MTP/SCS
Appendix E-4
Natural Resource Data

APPENDIX E-4
NATURAL RESOURCES DATA

This appendix contains information about the biological and hydrological resources in the MTP/SCS plan area.

Biological Resources

This section contains information on the following biological resources:

- land cover types and associated biological habitat uses,
- invasive plants,
- waters of the United States (including wetlands), and
- special-status species.

The key sources of data and information used to identify existing biological resources are listed below:

- a records search of the California Natural Diversity Database (CNDDB) for Sacramento, Sutter, Yolo, Yuba, Placer, and El Dorado Counties;
- the U.S. Fish and Wildlife Service (USFWS) list of endangered, threatened, and proposed species for Sacramento, Sutter, Yolo, Yuba, Placer, and El Dorado Counties;
- CDFG's List of Special Vascular Plants, Bryophytes, and Lichens (California Department of Fish and Game 2010);
- a list from the California Native Plant Society's (CNPS's) 2011 online Inventory of Rare and Endangered Plants for Sacramento, Sutter, Yolo, Yuba, Placer, and El Dorado Counties (California Native Plant Society 2011);
- the California Department of Food and Agriculture's (CDFA's) Pest Ratings of Noxious Weed Species and Noxious Weed Seed (California Department of Food and Agriculture 2010);
- the California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California. Prepared for California Department of Transportation, California Department of Fish and Game, and Federal Highways Administration (Spencer et al 2010);
- the California Invasive Plant Council's (Cal-IPC's) California Invasive Plant Inventory (California Invasive Plant Council 2006, 2007);
- the California Flora Database (Calflora 2011);

- preliminary information on Habitat Conservation Plans for the Bay Delta, Sacramento, Sutter, Yuba, Yolo, and Placer Counties; and
- USFWS' National Wetland Inventory Maps.

Land Cover Types and Associated Habitat Uses and Values

Information about the locations and distribution of land cover types in the MTP/SCS plan area was compiled from mapping data from the sources listed below.

- Yuba-Sutter HCP/NCCP (in progress)
- South Sacramento HCP/NCCP (in progress)
- Placer County Conservation Plan (in progress)
- Yolo County HCP/HCCP (in progress)
- California Vegetation Maps (CALVEG) for the North Sierran and Central Valley ecological zones (available: http://www.fs.fed.us/r5/rsl/clearinghouse/gettiles.shtml)

The mapping scales of land cover data obtained from these sources varied from general natural community types to specific vegetation alliances. Therefore, for the purposes of this program-level document, land cover data was grouped into general land cover types within three broad categories: wildlands, agriculture, and developed/disturbed areas.

Wildlands

Grassland

Within the MTP/SCS plan area there are two types of grassland land cover types; annual grassland and perennial grassland. Annual grassland is one of the most common plant communities in the MTP/SCS plan area and is dominated by nonnative annual grasses, nonnative native forbs, and native forbs. Grasslands are found on ridges, hill slopes, and valley floors. Representative species include a mix of dominant nonnative grasses such as soft chess (*Bromus hordeaceus*), red brome (*B. madritensis ssp. rubens*), ripgut brome (*B. diandrus*), foxtail barley (*Hordeum murinum* spp. *leporinum*), wild oat (*Avena* spp.), and annual fescues (*Vulpia* spp.), intermixed with forb species such as clovers (*Trifolium* spp.), lupines (*Lupinus* spp.), owl's clover (*Castilleja* spp.), popcornflower (*Plagiobothrys* spp.), poppies (*Eschscholzia* spp.), and various species of filaree (*Erodium* spp.). Some annual grasslands in the MTP/SCS plan area are subject to frequent disturbance, such as grazing and maintenance activities along roadsides. The annual grassland vegetation in these areas may be dominated by introduced nonnative species, such as yellow star-thistle (*Centaurea solstitialis*).

Perennial grassland is dominated by native perennial bunchgrass plants that are intermixed with species typical of the aforementioned annual grassland. Perennial grassland is not common in California, and is considered a sensitive natural community by the CDFG. Several areas of this land cover type are habitat restoration sites created and set aside specifically for this community.

In the MTP/SCS plan area, grasslands are important because they support insects, amphibians, reptiles, and small birds and mammals that are prey for other wildlife, such as red-tailed hawks, northern harriers, American kestrels, burrowing owls, and coyotes. Grasslands near open water and woodland habitats are used by the greatest number of wildlife species because they provide places for resting, breeding, and escape.

Annual grassland is a common plant community regionally and statewide. Both types of grassland stabilize soils, protect watersheds from erosion, and provide forage for wildlife and livestock. They also provide habitat for a variety of special-status species.

Chaparral

Chaparral communities typically occur on the drier slopes of the foothill region and are characterized by drought-resistant shrubs. These communities are relatively uncommon in the foothill regions of the MTP/SCS plan area. Dominant species in chaparral communities in the MTP/SCS plan area include manzanita species (*Arctostaphylos* spp.), buckbrush (*Ceanothus* spp.), black sage (*Salvia mellifera*), coyote brush (*Baccharis pilularis*), scrub oak (*Quercus berberidifolia*), leather oak (*Q. durata*) and chamise (*Adenostoma fasciculatum*). The herbaceous understory varies depending on the density of shrub cover, and typically includes native grasses and wildflowers.

Chaparral plants provide browse, berries, and seeds for a variety of birds, such as California quail, northern mockingbird, American robin, hermit thrush, rufous-sided towhee, California towhee, dark-eyed junco, and golden-crowned sparrow. Insectivorous birds, such as orange-crowned warbler, bushtit, and Bewick's wren, feed on insects in chaparral foliage. Many bird species also find nesting and roosting sites and protection from predators in chaparral habitats. Numerous rodents inhabit chaparral habitats, and deer, rabbits, and hares make extensive use of chaparral sources of food and cover. In addition, chaparral provides foraging and refuge habitat for other mammals and reptiles, including gray fox, coyote, deer mouse, western fence lizard, western rattlesnake, and gopher snake.

Special-status wildlife species that may occur in chaparral habitat include California horned lizard, and Marysville kangaroo rat. Some chaparral communities, especially those found in the lower foothill region of El Dorado County, provide habitat for a variety of special-status plant species.

Scrub

Four scrub land cover types have been identified in the MTP/SCS plan area: alkali desert scrub, alpine dwarf scrub, low sage scrub, and sagebrush scrub. These areas are characterized by typically low growing (i.e., 25–0.5m tall) shrubs that have varying canopy density. Although generally dominated by shrubs, small trees and herbaceous annual species may also occur in these scrub areas.

No special-status wildlife in MTP/SCS plan area were identified as potentially occurring in this habitat.

Valley Oak Savanna

In the MTP/SCS plan area, the valley oak savanna occurs in the valley and at the mid- to upper elevations. These communities are dominated by valley oak (*Q. lobata*), but blue oak (*Q. douglasii*) and interior live oak *(Q. wislizeni*) may also be present. The canopy cover is less than 10 percent, the shrub layer is sparse or absent, and the herbaceous layer consists of grassland.

Valley oak savanna communities provide important breeding, foraging, and cover habitat for several wildlife species common to the region. The upper canopy of the oak trees provides nesting, foraging, and cache sites for many birds, such as Lewis' woodpecker, acorn woodpecker, northern flicker, oak titmouse, western bluebird, mourning dove, and red-tailed hawk; the understory grassland layer provides nesting and foraging habitat for many common species of birds, small mammals, and reptiles.

Special-status wildlife species that could occur in valley oak savanna communities in the MTP/SCS plan area include western spadefoot, western pond turtle, California horned lizard, white-tailed kite, Cooper's hawk, golden eagle, purple martin, Townsend's big-eared bat, and pallid bat.

Valley Oak Woodland

Valley oak woodlands are differentiated from oak savanna by the amount of canopy cover within the community. Valley oak woodland canopy cover ranges from approximately 10–60 percent. Oak woodlands are dominated by valley oak, but interior live oak, and coast live oak (*Q. agrifolia*) are also present. The understory of valley oak woodlands varies from sparse to well-developed, including shrubs such as poison oak (*Toxicodendron diversilobum*), ceanothus (*Ceanothus* spp.), and scrub oak. The herbaceous understory frequently contains plant species found in annual grasslands.

Valley oak woodland communities provide important breeding, foraging, and cover habitat for several wildlife species common to the region. The upper canopy of the oak trees provides nesting, foraging, and cache sites for many birds, such as Lewis' woodpecker, acorn woodpecker, northern flicker, oak titmouse, western bluebird, mourning dove, and red-tailed hawk; the understory layer provides nesting and foraging habitat for many common species of birds, small mammals, and reptiles.

Special-status wildlife species that could occur in valley oak woodland communities in the MTP/SCS plan area include western spadefoot, western pond turtle, California horned lizard, white-tailed kite, Cooper's hawk, golden eagle, purple martin, Townsend's big-eared bat, and pallid bat.

Foothill Woodland

Foothill woodlands occur along the slopes of the both Sierra Nevada foothill regions of Placer, El Dorado, and Yuba counties and the interior coast ranges of Yolo County. This land cover type included woodlands dominated by blue oak, canyon live oak (*Q. chrysolepis*), coast live oak, foothill pine (*Pinus sabiniana*), juniper (*Juniperus* spp.), and knobcone pine (*Pinus attenuata*).

A variety of common wildlife species inhabit foothill woodlands. These areas represent important habitat for nesting birds, roosting habitat for bats that utilize tree cavities, wintering habitat for deer, and resident habitat for many common mammals.

Montane Forest

Montane forest communities occur in the Sierra Nevada foothill and mountainous regions of Placer, El Dorado, and Yuba counties. These forest communities are dominated by a mix of pines (depending on the elevation), black oaks (*Q. kelloggii*), red fir (*Abides magnificent*), white fir (*A. councilor*), incense-cedar (*Calocedrus decurrens*), quaking aspen (*Populus tremuloides*), Douglas-fir (*Pseudotsuga menziesii*), juniper, Pacific madrone (*Arbutus menziesii*). Pine species that occur in montane forest are ponderosa pine (*P. ponderosa*), Jeffrey pine (*P. jeffreyi*), sugar pine (*P. lambertiana*), and lodgepole pine (*P. contorta*).

Species composition of the understory of the montane forest communities varies widely with elevation, slope aspect, and fire history of individual stands. However, in most areas, the shrub and herbaceous layers occur primarily at forest edges or in canopy openings, such as rock outcrops and other natural or artificial clearings.

Large mammals that frequent montane forest communities include coyote, black bear, mountain lion, and bobcat. A variety of smaller rodents, squirrels, and shrews are found in shrub thickets and open patches within the forest. Amphibians and reptiles that occur in forest communities include California newt, long-toed salamander, Pacific treefrog, western toad, western fence lizard, northern alligator lizard, gopher snake, common kingsnake, mountain kingsnake, common garter snake, and western rattlesnake.

A variety of flycatchers, vireos, warblers, and many other birds occur in montane forests. Canopy-dwelling species include olive-sided flycatcher, golden-crowned kinglet (winter only), and western tanager. Large snags and the decaying portions of living trees offer nesting cavities for pileated woodpecker, western screech owl, and northern flicker. The forest also provides food and habitat for a variety of birds, including white-headed woodpecker, white-breasted nuthatch, red-breasted nuthatch, chestnut-backed chickadee, mountain chickadee, dark-eyed junco, spotted towhee, black-headed grosbeak, and evening grosbeak.

Special-status species that are known to visit this habitat include western pond turtle, northern goshawk, California spotted owl, great gray owl, yellow warbler, American marten, Pacific fisher, ringtail, and bats such as Yuma myotis and pallid bat. There are also a variety of special-status plants that are known to occur within montane forest communities in the Sierra Nevada region.

Riparian

Riparian land cover types occur along creeks, rivers, and other water bodies in the MTP/SCS plan area. The composition and structure of vegetation varies among riparian areas on the valley floor, in the foothills, and in montane areas, but typically includes willows (*Salix* spp.), Fremont's cottonwood (*Populus fremontii* ssp. *fremontii*), valley oak, California sycamore (*Platanus racemosa*), box elder (*Acer negundo* var. *californicum*), Oregon ash (*Fraxinus*

latifolia), white alder (*Alnus rhombifolia*), and wild grape (*Vitis californica*). The shrub layer of riparian areas is also highly variable and can range from extremely sparse to well-developed. The herbaceous understory of riparian areas typically contains a mixture of native and introduced species.

Despite widespread disturbances resulting from urbanization, agricultural conversion, and grazing, riparian forests remain important wildlife resources because of their scarcity regionally and statewide and because the riparian community is used by a large variety of wildlife species. This habitat supports abundant aquatic and terrestrial invertebrates that are prey for amphibians and reptiles, such as common garter snakes, western skinks, and ringneck snakes, as well as insectivorous birds, such as warblers, northern flickers, downy woodpeckers, and flycatchers. Small mammals found in riparian habitats include shrews, voles, bats, and mice. Raptors that nest in large riparian trees include great horned owls, red-tailed hawks, and American kestrels. Cavity-dependent species, such as woodpeckers, bats, squirrels, and raccoons, require mature stands of trees. Striped skunks, red foxes, gray foxes, and badgers forage in riparian habitats and use them for cover and travel.

Elderberry shrubs within riparian woodlands in the MTP/SCS plan area provide habitat for valley elderberry longhorn beetle, a species listed as threatened under the federal Endangered Species Act (ESA). Riparian woodlands also provide nesting habitat for several special-status raptors, including osprey, bald eagle, Cooper's hawk, Swainson's hawk, and white-tailed kite. Although it is a very rare species, western yellow-billed cuckoos potentially could nest in very dense areas of riparian woodland. Cavities in riparian trees along waterways in the MTP/SCS plan area may be used as roosting sites by some species of special-status bats, such as pallid bat.

Many riparian forests (especially those found in the MTP/SCS plan area) represent uncommon plant communities regionally and statewide because of historic and continuing habitat loss. These communities provide essential habitat functions and values for many species. For this reason, riparian habitat has been designated by CDFG as a critical primary habitat. Land conversion practices and flood control projects have been identified as the primary causes of riparian habitat loss.

Wetland

The MTP/SCS plan area contains a variety of seasonal and perennial wetland communities and riverine communities. Wetlands are ecologically productive habitats that support a rich variety of both plant and animal life. The importance and sensitivity of wetlands has increased as their value as recharge areas and filters for water supplies has become recognized. The most common types of wetlands in the MTP/SCS plan area, seasonal wetlands (including vernal pools) and fresh emergent wetlands, are discussed below.

Vernal Pools and Other Seasonal Wetland Communities

Seasonal wetlands are typically shallow depressions that frequently occur in grasslands and are inundated only during the rainy season. Vernal pools are a type of seasonal wetland that is characterized by the presence of an impermeable hardpan layer, a unique hydrologic cycle, and a plant community that adapted to conditions within vernal pools. Vernal pools provide habitat for numerous plant, vertebrate, and invertebrate species, many of which are endemic to vernal pools.

Seasonal wetlands, including vernal pools and seasonal swales, provide habitat for a variety of wildlife species. During the wet season when seasonal wetlands and vernal pools are ponded, avian species such as killdeer black-necked stilts, American avocets, great egrets, and greater yellowlegs commonly forage on the many invertebrate and amphibian larvae commonly found in this habitat. Seasonal wetlands are also an important breeding habitat for several amphibian species that depend on these temporary water bodies for successful reproduction.

Vernal pools and other types of seasonal wetlands provide habitat for several special-status wildlife species in the MTP/SCS plan area, including vernal pool fairy shrimp, vernal pool tadpole shrimp, Conservancy fairy shrimp, Delta green ground beetle, California tiger salamander, and western spadefoot toad.

Special-status plants that may occur in these seasonal wetland communities include Bogg's Lake hedge-hyssop (*Gratiola heterosepala*), legenere (*Legenere limosa*), dwarf downingia (*Downingia pusilla*), Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*), Sacramento Orcutt grass (*Orcuttia viscida*), slender Orcutt grass (*Orcuttia tenuis*), Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*, and pincushion navarretia (*Navarretia myersii* ssp. *myersii*).

Vernal pools are sensitive natural communities that are being lost increasingly as a result of conversion of land to other uses. One priority of several of the HCPs that are currently being prepared for areas within the SACOG region is to conserve and protect remaining vernal pool complexes within the respective planning areas.

Fresh Emergent Wetland Communities

This community is distinguished from deepwater aquatic habitats and other wetlands by the presence of tall, perennial, grass-like plants rooted in soils that are permanently or seasonally flooded or inundated. Characteristic species include broadleaf cattail (*Typha latifolia*), California bulrush (*Schoenoplectus californicus*), creeping spikerush (*Eleocharis macrostachya*), Pacific rush (*Juncus effusus* var. *pacificus*), Baltic rush (*Juncus balticus*), mannagrass (*Glyceria* spp.), water primrose (*Ludwigia* spp.), water-plantain (*Alisma plantago*-aquatica), and swamp smartweed (*Polygonum hydropiperoides*).

In the MTP/SCS plan area, fresh emergent wetlands are often associated with small artificial ponds, reservoirs, natural drainages, irrigation canals, and roadside ditches.

Characteristic water birds that nest in emergent wetlands include Canada goose, mallard, cinnamon teal, gadwall, Virginia rail, American coot, common moorhen, and Wilson's snipe. These species may be joined by migratory and wintering waterfowl such as American wigeon, northern shoveler, northern pintail, green-winged teal, ring-necked duck, bufflehead, and ruddy duck. Amphibians and reptiles that are found in fresh emergent wetland communities include western toad, Pacific tree frog, common garter snake, and western aquatic garter snake.

Special-status wildlife species in the MTP/SCS plan area that may use this community type include California tiger salamander, California red-legged frog, western pond turtle, giant garter snake, northern harrier, white-tailed kite, California black rail, saltmarsh common yellowthroat, and tricolored blackbird. There are also a variety of special-status plants that are known to occur in this wetland community.

Riverine Systems

Riverine systems comprise permanent, intermittent, and ephemeral drainages. Most of the rivers in the MTP/SCS plan area and their tributaries are part of the Sacramento–San Joaquin River watershed. This includes streams and creeks, as well as their associated gravel and sand bars.

A variety of invertebrate and vertebrate species occur in riverine ecosystems in the MTP/SCS plan area. Invertebrates that might be found in rivers and creeks include mayflies, alderflies, stoneflies, dragonflies, damselflies, water striders, and caddis flies.

Fish-eating birds such as ospreys and bald eagles forage for fish near the surface of pools and shallow waters along the rivers. Belted kingfishers, double-crested cormorants, and common mergansers also forage for fish in streams and reservoirs. Many amphibians and reptiles depend on riverine systems; these include California newt, western toad, foothill yellow-legged frog, western terrestrial garter snake, western aquatic garter snake, and western pond turtle. Mammals in riverine systems include northern river otter, American mink, muskrat, and American beaver. Emerging aquatic insects are a major food source for many bat species that forage over open waters in the MTP/SCS plan area.

Low-elevation rivers and large, perennial creeks support runs of Chinook salmon and Central Valley steelhead. Other native fish species include hitch, Sacramento roach, hardhead, Sacramento sucker, riffle sculpin, Sacramento pike minnow, and Pacific lamprey.

Open Water/Lakes and Reservoirs

The MTP/SCS plan area contains several lakes, reservoirs, and flood control basins, including Folsom Lake, Rollins Reservoir, Sugar Pine Reservoir, New Bullards Bar Reservoir, Collins Lake, and Camp Far West Reservoir. There are many other small reservoirs, lakes, and ponds throughout each of the counties. Many of these large water bodies support perennial and seasonal wetland and riparian communities along their edges.

These reservoirs provide habitat for a variety of waterfowl, including goose species, mallard, cinnamon teal, green-winged teal, American wigeon, northern pintail, northern shoveler, gadwall, ruddy duck, and merganser, and can provide important resting and foraging habitat for many waterfowl species during migration.

Vegetation growing along the edges of water bodies also provides nesting habitat for several bird species and foraging and refuge habitat for numerous amphibian, reptile, and mammal species occupying the open water and adjacent grassland, woodland, and forest habitats.

Barren

Barren areas in the MTP/SCS plan area include cliffs, rock outcrops, and serpentine barrens that support little, if any, vegetative cover.

Agriculture

Agricultural lands occur throughout the valley and lower foothill regions of the MTP/SCS plan area. Agricultural lands include, but are not limited to, irrigated pastures, vineyards, rice fields, row crops, and orchards. Depending on the crop pattern and the land's proximity to native habitats, agricultural lands can provide relatively high-value habitat for wildlife, particularly as foraging habitat. Raptor species use row- and grain-crop agricultural lands for foraging because several species of common rodents are found in agricultural fields. Agricultural habitats also provide foraging and resting habitat for migrating and wintering waterfowl and shorebirds.

Special-status wildlife species associated with agricultural lands, such as northern harrier and giant garter snake, may use adjacent irrigation canals and freshwater marsh vegetation for foraging or breeding. Giant garter snakes have the potential to occur in irrigation canals and can use the adjacent agricultural lands as foraging and basking habitat. Swainson's hawks also forage in agricultural land types such as alfalfa and grain crops.

Orchards and Vineyards

Areas mapped as orchards and vineyards occur in both the valley and lower foothill regions of the MTP/SCS plan area, with the majority of orchards composed of walnut, plum, or peach trees. This type of agriculture requires active maintenance such as irrigation, pruning, and frequent mowing or herbicide use to discourage vegetation. If present, vegetation typically consists of nonnative, weedy species. The vineyards in the study area contain grape vines, and maintenance is comparable to that in orchards.

Row and Field Crops

Agricultural areas mapped as row and field crops are distributed primarily in the valley regions of the MTP/SCS plan area. Row and field crops include both active and fallow fields that exhibit indicators of tillage. Row and field crop types mapped in the study area include alfalfa, croplands, grain and hay, irrigated grain crops, irrigated hay field, irrigated row and grain crops, dry land grain crops, and upland crops. Active row and field crops are maintained with irrigation and herbicide application. Alfalfa, hay, and rotating crop farming methods can mean a given piece of land may be harvested several times during the course of the year. The margins of row and field crops typically support nonnative, weedy species.

Rice

Areas mapped as rice, primarily in the valley regions of the MTP/SCS plan area, are agricultural lands planted in rice and include both flooded and fallow rice fields. Rice fields commonly include irrigation features such as berms, ditches, canals, and water control structures. Rice is grown as a monoculture, using tillage or herbicides to eliminate unwanted vegetation; remaining vegetation is generally confined to the berms, ditches, and canals between and around fields, and is dominated by wetland plants, both native and nonnative.

Pasture

Areas mapped as pasture occur in both the valley and lower foothill regions of the MTP/SCS plan area, and consist of actively irrigated fields utilized for grazing purposes. Vegetation in pastures, which is regularly grazed or mowed, typically consists of grasses, rushes, and legumes that form a dense ground cover. Representative species are nonnative clovers (*Trifolium* spp.), dallis grass (*Paspalum dilatatum*), and Italian ryegrass (*Lolium multiflorum*).

Irrigation Canal

Areas mapped as irrigation canals are composed ditches, canals, and levees that convey and distribute water to agricultural lands (e.g., row and field crops, irrigated pasture, rice, orchard and vineyard) in the MTP/SCS plan area. Irrigation canals are typically maintained and cleared of vegetation, although some may contain wetland vegetation characteristic of fresh emergent wetland communities.

Developed/Disturbed

Developed

Developed areas within the MTP/SCS plan area are characterized by residential and commercial properties, infrastructure, and impermeable surfaces. The composition of vegetation within developed areas is variable, but most are ornamental species planted for landscaping or horticulture (e.g., fruit trees) and are actively irrigated. Developed areas also contain weedy plant species, some of which are considered invasive by the CDFA and Cal-IPC. Representative weed species that occur in these areas are black mustard (*Brassica nigra*), bristly ox-tongue (*Picris echioides*), Himalayan blackberry, pampas grass (*Cortaderia jubata*), Bermuda grass (*Cynodon dactylon*), Italian ryegrass, Bermuda buttercup (*Oxalis pes-caprae*), and periwinkle (*Vinca major*).

Developed areas in the MTP/SCS plan area also contain inclusions of annual grassland, riparian habitat along streams and rivers, and landscaped areas. These habitat types, in addition to the ornamental landscaping, in the developed areas provide nesting and foraging habitat for common bird species, including house sparrow, northern flicker, western scrub-jay, northern mockingbird, Brewer's blackbird, and European starlings. California ground squirrels, eastern gray squirrels, house mice, and striped skunks can also be found using habitats in urban landscapes, such as parks, schools, and vacant lots.

Disturbed

The disturbed portions of the MTP/SCS plan area include nonagricultural areas that have been heavily disturbed or graded such as landfills, gravel mines, and mine tailings. The vegetation in disturbed areas varies in density and typically contains a large proportion of nonnative species.

Landscaped

Landscaped portions of the MTP/SCS plan area include urban parks, golf courses, and urban woodlands, which are frequently located within city limits and are typically surrounded (partially or fully) by developed areas. Landscaped areas vary in size from large areas that may include remnant patches of natural vegetation to small, heavily landscaped and managed playgrounds and ball fields.

Nonnative Vegetation

The areas of nonnative vegetation that have been identified in the MTP/SCS plan area consist of dense, monotypic patches of nonnative trees, shrubs, or herbs including: black locust (*Robinia pseudoacacia*), eucalyptus (*Eucalyptus* spp.), Himalayan blackberry, tamarisk (*Tamarisk* spp.), giant reed (*Arundo donax*), and perennial pepperweed (*Lepidium latifolium*).

Invasive Plants

The MTP/SCS plan area contains plant species that are considered invasive plants or noxious weeds by Cal-IPC and/or CDFA. According to the California Flora Database (Calflora 2011), 204 invasive plant species have been reported in El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba Counties. The introduction and spread of invasive plants adversely affect natural plant communities by altering ecosystem processes (e.g., fire frequency, hydrological cycles), displacing native plant species, and reducing the quality of habitats that provide shelter and forage for wildlife species (California Invasive Plant Council 2006). Invasive plants also affect the quality of forage on rangelands and cropland productivity. Invasive plant ratings assigned by Cal-IPC and CDFA are based on multiple criteria, including ecological impacts, invasive potential, distribution, the likelihood that eradication or control efforts would be successful, and perceived importance by CDFA and Cal-IPC.

Invasive plants in the MTP/SCS plan area were not inventoried for this program-level analysis because target invasive plants would differ widely from project site to project site, depending on the sensitivity of the site to infestation, the nature of the specific proposed project, and the type of invasive plants in the immediate specific project area. Target lists of invasive plants for specific project implementation would include both CDFA and Cal-IPC species, with priority given to CDFA A-rated weed species and species designated as ‘high’ or ‘moderate’ invasive plants by Cal-IPC. Some CDFA B- and C-rated species would be included on project-specific target lists if they are identified by the applicable county agricultural commissioner as target invasive plants. Federal Executive Order (EO) 13112, signed on February 3m 1999, directs federal agencies to prevent and control the introduction of invasive species,

Wetlands and Other Waters

The MTP/SCS plan area contains numerous types of wetlands and other waters (i.e., non-wetlands) that are subject to state and/or federal regulation. Compliance with regulations for wetlands and other waters in the MTP plan area would be required on a project-level basis. Wetlands and other waters in the MTP plan area are discussed briefly below; more detailed

information is provided in the discussion of land cover types. Applicable regulations and regulatory agencies are discussed under 'Regulatory Setting'.

The U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA) define wetlands as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (40 Code of Federal Regulations [CFR] 232.2). This definition is referred to as a *three-parameter definition* because positive indicators of all three wetland criteria (vegetation, soils, and hydrology) must be present. The most common wetland land cover types identified in the MTP/SCS plan area are seasonal wetlands (including vernal pools) and freshwater emergent wetlands. Areas identified as other waters typically lack positive indicators of one or more wetland criteria. Other waters that occur in the MTP/SCS plan area include streams, creeks, rivers, irrigation canals, reservoirs, and ponds.

Habitat Corridors

The Plan Area encompasses larger large areas of wildlands that provide habitat for both common and rare plants and animals. Some of these areas were mapped as Essential Connectivity Areas (ECA) for the California Essential Habitat Connectivity Project, which was commissioned by the California Department of Transportation and California Department of Fish and Game with the purpose of making transportation and land-use planning more efficient and less costly, while helping reduce dangerous wildlife-vehicle collisions (Spencer et al 2010). The ECAs weren't developed for the purposes of defining areas subject to specific regulations by the California Department of Fish and Game, or other agencies.

The Essential Connectivity Areas (ECA) are not regulatory delineations and are identified as lands likely important to wildlife movement between large, mostly natural areas at the state wide level. The ECAs form a functional network of wildlands that are considered important to the continued support of California's diverse natural communities. The ECAs were not developed for the needs of particular species but were based primarily on the concept of ecological integrity, which considers the degree of land conversion, residential housing impacts, road impacts, and status of forest structure (for forested areas) (Spencer et al 2010). In addition, consideration was given to the degree of conservation protection and areas known to support high biological values, such as mapped Critical Habitat and hotspots of species endemism (Spencer et al 2010). ECAs are placeholder polygons that can inform land-planning efforts, but that should eventually be replaced by more detailed linkage designs, developed at finer resolution at the regional and ultimately local scale based on the needs of particular species and ecological processes. ECAs occur in within all six of the counties comprising the plan area with El Dorado, Placer, and Sacramento counties having the largest blocks of ECAs. There are total of 20 ECAs mapped within the plan area with many of these having some overlap. There are total of 1,032,641 acres of ECA lands mapped within the plan area, which equates to roughly ¼ of the plan area. These areas are comprised of mostly wildlands, but also include certain agricultural areas and certain developed areas (mostly rural residential).

Special-Status Species

Special-status species are plants and animals that are legally protected under the California Endangered Species Act (CESA), the ESA, or other regulations, as well as species considered sufficiently rare by the scientific community to qualify for such listing. Special-status species are defined as:

- species listed or proposed for listing as threatened or endangered under the ESA (Title 50, CFR, Section 17.12 for listed plants, 50 CFR 17.11 for listed animals, and various notices in the FR for proposed species);
- species that are candidates for possible future listing as threatened or endangered under the ESA (75 FR 69222, November 10, 2010);
- species that are listed or proposed for listing by the State of California as threatened or endangered under CESA (Title 14, CCR, Section 670.5);
- plants listed as rare under the California Native Plant Protection Act of 1977 (California Fish and Game Code, Section 1900 et seq.);
- plants considered by CDFG and CNPS to be "rare, threatened, or endangered in California" (Rare Plant Ranks 1B and 2; California Department of Fish and Game 2010; California Native Plant Society 2011);
- plants identified by CDFG and CNPS about which more information is needed to determine their status, and plants of limited distribution (Rare Plant Ranks 3 and 4, California Department of Fish and Game 2010; California Native Plant Society 2011), which may be included as special-status species on the basis of local significance or recent biological information; ;
- species that meet the definition of rare or endangered under the State CEQA Guidelines, Section 15380;
- animals fully protected in California (California Fish and Game Code, Section 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]); or
- animal species of special concern to CDFG (California Department of Fish and Game 2011).

Critical habitat for various federally listed species has been designated in each of the counties within the MTP/SCS plan area.

Hydrological Resources

Climate and Topography

The topography in the Proposed MTP/SCS plan area (hereafter, plan area) varies from relatively flat areas in the Sacramento-San Joaquin Delta and the northern portion of the California Central Valley to steeper slopes and greater elevations in the Sierra Nevada foothills in the east and the Coast Range foothills in the west. Elevations in the plan area along the Sacramento River and in the southern portion in the Sacramento-San Joaquin Delta are generally at or below sea level.

Near the foothills of the Coast Range and the Sierra Nevada, elevations in the plan area range from greater than 2,000 feet above mean sea level (amsl) to greater than 7,000 feet amsl, respectively.

In general, the plan area experiences a typical Mediterranean climate with hot, dry summers and cool, wet winters. Average high temperatures during the summer range from 80 to 90 degrees Fahrenheit in the coastal and Sierra Nevada foothills to 90 to 100 degrees Fahrenheit in the Sacramento Valley (NOAA 2006). During winter, average low temperatures range from approximately the low 30s (degrees Fahrenheit) in the Sierra Nevada foothills to the low 50s (degrees Fahrenheit) in the Sacramento Valley (NOAA 2006).Precipitation varies in the plan area.

Watersheds and Hydrological Characteristics

The Sacramento River Hydrologic Region encompasses an area of approximately 17.4 million acres (27,200 square miles) and contains all or large portions of Modoc, Siskiyou, Lassen, Shasta, Tehama, Glenn, Plumas, Butte, Colusa, Sutter, Yuba, Sierra, Nevada, Placer, Sacramento, El Dorado, Yolo, Solano, Lake and Napa counties. Most of northern California is located in the Sacramento River Hydrologic Region, which encompasses several watersheds of various sizes (DWR 2003b).

A small portion of the plan area lies in the San Joaquin River Hydrologic Region. The San Joaquin River Hydrologic Region covers approximately 9.7 million acres (15,200 square miles) and contains all or parts of Calaveras, Tuolumne, Mariposa, Madera, San Joaquin, Stanislaus, Merced, Amador, Alpine, Fresno, Alameda, Contra Costa, Sacramento, El Dorado, and San Benito counties (DWR 2003c).

Major watersheds in the Sacramento River Hydrologic Region and San Joaquin River Hydrologic Region that lie in the plan area include: the American River; Bear River; Cache Creek; Cosumnes River; Feather River; Mokelumne River; Putah Creek; Sacramento River; and Yuba River. These watersheds and their major surface waters, including average annual flows and reservoir capacities, are summarized in Tables 11-1 and 11-2. Ultimately, these watersheds drain to the Sacramento-San Joaquin River Delta.

Table 11-1. Major Rivers, Creeks, and Drainage Canals

	Annual Average Flows (cfs)[a]	Drains/Tributary to
American River Watershed		
North Fork American River	2,300	Main Branch American River
Middle Fork American River	1,300	Main Branch American River
South Fork American River	1,500	Main Branch American River
Main Branch American River	3,800	Sacramento River
Rubicon River	400	Middle Fork American River
Silver Fork	N/A	South Fork American River
Bear River Watershed		
Bear River	450	Feather River
Cache Creek Watershed		
Cache Creek	540	Sacramento River / Yolo Bypass
Cosumnes River Watershed		
Cosumnes River	600	Mokelumne River
Laguna Creek	15	Sacramento River
Folsom South Canal	3,500	Lake Natomas
Feather River Watershed		
Feather River	8,300	Sacramento River
Honcut Creek	600	Feather River
Yuba River	2,400	Feather River
Bear River	450	Feather River
Mokelumne River Watershed		
Mokelumne River	760	Sacramento-San Joaquin Delta
Cosumnes River	600	Mokelumne River
Dry Creek (Sacramento County)	78	Mokelumne River
Putah Creek Watershed		
Putah Creek	490	Sacramento River / Yolo Bypass
Sacramento River Watershed		
Sacramento River	24,200	Sacramento-San Joaquin Delta
Feather River	8,500	Sacramento River
Dry Creek	78	Sacramento River
Arcade Creek	19	Sacramento River
American River	3,800	Sacramento River
Morrison Creek	22	Sacramento River
Laguna Creek	15	Sacramento River
Yuba River Watershed		
Yuba River	2,400	Feather River
Dry Creek (Yuba County)	72	Yuba River

[a] USGS 2007.

Table 11-2. Major Lakes and Reservoirs

Reservoir	Location	Reservoir Capacity (acre-feet)a
American River Watershed		
Folsom Lake	Convergence of the North and South Forks of the American River	977,000
North Fork Dam/ Lake Clementine	Convergence of the North and Middle	14,700[b]
Lake Natoma	Main branch of the American River	9,000
Union Valley Reservoir	South Fork American River	277,300
Ice House Reservoir	South Fork Silver Creek	45,960
Bear River Watershed		
Camp Far West Reservoir	Bear River	104,000
Cache Creek Watershed		
N/A		
Cosumnes River Watershed		
Sly Park Reservoir/Jennison Lake	Cosumnes River	41,000
Rancho Seco Lake	Folsom Canal	160[c]
Feather River Watershed		
N/A		
Mokelumne River Watershed		
N/A		
Putah Creek Watershed		
N/A		
Sacramento River Watershed		
N/A		
Yuba River Watershed		
Lake Francis	Dobbins Creek	1,905[d]
Collins Lake	Dry Creek	1,600[e]
New Bullard's Bar Reservoir	Yuba River	966,000
Englebright Reservoir	Yuba River	70,000

N/A = Not applicable.

[a] DWR 2011a

[b] http://www.parks.ca.gov/?page_id=1141

[c] http://www.smud.org/en/about/Pages/recreation-rancho.aspx

[d] http://www.collinslake.com/

[e] http://findlakes.com/lake_francis_california~ca00866.htm

Accessed July 25, 2011.

The American River Watershed is one of the largest watersheds in the plan area and overlies Placer, El Dorado and Sacramento counties. This watershed originates in the high Sierra Nevada, west of Lake Tahoe, and drains east until it ultimately discharges into the Sacramento River near the city of Sacramento. Major rivers and tributaries draining the watershed include the North, Middle, and South Forks of the American River; the Rubicon River, and Silver Fork Creek. Several major reservoirs in this watershed provide water storage and flood control, including Folsom Lake, Lake Natoma, Lake Clementine, Union Valley Reservoir, and Ice House Reservoir (SACOG 2008).

The Bear River watershed's boundary forms the northwestern border for the plan area. The watershed overlies portions of Placer and Yuba counties. This watershed originates in the lower Sierra Nevada foothills and drains to the Feather River. The Bear River is the major surface water in this watershed. Bear River flows are affected by Camp Far West Reservoir, which is located along the river on the northwestern border of Yuba and Placer counties (SACOG 2008).

The Cache Creek watershed is located in the eastern portion of the plan area and is entirely within Yolo County. The major surface water in the watershed is Cache Creek, which is a large stream that originates in the Coastal Ranges. The creek drains to the Sacramento River and, during heavy storms, to the Yolo Bypass (SACOG 2008).

The Cosumnes River watershed overlies the southwestern portion of the plan area and is located in El Dorado and Sacramento counties. Major surface waters in this watershed include the Cosumnes River, Laguna Creek, Sly Park Reservoir, Folsom South Canal, and Rancho Seco Lake. The Cosumnes River originates on the western slopes of the central Sierra Nevada and converges with the Mokelumne River in San Joaquin County before draining to the Sacramento-San Joaquin River Delta. Laguna Creek is a major tributary to the Cosumnes River. The Folsom South Canal is a major human-made canal that distributes water from Lake Natoma south of Folsom Dam to residents in eastern Sacramento County. Rancho Seco Lake provides minor water storage along the canal (SACOG 2008).

The Feather River watershed originates high in the northern Sierra Nevada Mountains and drains into Lake Oroville. This watershed is mostly outside of the plan area; however, the major surface water of the watershed, the Feather River, passes through the northern portion of the plan area. This portion of the Feather River converges with the Sacramento River approximately 20 miles north of Sacramento. Major tributaries that drain to the Feather River include Honcut Creek, the Yuba River, and the Bear River (SACOG 2008).

The Mokelumne River watershed is mostly outside of the plan area; however, the eastern portion of this watershed overlies the southern border. The Cosumnes River and Dry Creek drain into the Mokelumne River, which drains to the Sacramento-San Joaquin River Delta (SACOG 2008).

The Putah Creek watershed overlies the southeastern border of the plan area and is located in Yolo County. Putah Creek, the primary surface water in the watershed, originates in the Coastal Ranges. The creek is a major tributary to the Yolo Bypass (SACOG 2008).

The largest watershed in the plan area is the Sacramento River watershed, which encompasses the entire plan area. The Sacramento River is the main drainage in this watershed and originates near Mount Shasta in the Cascades Range (Domagalski 2000). Tributaries to the Sacramento River include the Feather River, Cache Creek, Putah Creek, Dry Creek, American River, Arcade Creek, Morrison Creek, and Laguna Creek. The Sacramento River drains an area of approximately 43,500 square miles including all or parts of six landforms or physiographic provinces—the Great Basin, the Middle Cascade Mountains, the Sierra Nevada, the Klamath Mountains, the Coast Ranges, and the Sacramento Valley (Domagalski 2000). It flows south from the northern mountain ranges through the plan area before discharging into the Sacramento-San Joaquin River Delta (SACOG 2008).

The Yuba River watershed originates in the Sierra Nevada and drains to the Feather River near Yuba City. The portion of the watershed in the plan area is in Yuba County. The Yuba River is the main surface water of this watershed. Reservoirs affecting flows in the Yuba River include Dry Creek, Collins Lake, Englebright Reservoir, and New Bullard's Bar Reservoir (SACOG 2008).

The Sacramento-San Joaquin River Delta receives runoff from approximately 40 percent of the state's land area, including through discharges from surface waters traversing the plan area, and covers an area of approximately 738,000 acres. Generally, lands in the Delta are at or below sea level and are protected from flooding by over a 1,000 miles of levees. The Delta is the terminus for the Sacramento and Mokelumne Rivers, as well as the Sacramento Deep Water Ship Channel. The Sacramento-San Joaquin River Delta provides habitat for several species of fish, birds, mammals, and plants; supports agriculture; provides recreational activities; and is key for water distribution throughout the State (DWR 2007a).

Flooding

Potential flood hazards in the plan area are related to 100-year flood events, the failure of levees located along several of the major rivers and in the Delta, and dam failures. A portion of the MTP plan area lies in a FEMA-identified 100-year floodplain. Recently, the U.S. Army Corps of Engineers and California Department of Water Resources have advised local communities that there is a greater potential for levee failure than previously thought. This is as a result of preliminary tests of levees for potential below levee seepage. Dams and some of the levees that provide flood protection to the region could potentially fail and inundate portions of the plan area.

Flood events can result in damage to structures or infrastructure, injury or loss of human and animal life, and the spread of waterborne diseases. In addition, standing floodwater can destroy agricultural crops, and contaminate groundwater. Flooding can also contribute to mudslides and slope instability. In urbanized areas, flood events can also overwhelm stormwater drainage systems resulting in additional flooding.

Because of the potential flood hazards in the plan area and the severe consequences of flooding, flood protection features have been implemented in and upstream of the plan area. Along the Sacramento and American Rivers and various other rivers and creeks in the plan area is a system of flow bypasses, dams, levees, and reservoirs to control flooding. Two key elements of this

flood protection system are the Yolo and Sutter Bypasses, which function as flood basins and divert floodwaters away from populated areas during the winter storm season. The Sacramento River and Putah and Cache Creeks drain floodwaters into these bypasses. There are several dams located in and around the plan area that provide flood protection. The most significant of these dams are Folsom, Natoma, Englebright Narrows, Sly Park, Ice House, Camp Far West North Fork, Union Valley Reservoir, and New Bullards Bar dams.

Several federal, state, and local agencies are responsible for maintaining flood protection features in the plan area. The U.S. Army Corps of Engineers (USACE) is a federal agency responsible for maintaining and repairing several levees and flood protection devices in the plan area. The California Department of Water Resources (DWR) provides dam safety and flood control services and is responsible for reducing the flood risk to Californians, developing a sustainable flood management system, and reducing the consequences of floods when they occur (DWR 2007c). Reclamation districts and local flood control agencies are also responsible for flood control and maintenance activities. These agencies include the Sacramento Area Flood Control Agency (SAFCA); West Sacramento Flood Control Agency; American River Flood Control District; Yolo County Flood Control and Water Conservation District; Sutter County Flood Control and Water Conservation District; Placer County Flood Control and Water Conservation District; Yuba County Water Agency; and El Dorado County Water Agency.

Groundwater

The Sacramento groundwater basin makes up the northern part of the great Central Valley groundwater basin. The Sacramento groundwater basin is bound on the east by the Sierra Nevada and southern Cascades, and on the west by the crest of the Coast Range and Klamath Mountains. It extends north past Redding and south to the Sacramento-San Joaquin River Delta. The Sacramento groundwater basin includes 24 of 88 groundwater basins underlying the Sacramento River Hydrologic Region. The plan area overlies nine of the 24 Sacramento groundwater basins, namely the North Yuba, South Yuba, East Butte, Sutter, North American, South American, Solano, Yolo, and Capay Valley basins (DWR 2003b).

The San Joaquin Valley groundwater basin is part of the San Joaquin River Hydrologic Region. The San Joaquin Valley groundwater basin is bound by the northern half of the San Joaquin Valley, the southern part of the Sacramento-San Joaquin Delta, the Sierra Nevada and Diablo Range. The San Joaquin Valley groundwater basin includes nine of the 11 groundwater basins in the San Joaquin River Hydrologic Region. The plan area overlies a portion of the Cosumnes basin (DWR 2003c).

The North Yuba basin is located in the eastern central portion of the Sacramento groundwater basin and has a surface area of 78 square miles. This basin is bound on the west by the Feather River, on the south by the Yuba River, on the east by the Sierra Nevada and on the north by Honcut Creek. The North Yuba basin is recharged from stream channel and floodplain deposits along the Yuba River and Honcut Creek. Water bearing formations in this basin consist of continental deposits of Quaternary to Late Tertiary (Pliocene) age including recent valley sedimentary deposits, Pleistocene Victor Formation, Pleistocene floodplain deposits, Pleistocene alluvium, Pliocene Laguna Formation, and Miocene-Pliocene Mehrten Formation. Groundwater

levels have remained relatively constant over the last 50 years at approximately 20 feet below the surface (DWR 2006a; DWR 2006b).

The South Yuba basin is located in the southern portion of the Sacramento groundwater basin and has a surface area of 138 square miles. This basin is recharged from stream channel and floodplain deposits along the Yuba River, Feather River and the Honcut Creek. The South Yuba basin is bound on the west by the Feather River, on the south by the Bear River, on the east by the Sierra Nevada and on the north by the Yuba River. Water bearing formations in this basin consist of continental deposits of Quaternary (Recent) to Late Tertiary (Miocene) age including Holocene dredger tailings, Holocene stream channel and floodplain deposits, Pleistocene Victor Formation, Pleistocene floodplain deposits, Pleistocene alluvium, Pliocene Laguna Formation, and Miocene-Pliocene Mehrten Formation. The thickness of these deposits changes from a few hundred feet at the Sierra Nevada foothills in the east to well over 1,400 feet in the western margin of the basin. Beneath the South Yuba groundwater basin exists a well-developed cone of depression with water levels at approximately 10 feet above sea level. However, due to surface water irrigation and reduction in groundwater pumping, these groundwater levels have shown continual increases. Existing groundwater levels in this basin range from 40 to 120 feet below the ground surface (DWR 2006b).

The East Butte basin is located in the northern portion of the Sacramento groundwater basin and has a surface area of 415 square miles. This basin is recharged by the Thermalito Afterbay. The East Butte basin is bounded on the west and northwest by Butte Creek, on the northeast by the Cascade Ranges, on the southeast by the Feather River and the south by the Sutter Buttes. The northeast boundary along the Cascade Ranges is primarily a geographic boundary with some groundwater recharge occurring beyond that boundary. The subbasin is contiguous with the West Butte Subbasin at depth. Water bearing formations in this basin consist of deposits of late Tertiary to Quaternary age including Holocene stream channel deposits and basin deposits, Pleistocene deposits of the Modesto and Riverbank formations, Sutter Buttes alluvium, and Tuscan and Laguna formations. The thickness of these deposits changes from 1 to 1,000 feet. Existing groundwater levels in this basin range 15 to 40 feet below the ground surface (DWR 2004d).

The Sutter basin is located in the eastern central portion of the Sacramento groundwater basin and has a surface area of 366 square miles. This basin is recharged from local streams and rainwater. It is bounded on the west by the Sacramento River, on the south by the confluence of the Sacramento River and the Sutter Bypass, on the east by the Feather River, and on the north by confluences of Butte Creek and the Sacramento River and the Sutter Buttes. Water bearing formations in this basin consist of continental deposits of Quaternary (Recent) to Late Tertiary (Miocene) age, including Holocene stream channel and floodplain deposits, Pleistocene Victor formation, Pleistocene floodplain deposits, Pleistocene alluvium, Pliocene Laguna formation, Miocene- Pliocene Mehrten Formation and Oligocene-Miocene Valley Springs Formation. The thickness of these deposits changes from a few hundred feet at Sierra Nevada foothills in the east to well over 2,000 feet in the western margin of the basin. Groundwater levels for this basin have remained relatively constant with average levels approximately 10 feet below the surface (DWR 2006c).

The North American basin is located in the eastern central portion of the Sacramento groundwater basin and has a surface area of 548 square miles. It is bound on the west by the Feather River, on the south by the Sacramento River, on the east and north by the Bear River. Water bearing formations in this basin consist of continental deposits of Quaternary and Late Tertiary age, including younger alluvium, older alluvium, and Miocene/Pliocene volcanics. The cumulative thickness of these deposits changes from 0 to 1,200 feet in the center margin of the basin. Groundwater levels in northern Sacramento County and southern Placer County have been declining at a rate of one and a half feet per year for the last 40 years, while groundwater levels in northern Placer and northern Sutter counties have remained relatively stable. Existing groundwater levels in this basin range from 10 to 70 feet below the ground surface (DWR 2006d).

The South American groundwater basin is located in the southeastern portion of the Sacramento groundwater basin and has a surface area of 388 square miles. It is bounded on the west by the Sacramento River, on the south by the Cosumnes and Mokelumne Rivers, on the east by the Sierra Nevada, and on the north by the American River. Water-bearing formations in this basin consist of continental deposits of Quaternary and Late Tertiary age, including flood basin deposits, dredger tailings, stream channel deposits, older alluvium, and Miocene/Pliocene volcanics. The thickness of these deposits changes from a few hundred feet at Sierra Nevada foothills in the east to well over 2,500 feet in the western margin of the basin. Groundwater levels in this basin have fluctuated over the last several years as a result of dry years and well activity. Existing groundwater levels are approximately 20 feet or less throughout the basin (DWR 2004a).

The Solano groundwater basin is located in the southwestern portion of the Sacramento Basin and the northern portion of the Sacramento-San Joaquin Delta and has a surface area of 664 square miles. It is bounded on the north by Putah Creek, on the east by the Sacramento River (from Sacramento to Walnut Grove), on the southeast by the North Mokelumne River (from Walnut Grove to the San Joaquin River), and on the south by the San Joaquin River (from the North Mokelumne River to the Sacramento River. The western subbasin border is defined by the hydrologic divide that separates lands draining to the San Francisco Bay from those draining to the Sacramento-San Joaquin River Delta. Water-bearing formations consist of sedimentary continental deposits of Late Tertiary (Pliocene) to Quaternary (Recent) age. Fresh water-bearing units include younger alluvium, older alluvium, and the Tehama Formation. The thickness of these deposits increases to 3,000 feet near the eastern margin of the subbasin. Groundwater level trends within the Solano subbasin are susceptible to drought, but quickly recover in wet years. DWR has not conducted groundwater level estimates for the subbasin (DWR 2004e).

The Yolo groundwater basin is located in the southern portion of the Sacramento groundwater basin and has a surface area of 400 square miles. This basin is recharged by local streams, including Cache and Putah Creeks, and by rainwater. It is bounded on the west by the Coast Range, on the south by Putah Creek, on the east by the Sacramento River, and on the north by Cache Creek. Water-bearing formations in this basin consist of sedimentary continental deposits of Late Tertiary (Pliocene) to Quaternary (Holocene) age, including younger alluvium, older alluvium, and the Tehama Formation. The thickness of these deposits changes from a few hundred feet near the Coast Range in the west to more than 3,000 feet in the eastern margin of

the basin. Groundwater levels in this basin are affected by dry years and drought; however, they recover quickly during wet years. Existing groundwater levels range from 20 to 420 feet below the surface (DWR 2004b).

The Capay Valley groundwater basin is located in the southwestern portion of the Sacramento groundwater basin and has a surface area of 39 square miles. This basin is primarily recharged by Cache Creek, but is also influenced by Bear Creek and rainwater. It is located within the Coastal Ranges and is bounded by the Yolo County boundary on the north end and the confluence of Salt Creek and Cache Creek on the south. Water-bearing formations in this basin consist of sedimentary continental deposits of Late Tertiary (Pliocene) to Quaternary (Holocene) age, including the Tehama Formation and Cretaceous marine rocks. The thickness of these deposits changes from 0 to over 200 feet in the eastern margin of the basin. Existing groundwater levels throughout most of the Capay Valley basin range from 10 to 40 feet below the ground surface and have remained relatively stable over the years (DWR 2004c).

The Cosumnes groundwater basin is located in the southwestern portion of the San Joaquin Valley groundwater basin and has a surface area of 439 square miles. It is bounded on the south and southwest by the Eastern San Joaquin Subbasin and on the north to northwest by the South American Subbasin of the Sacramento Valley Groundwater Basin. Water-bearing formations consist of continental deposits of Late Tertiary to Quaternary age. These deposits include Younger Alluvium, Older Alluvium, and Miocene/Pliocene Volcanics. The thickness of these deposits changes from a few hundred feet near the Sierra Nevada foothills on the east to over 2,500 feet along the western margin of the subbasin. Groundwater levels have fluctuated, recovering between 1993 and 2000 after several decades of decline. Existing groundwater levels are approximately 15-20 feet (DWR 2006e).

Water Quality

Surface Water Quality

Generally, surface water quality in the plan area is considered sufficient for municipal, agricultural, wildlife, and recreational uses (DWR 2003a); however, several of the larger water bodies in the plan area are listed as impaired according to Section 303(d) of the Clean Water Act (see Regulatory Setting section below). Beneficial use impairments can result from several factors but are generally a result of pollutant discharges from point and non-point sources. Point sources of pollutants include discharges of treated effluent from municipal wastewater treatment plants and wastewater discharges from industrial and commercial facilities. Non-point pollutant sources include urban runoff, construction runoff, livestock and animal wastes, and runoff from agricultural areas. Water quality is expected to reflect the land uses in the watershed. Land uses surrounding the project area include open space, urban, and agricultural uses. Open space is not anticipated to contribute pollutants to water bodies above background levels, except when it includes grazing. Urban and agricultural land uses typically contribute sediment, hydrocarbons and metals, pesticides, nutrients, bacteria, and trash. The proposed project would be expected to contribute similar contaminants. Table 11-3 summarizes water quality impairments in surface waters in the plan area and the sources of these impairments.

Table 11-3. CWA Section 303(d)-Listed Impairments in the Plan Area

Surface Water	*Water Quality Impairments*	*Suspected Sources*
American River, Lower (Nimbus Dam to confluence with Sacramento River)	Mercury, PCBs (Polychlorinated biphenyls), Unknown	Abandoned mines, Unknown
American River, North and South Forks (North Fork Dam to Folsom Lake; below Slab Creek Reservoir to Folsom Lake)	Mercury	Unknown
Arcade Creek	Chlorpyrifos, Copper, Diazinon, Malathion, Pyrethroids, Sediment Toxicity	Agricultural aerial deposition, unknown
Bear River (Amador Co, Lower Bear River Reservoir to Mokelumne River, N Fork)	Copper	Unknown
Bear River (from Allen to Upper Bear River Reservoir, Amador County)	pH (low)	Unknown
Bear River, Lower (below Camp Far West Reservoir)	Chlorpyrifos, Copper, Diazinon, Mercury	Unknown
Bear River, Upper (from Combie Lake to Camp Far West Reservoir, Nevada and Placer Counties)	Mercury	Unknown
Cache Creek, Lower (Clear Lake Dam to Cache Creek Settling Basin near Yolo Bypass)	Boron, Mercury, Unknown	Abandoned mines, Unknown
Cache Creek, North Fork (below Indian Valley Reservoir, Lake County)	Mercury	Unknown
Camp Far West Reservoir	Mercury	Unknown
Carson Creek (from wastewater treatment plant to Deer Creek)	Aluminum, Manganese	Unknown
Chicken Ranch Slough	Chlorpyrifos, Diazinon, Pyrethroids, Sediment Toxicity	Agricultural aerial deposition, unknown
Coon Creek, Lower (from Pacific Avenue to Main Canal, Sutter County)	Chlorpyrifos, Escherichia coli (E. coli), Unknown	Unknown
Cosumnes River, Lower (below Michigan Bar; partly in Delta Waterways, eastern portion)	Escherichia coli (E. coli), Invasive Species, Sediment Toxicity	Unknown
Cosumnes River, Upper (above Michigan Bar)	Invasive Species	Unknown
Curry Creek (Placer and Sutter Counties)	Pyrethroids, Sediment Toxicity	Unknown
Davis Creek (downstream and upstream from Davis Creek Reservoir, Yolo County); Davis Creek Reservoir	Mercury	Unknown
Deer Creek (Sacramento County)	Iron	Unknown
Deer Creek (Yuba County)	pH	Unknown
Delta Waterways (northern and	Chlordane, Chlorpyrifos, DDT, diazinon, Dieldrin, invasive	Agriculture, urban runoff, storm

Surface Water	*Water Quality Impairments*	*Suspected Sources*
northwestern portions)	species, group A pesticides, mercury, PCBs, unknown toxicity, electrical conductivity and mercury	sewers, abandoned mines
Elk Grove Creek	Chlorpyrifos, Diazinon	Unknown
Englebright Lake	Mercury	Abandoned mines
Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	Chlorpyrifos, Group A Pesticides, Mercury, PCBs (Polychlorinated biphenyls), Unknown	Abandon mines, Unknown
Folsom Lake	Mercury	Unknown
Gilsizer Slough (from Yuba City to downstream of Township Road, Sutter County)	Diazinon, Oxyfluorfen, pH,	Unknown
Gordon Slough (from headwaters and Goodnow Slough to Adams Canal, Yolo County)	Oxygen (dissolved)	Unknown
Honcut Creek (Butte and Yuba Counties)	Oxygen, Dissolved	Unknown
Kaseberg Creek (tributary to Pleasant Grove Creek, Placer County)	Pyrethroids, Sediment Toxicity	Unknown
Knights Landing Ridge Cut (Yolo County)	Boron, oxygen (dissolved), salinity	Unknown
Live Oak Slough	Diazinon, Oxyfluorfen, oxygen (dissolved)	Unknown
Main Drainage Canal	Diazinon, Diuron, oxygen (dissolved)	Unknown
Miners Ravine (Placer County)	Oxygen (dissolved)	Unknown
Morrison Creek	Diazinon, Pentachlorophenol (PCP), Pyrethroids, Sediment toxicity	Unknown
Morrison Slough	Diazinon	Unknown
Lake Natoma	Mercury	Unknown
Natomas Cross Canal (Sutter County)	Mercury	Unknown
Natomas East Main Drainage Canal (aka Steelhead Creek, downstream of confluence with Arcade Creek)	Diazinon, Mercury, PCBs (Polychlorinated biphenyls)	Agricultural aerial deposition, unknown
New Bullards Bar Reservoir	Mercury	Unknown
Oxbow Reservoir (Ralston Afterbay, El Dorado and Placer Counties)	Mercury	Unknown
Putah Creek (Solano Lake to Putah Creek Sinks; partly in Delta Waterways, northwestern portion)	Boron, Mercury	Abandoned mines, unknown
Sacramento Deep Water Ship Channel	Chlorpyrifos, DDT, diazinon, dioxins, exotic species, group A pesticides, mercury, pathogens, PCBs and unknown toxicity	Agriculture, urban runoff, storm sewers, abandoned mines, contaminated sediments, unknown sources
Sacramento River (Keswick Dam to Cottonwood Creek)	Unknown Toxicity	

Surface Water	*Water Quality Impairments*	*Suspected Sources*
Sacramento River (Cottonwood Creek to Red Bluff)	Mercury, Unknown	Unknown
Sacramento River (Red Bluff to Knights Landing)	DDT (Dichlorodiphenyltrichloroethane), Dieldrin, Mercury, PCBs (Polychlorinated biphenyls), Unknown	Unknown
Sacramento River (Knights Landing to the Delta)	Chlordane, DDT, Dieldrin, Mercury, PCBs, Unknown	Abandoned mines, unknown
Sacramento Slough	Chlorpyrifos, Mercury, oxygen (dissolved), unknown, pH (low)	Unknown
Strong Ranch Slough	Chlorpyrifos, Diazinon, Pyrethroids, sediment toxicity	Agricultural aerial deposition, unknown
Sutter Bypass	Mercury	Unknown
Sycamore Slough (Yolo County)	Oxygen (dissolved	Unknown
Thermalito Afterbay	Mercury, PCBs	Unknown
Tule Canal (Yolo County)	Boron, Escherichia coli (E. coli), fecal coliform, salinity	Unknown
Wadsworth Canal	Chlorpyrifos, Diazinon	Unknown
Willow Slough (Yolo County)	Boron	Unknown
Willow Slough Bypass (Yolo County)	Boron, Escherichia coli (E. coli), fecal coliform	Unknown
Winters Canal (Yolo County)	Diazinon	Unknown
Yankee Slough (Placer and Sutter Counties)	Chlorpyrifos, unknown	Unknown
Yuba River, Lower	Mercury	Unknown
Yuba River, Middle Fork (Bear Creek to North Yuba River)	Mercury	Unknown
Yuba River, North Fork (New Bullards Bar Reservoir dam to Lake Englebright)	Mercury	Unknown
Yuba River, South Fork (Spaulding Reservoir to Englebright Reservoir)	Mercury, Temperature, water	Unknown

Source: State Water Board 2010

Groundwater Quality

Groundwater in the Sacramento Groundwater Basin is generally excellent, with only local impairments in certain areas, and suitable for irrigation and municipal and domestic uses (DWR 2003b). Water quality problems in the basin are a result of high total dissolved solids (TDS) from the underlying marine sedimentary rocks and high nitrates and organic compounds from fertilizers and septic tanks (DWR 2003b). The majority of groundwater underlying the plan area can generally be characterized as calcium-magnesium bicarbonate or magnesium-calcium bicarbonate rich (DWR 2006a; DWR 2006b; DWR 2006c; DWR 2006d; DWR 2006e; DWR 2004a; DWR 2004b; DWR 2004c; DWR 2004d; DWR 2004e).

Groundwater quality in the San Joaquin Groundwater Basin is suitable for most urban and agricultural uses with only local impairments. The primary constituents of concern are TDS, nitrate, boron, chloride, and organic compounds (DWR 2003c). Because only one subbasin is within the plan area, see the Cosumnes subbasin for a discussion of relevant groundwater quality.

The North American subbasin generally has acceptable water quality. However, high TDS levels are found in areas along the Sacramento River from the Sacramento International Airport northward to the Bear River. In addition, in this subbasin there are three sites with significant groundwater contamination issues: the former McClellan Air Force Base, Union Pacific Railroad Yard in Roseville, and the Aerojet Superfund Site. Of the 265 wells sampled from 1994 through 2000 throughout the basin, seven wells had primary inorganics above maximum contaminant levels (MCLs), two had radiological MCL exceedances and six had volatile organic carbons (VOCs) or semi-volatile organic carbons (SVOCs) MCL exceedances. This subbasin is predominantly characterized by calcium-magnesium bicarbonate or magnesium-calcium bicarbonate with some areas of magnesium bicarbonate (DWR 2006d).

Groundwater in the South American subbasin is generally of good to excellent quality. However, there are seven listed sites with significant groundwater contamination. These sites include three Superfund sites—Aerojet, Mather Field, and the Sacramento Army Depot. The other impaired sites are the Kiefer Boulevard Landfill, an old PG&E site on Jiboom Street near Old Sacramento, and the Southern Pacific and Union Pacific Rail yards in downtown Sacramento. Of the 144 wells sampled from 1994 through 2000, MCL exceedances were measured for primary inorganics (two wells), radiological constituents (one well), nitrates (one well), and VOCs and SVOCs (eight wells). This subbasin is predominantly characterized by calcium-magnesium bicarbonate or magnesium-calcium bicarbonate with magnesium-sodium bicarbonate dominant in Elk Grove (DWR 2004a).

Groundwater in the Cosumnes subbasin is generally good, with no identified significant impairments. Of the 26 wells sampled from 1994 through 2000, MCL exceedances were detected for pesticides in one well. Groundwater contained in the water-bearing deposits underlying most of Sacramento County is of excellent mineral quality for irrigation and domestic use. Within the subbasin, calcium-magnesium and calcium-sodium bicarbonate water types are most common (DWR 2006e).

The Yolo subbasin's groundwater quality is generally good with localized groundwater impairments. These impairments include elevated boron concentrations along Cache Creek and the Cache Creek Settling Basin area, elevated selenium concentrations in the City of Davis, and several localized areas of nitrate contamination. Of the 61 wells sampled from 1994 through 2000, MCL exceedances were detected for primary inorganics (three wells), nitrates (one well), and VOCs (one well). The subbasin is predominantly characterized by calcium-magnesium bicarbonate or sodium-magnesium bicarbonate with small areas of magnesium bicarbonate (DWR 2004b).

Groundwater in the Capay Valley subbasin is of good quality with moderate to high levels of boron surrounding Cache Creek. Several wells sampled in 2001 indicated that none of the wells' constituent levels exceeded the respective MCLs. This subbasin is dominated by calcium-sodium bicarbonate (DWR 2004c).

The North Yuba subbasin contains good to excellent groundwater quality and has not been listed for any major impairments. Of the 27 wells sampled from 1994 through 2000, MCL exceedances occurred for radiological constituents (one well), nitrates (one well), and VOCs (two wells). This

subbasin is predominantly characterized by calcium-magnesium bicarbonate or magnesium-calcium bicarbonate (DWR 2006a).

The South Yuba subbasin generally has good water quality characteristics and has not been listed for any major impairments. Of the 38 wells sampled from 1994 through 2000, two wells had MCL exceedances for primary inorganics, and one well had MCL exceedances for VOCs. This subbasin is predominantly characterized by calcium-magnesium bicarbonate or magnesium-calcium bicarbonate with some magnesium bicarbonate in the northern section of the basin (DWR 2006b).

The East Butte subbasin has localized high concentrations of manganese, iron, magnesium, total dissolved solids, conductivity, ASAR, and calcium. DWR does not have a qualitative assessment of its water quality characteristics. Of the 30 wells sampled from 1994 through 2000, one well had MCL exceedances for primary inorganics, and two wells had MCL exceedances for nitrates. This subbasin is predominantly characterized by calcium-magnesium bicarbonate and magnesium-calcium bicarbonate waters are the predominant groundwater water types in the subbasin. Magnesium bicarbonate waters occur locally near Biggs-Gridley, south and east to the Feather River (DWR 2004d).

The Sutter subbasin has not been listed for any major impairments and groundwater quality is generally good to excellent. Groundwater does have some portions with high levels of naturally occurring minerals. This subbasin is predominantly characterized by calcium-magnesium bicarbonate or magnesium-calcium bicarbonate with magnesium bicarbonate in some areas of the northwestern portion (DWR 2006c).

Groundwater within the Solano subbasin is considered to be of generally good quality, and useable for both domestic and agricultural purposes. Impairments include overall hardness (as $CaCO_3$) generally greater than 180 ppm, high concentrations of bicarbonate which cause precipitation of Ca and Mg carbonates in the southern area, arsenic concentrations between 0.02 and 0.05 ppm (highest along the southeastern margin), and manganese (a secondary constituent) above the MCL of 0.05 ppm along the Sacramento River along the eastern portion of the subbasin. Of 71 wells sampled between 1994 and 2000, one well had MCL exceedances for primary inorganics, eight wells had MCL exceedances for nitrates, three wells had MCL exceedances for pesticides, and one well had exceedances for VOCs and SVOCs. This subbasin is generally characterized by sodium bicarbonate in the southern and eastern areas (2004e).

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