maturation. However, based on annual surveys the existing reservoir operations appear to allow for successful reproduction and recruitment to the sunfish population. Black crappie are also a popular warm water game fish in the reservoir. They have similar life cycle, habitat, and cover requirements as largemouth bass and are also susceptible to breeding disruptions caused by changes in the water level. Even so, it is characteristic for this species to exhibit substantial population fluctuations.

Black crappie abundance has increased in recent years (Figure 3-12), and many large (>9 inch) fish have been captured during annual electrofishing surveys and by anglers. The average black crappie captured during electrofishing surveys between 2009 and 2011 has been 8 to 10 inches and the maximum size black crappie capture was 15 inches (Alexander, pers. comm. 2011). The current lake record is 4.1 pounds.

Striped bass also provide a trophy fishery for anglers targeting this species. Before the recent completion of the Rock Slough Fish Screen Project, striped bass had been pumped into the

reservoir from the Delta. Striped bass within the reservoir have grown to large sizes by preying on planted trout and other resident fish species. Striped bass numbers are relatively low (Figure 3-12), but the potential for hooking a large specimen creates a very popular fishery. The current lake record for striped bass is 40 pounds. The Rock Slough Fish Screen will minimize further introduction of striped bass to the reservoir.

Channel catfish are planted and caught during the warm summer months from June through mid-September. The planted channel catfish average 1 pound each, but larger catfish are also planted. The catfish sport fishery is intended to supplement angling opportunities during the warm summer months when conditions are less conducive for trout and is managed as a put-and-take fishery. The average size and number of catfish stocked into the reservoir between 2000 and 2010 are provided in Table 3-9. On average, 3,984 pounds of channel catfish are stocked annually. Stocking rates have remained relatively stable over the past 10 years (Table 3-9) and many of the planted channel catfish remain in the reservoir and grow to large sizes. The current lake record is 26.4 pounds. Neither catfish species (channel or white) has been documented to naturally reproduce in the reservoir; therefore, the primary factors likely limiting the abundance and growth of catfish in Contra Loma are annual stocking rates and angler harvest. However, no data are currently available on the harvest rate of catfish.

According to a plaque posted at a Contra Loma information kiosk, a 58-inch white sturgeon was caught by an angler at the reservoir in 2003; however, annual electro-fish surveys have not found sturgeon.

Since approximately 1996, Contra Loma Reservoir has provided recreational fishing opportunities in the form of fishing derbies for the public. These derbies are intended to attract children with special needs, senior citizens, and children from the surrounding area. New anglers are invited to participate through the EBRPD's Parks Express Program and through the Delta Striped Bass Association's annual "Learn to Fish" day. In October 2009, over the duration of these annual events, 147 special-needs children, 87 seniors, and over 528 local children experienced a special day of trout fishing. These annual fishing events attract more new anglers each year and are an important component of the recreational opportunities at Contra Loma Recreation Area.

Fishing regulations for Contra Loma Reservoir are set in part by the State Fish and Game Commission. Current fishing harvest regulations are provided in Table 3-10. As described above, EBRPD encourages, but doesn't require, anglers to practice catch and release with largemouth bass and catfish.

Table 3-10. Current Limits on Fish Harvest from Contra Loma Reservoir

Fish Species	Size Limit	Number per day
Trout	No limit	5
Catfish	No limit	5
Largemouth bass ¹	12-inch minimum	5
Striped bass	18-inch minimum	2
Crappie, bluegill, and sunfish	No limit	25

Source: East Bay Regional Park District 2010c

¹ Largemouth bass is a species of black bass.

Special-Status Fish Species

For the purposes of evaluation, special-status fish species include those that are: 1) designated as threatened or endangered by the state or Federal government (“listed species”); or 2) proposed for state or Federal listing as threatened or endangered; and/or 3) candidates for state or Federal listing as threatened or endangered; and/or 4) identified by the CDFW as species of special concern and/or California fully protected species. A list of special-status fish species considered for analysis in this section was compiled through obtaining an official species list from the USFWS Sacramento Office (Fish and Wildlife Service 2013), informal discussions with the CDFW and USFWS, and reviewing biological literature applicable to the study area (Table 3-11).

The Delta provides suitable habitat for many of the species listed in Table 3-11, and because the reservoir’s water source is the Delta, fish species could have been carried into the reservoir via the Contra Costa Canal. To date no special-status fish species have been captured or identified in the reservoir. Furthermore, special-status species that might have made it in to the reservoir are not likely to have survived due to a lack of suitable habitat that would support most of these species. In addition, any new entrainment of fish, including special-status species, is highly unlikely with the installation of the new Rock Slough Fish Screen at the intake pump station for the Contra Costa Canal. The screen size was designed to be more restrictive than the National Marine Fisheries Service criteria (i.e., 3/32 inch or 2.25 millimeters) in order to protect larval Delta smelt and would, therefore, protect the smallest and most vulnerable special-status fish from entrainment.

Table 3-11. Special-Status Fish Species with Potential to Occur in the Contra Loma Recreation Area

Common Name/ Scientific Name	Status¹ (Federal/ State)	General Habitat Description	Potentially Suitable Habitat?	Nearest Recorded Occurrence
Delta smelt (<i>Hypomesus transpacificus</i>)	T/E	Inhabit the Sacramento-San Joaquin Delta estuary in open, shallow waters.	No. Suitable habitat for this species does not occur in Contra Loma Reservoir. Contra Loma is not part of designated critical habitat for this species.	Delta smelt are present in the Sacramento-San Joaquin Delta.
Longfin smelt (<i>Spirinchus thaleichthys</i>)	—/T	Inhabit the Sacramento-San Joaquin Delta estuary in open, shallow waters.	No. Suitable habitat for this species does not occur in Contra Loma Reservoir.	Longfin smelt are present in the Sacramento-San Joaquin Delta.
Steelhead, California Central Valley Distinct Population Segment (DPS) (<i>Oncorhynchus mykiss</i>)	T/—	Spawn and rear in the upper Sacramento and San Joaquin rivers and their tributaries.	No. Suitable habitat for this species does not occur in Contra Loma Reservoir. Contra Loma is not part of an existing tributary system that supports this species and it is not part of designated critical habitat for this species.	Central Valley DPS steelhead are present in the Sacramento-San Joaquin Delta.
Central Valley spring-run Evolutionarily Significant Unit (ESU) Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	T/T	Spawn and rear in the upper Sacramento and San Joaquin rivers and their tributaries.	No. Suitable habitat for this species does not occur in Contra Loma Reservoir. Contra Loma is not part of an existing tributary system that supports this species and it is not part of designated critical habitat for this species.	Central Valley spring-run Chinook salmon are present in the Sacramento-San Joaquin Delta.
Sacramento River winter-run ESU Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	E/E	Spawn and rear in the upper Sacramento and San Joaquin rivers and their tributaries.	No. Suitable habitat for this species does not occur in Contra Loma Reservoir. Contra Loma is not part of an existing tributary system that supports this species and it is not part of designated critical habitat for this species.	Sacramento River winter-run Chinook salmon are present in the Sacramento-San Joaquin Delta.

Table 3-11. Special-Status Fish Species with Potential to Occur in the Contra Loma Recreation Area

Common Name/ Scientific Name	Status¹ (Federal/ State)	General Habitat Description	Potentially Suitable Habitat?	Nearest Recorded Occurrence
Green sturgeon (<i>Acipenser medirostris</i>)	T/—	Require streams, rivers, and estuarine habitat as well as marine waters during their life cycle	No. Suitable habitat for this species does not occur in Contra Loma Reservoir.	Green sturgeon are present in the Sacramento-San Joaquin Delta.
Sacramento splittail (<i>Pogonichthys macrolepidotus</i>)	—/SSC	Inhabit rocky and sandy pools of rivers and lakes. Tolerant of brackish water.	No. Marginally suitable habitat occurs in Contra Loma Reservoir, but this species is not present.	Sacramento splittail are present in the Sacramento-San Joaquin Delta.
Sacramento perch (<i>Archoplites interruptus</i>)	—/SSC	Inhabit sloughs, slow-moving rivers, and lakes, but now mostly reservoirs and farm ponds.	No. Significantly limited within their native range. Most abundant where other centrarchids are absent.	Major localities containing perch in the 1990's included Calaveras Reservoir, Lake Anza, Jewel Lake and gravel pit ponds (Alameda Creek near Niles).
Hardhead (<i>Mylopharodon conocephalus</i>)	—/SSC	Inhabit quiet, deep pools of large, warm, clear streams over rocks or sand.	No. Marginally suitable habitat occurs in Contra Loma Reservoir, but this species is not present.	Hardhead are present in the Sacramento-San Joaquin Delta.
Pacific lamprey (<i>Entosphenus tridentatus</i>)	—/SSC	Spawn in freshwater rivers and streams. Inhabit marine waters during their life cycle.	No. Suitable habitat for this species does not occur in Contra Loma Reservoir.	Pacific lamprey are present in the Sacramento-San Joaquin Delta.
River lamprey (<i>Lampetra ayresii</i>)	—/SSC	Spawn in freshwater rivers and streams. Inhabit marine waters during their life cycle.	No. Suitable habitat for this species does not occur in Contra Loma Reservoir.	River lamprey are present in the Sacramento-San Joaquin Delta.

¹Status Notes: E = Endangered; T = Threatened; SSC = CDFW species of special concern.

3.12 Geologic and Soil Resources

3.12.1 Existing Conditions

Geology

The geology of the Contra Loma area consists of terrestrial and marine Eocene- to Pliocene- (Tertiary) aged sandstone with lesser amounts of siltstone, conglomerate, and shale (Graymer et al. 1994). Minor amounts of igneous rocks are also present.

Contra Loma is located in the Diablo Range, which is part of the larger Coast Ranges of California. Rocks of both marine and terrestrial origin are present in the Contra Loma area. Most of the rocks that currently form the Coast Ranges were originally oceanic crust and overlying marine sediments of the Pacific Plate. Tectonic forces, which are still active in the region, have subducted (moved underneath) and translated (slid) the Pacific Plate under and against the margin of the North American Plate. This tectonic activity synchronously accreted and uplifted oceanic crust and marine sediments from the Pacific Plate to the western margin of North America.

Concurrently, subduction of the Pacific Plate also formed land masses in the Pacific Ocean near the western margin of North America, either through accumulation of sediment or from the formation of volcanoes. In the ocean trenches where the Pacific Plate was subducted under the North American Plate, large blocks of oceanic crust were broken off while material from both plates was scraped off into these trenches. Continued deposition and uplift brought these rocks above the surface of the ocean, eventually forming discrete land masses offshore of the North American coast. In addition, subduction of the Pacific Plate formed volcanoes that jutted out of the ocean near these trenches. Tectonic activity eventually carried these landforms and their detritus towards the North American Plate and accreted the rocks to the western margin of the North American Plate. The accretion of the oceanic crust, overlying sediments, and terrestrial deposits formed the geology of Contra Loma and its vicinity.

Geologic units in the project vicinity trend west to east and appear as relatively narrow bands of generally less than 1,000 feet in thickness on the Earth's surface (Figure 3-15). Therefore, many geologic units are present near Contra Loma (Table 3-12). Contra Loma Reservoir is flanked by hills that are composed of the Tulare Formation, a poorly consolidated assemblage of siltstone, sandstone, and conglomerate. The bases of the surrounding hills and adjacent flat-lying areas are mostly composed of younger Quaternary-aged surface deposits derived from alluvial deposits and the detritus of the surrounding terrain. The Lawlor Tuff occupies a narrow band that extends from the western margin of the reservoir to the western boundary of the Contra Loma Recreation Area. The higher elevations of Contra Loma south of the reservoir are mainly composed of the Neroly and Cierbo Sandstone units, with a minor amount of Kirker Tuff exposed near the southern boundary.

Seismicity and Faults

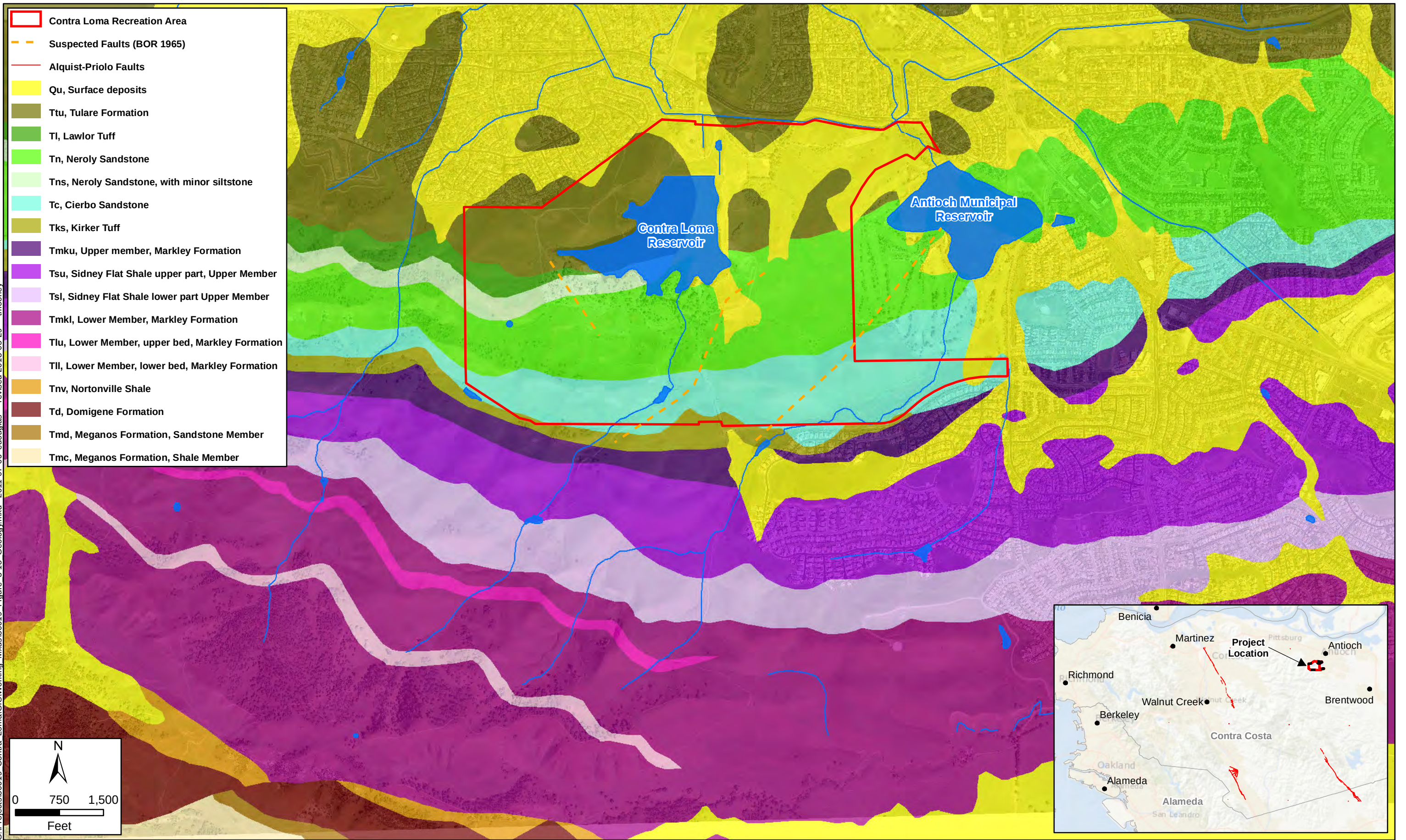
The San Francisco Bay Area is a seismically active area with numerous well-known active fault complexes, including the San Andreas, Hayward, and Mt. Diablo fault complexes. The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972. It requires the California State Geologist to define earthquake fault zones, and was designed to mitigate the hazards that earthquakes pose to structures and human life (California Public Resources Code 2009). Fault zones are established based on the presence of a fault that is traceable and that has exhibited displacement in the last 11,000 years.

There are no active fault zones identified by the State of California within the Contra Loma Recreation Area, but several active fault zones exist within 17 miles of Contra Loma (Figure 3-15 – see inset). Three suspected inactive faults (Figure 3-15) were mapped within Contra Loma by Reclamation and the Corps between 1962 and 1966 (East Bay Regional Park District 1975b). However, published maps and geospatial data from the USGS or the California Geologic Survey

(CGS) do not show these suspected faults. A series of pre-Quaternary-aged faults have been identified approximately 2 miles south of Contra Loma near the southern boundary of Black Diamond Mines Regional Preserve, but they indicate no evidence of displacement in the last 11,000 years.

Because there are active fault zones within 17 miles of Contra Loma, the recreation area may experience severe ground shaking and moderate to heavy damage from a nearby earthquake. The CGS has produced estimates of peak ground acceleration (PGA) values for every given point in California. PGA is a measure of earthquake acceleration on the ground and is measured in units of gravity (g); a value of 1.0 is equal to the force of gravity at the Earth's surface. In general, an area with a PGA of 0.001 g will experience shaking that can be felt by people and an area with a PGA of 0.50 g will experience very strong shaking that well-designed buildings and structures can withstand. PGA values for Contra Loma range between 0.40 g for firm rock and 0.44 g for alluvium (California Geological Survey 2011), which indicates the area has the potential to experience severe shaking and moderate to heavy damage to some buildings and structures. However, well-designed buildings and structures should be able to withstand the expected level of shaking.

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Table 3-12. Geologic Units Underlying Contra Loma

Map Unit	Geologic Age	Formation	Description
Qu	Holocene-Pleistocene (Quaternary)	Surface deposits	Surface deposits. Erosional detritus from erosion of surrounding features.
Ttu	Pliocene	Tulare Formation	Poorly consolidated, non-marine grey to maroon siltstone, sandstone, and conglomerate as well as minor amounts of tuff.
Tl	Pliocene	Lawlor Tuff	Non-marine, pumiceous, andesitic tuff.
Tn	Miocene	Neroly Sandstone	Blue, volcanic-rich, cross-bedded sandstone and conglomerate; mostly non-marine. Minor tuff deposits.
Tns	Miocene	Neroly Sandstone, with minor siltstone	Local siltstone member.
Tc	Miocene	Cierbo Sandstone	Blue, volcanic-rich sandstone with abundant marine fossils.
Tks	Oligocene	Kirker Tuff	Pumiceous white tuff, minor tuffaceous sandstone, conglomerate, and siltstone. Also mapped as Tkt.
Tmku	Eocene	Markley Formation, upper member	Bedded sandstone, siltstone, and claystone.
Tsu	Eocene	Sidney Flat Shale upper part, Markley Formation, upper member	Black shale with minor siltstone and sandstone.
Tsl	Eocene	Sidney Flat Shale lower part, Markley Formation, upper member	Interbedded shale and sandstone.
Tmkl	Eocene	Markley Formation, lower member	Thin-bedded to massive sandstone, with minor siltstone and mudstone.
Tlu	Eocene	Markley Formation, lower member, upper bed	Upper siltstone bed.
Tll	Eocene	Markley Formation, lower member, lower bed	Lower siltstone bed.
Tnv	Eocene	Nortonville Shale	Brown to grayish-green mudstone and claystone with minor siltstone and sandstone; marine.
Td	Eocene	Domingene Formation	Locally divided into 2 members: Tdu Brown sandstone with minor mudstone and conglomerate. Tdl Lower member. Siltstone and claystone with minor sandstone and basal conglomerate.
Tmd	Paleocene	Meganos Formation, sandstone member	Medium-grained, light gray to bluish-gray sandstone with carbonaceous laminations; pebble conglomerate present locally at base.
Tmc	Paleocene	Meganos Formation, shale member	Bluish-gray shale with sandstone interbeds.

Source: Graymer et al. 1994

Mineral Resources

There are currently no mineral development activities in or adjacent to Contra Loma. Some areas in EBRPD's adjacent Black Diamond Mines Regional Preserve were previously mined for coal, sandstone, and shale. From the 1860s through the turn of the last century, five coal mining towns thrived in the Black Diamond area: Nortonville, Somersville, Stewartville, West Hartley, and Judsonville. As the location of California's largest coal mining operation, nearly four million tons of coal ("black diamonds") were removed from the earth in the Black Diamond area. After coal mining ceased, underground mining for sand began near the deserted Nortonville and Somersville townsites in the 1920s. The Somersville mine supplied sand used in glass and the Nortonville mine supplied casting sand used in foundries. When sand mining ceased in 1949, more than 1.8 million tons of sand had been removed from the mines (East Bay Regional Park District 2011d).

Soils

The soils that cover Contra Loma and adjacent areas are weathering products derived from the underlying or upslope geologic units, and, as a result, the composition and the properties of soils vary within the area. A majority of the soils within Contra Loma are clay-rich soils that have slow infiltration rates and high runoff potential (Figure 3-16 and Table 3-13).

Clay soils in the area exhibit low permeability when compacted, and many of the soils have a relatively high shrink and swell potential (East Bay Regional Park District 1975b). The clay soils are fairly erodible when disturbed, but soils with higher sand and silt content have an even higher potential for erosion when disturbed.

Soil depth to bedrock generally varies by slope grade; soils on steep slopes are generally shallower than soils on gentle slopes. Within Contra Loma, approximately 70 percent of the land has slopes of less than 10 percent and 85 percent of the land has slopes of less than 25 percent. Slopes under 25 percent generally contain soils that are deep (> 40 inches) to moderately deep (20 to 40 inches), and slopes greater than 25 percent generally contain soils that are moderately deep (20 to 40 inches) to shallow (< 20 inches). The shallowest soil in the area is the Millsholm Loam, which is located near the southwest boundary of Contra Loma, while the deepest soil is the Capay Clay, which is located near the northeast boundary.