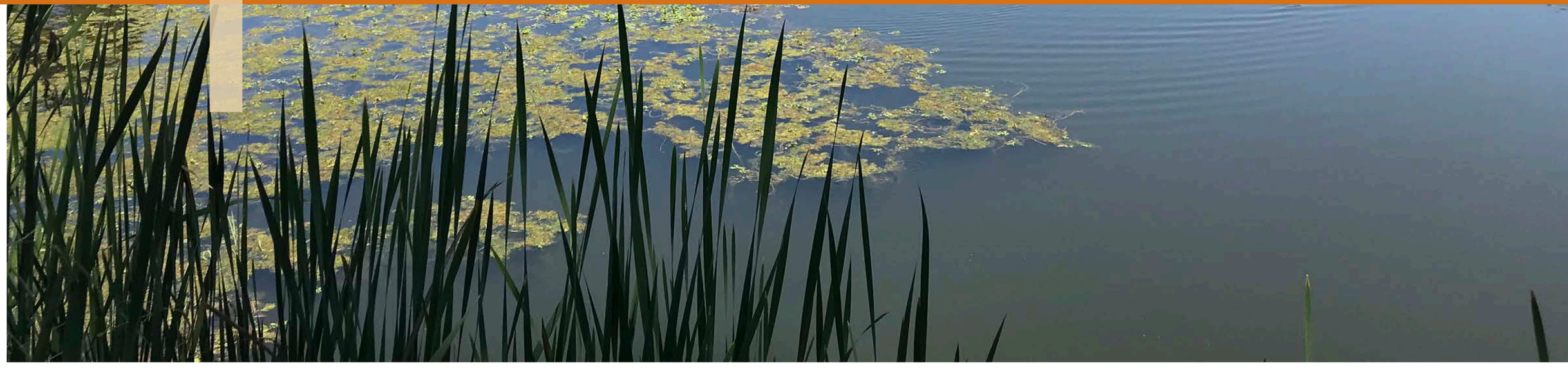
4 BIOLOGICAL RESOURCES



CHAPTER 4

INTRODUCTION AND OVERVIEW

The Parkway is a 29-mile riparian corridor home to abundant biological resources, the living organisms that inhabit Parkway today. Historically, what is now the Parkway and its surrounding lands contained an extensive landscape of riparian and upland habitat in sprawling floodplains influenced by recurring seasonal flooding of the American River.

Natural processes determined the composition and dynamics of the river valley's mosaic of habitats and the vegetation and wildlife species of the valley.

Historic land uses have substantially affected Parkway vegetation, resulting in fragmented and oftentimes degraded habitats. Much of the floodplain upstream of the Sailor Bar and Upper Sunrise Area Plans consists of dredge tailings and mining debris created over an approximate 100-year period from the 1860s to the 1970s. With the construction of Folsom Dam in 1955, the hydrology of the river changed dramatically. As a result, the river currently supports limited regeneration of early successional riparian species (e.g., willows and cottonwood) on much of the floodplain, except on the river channel edges, lower point bar surfaces, and in-channel islands (ESA 2018).

The riparian forest and woodland of LAR channel is type of vegetation community, or collection of vegetation attributes across a landscape, that has declined dramatically in California in recent history. Grasslands, savannas, and freshwater marshes are similarly reduced across many of the landscapes in which they historically occurred in California, including the Parkway. Still, the Parkway provides a contiguous naturalized environment unlike any other area in metropolitan Sacramento. A variety of plants and wildlife native to California rely upon the continued functionality of the habitat types found within the Parkway for survival.

The Parkway's biological resources are significant not only for the ecological functions they serve, but also as a main source of attraction to Parkway users. Nature-viewing, citizen science, interpretive programming, and volunteer restoration activities in the Parkway all depend highly on the continued health and integrity of its biological resources.

While most of the historical human uses that permanently altered the ecological makeup of the Parkway are no longer present, continued encroachment and increasing intensity of human uses in and adjacent to the Parkway may further adversely impact the biological resources of the Parkway. Active and adaptive management is needed to ensure continued human use of the Parkway complements its habitats, plants, and wildlife. The NRMP provides an important opportunity to protect, improve, and restore the Parkway's biological resources in conjunction with preserving its flood control capacity and recreational features.

This chapter provides an overview of the biological resources of the Parkway. Section 4.1 Vegetation Communities and Wildlife Habitats lists and describes the Parkway's vegetation communities. Section 4.2 Sensitive Habitat provides an overview of the four types of sensitive habitat, or habitat containing sensitive vegetation communities or is critical for special-status wildlife, in the Parkway. Section 4.3 Habitat Connectivity defines the components of habitat connectivity and describes the status of connectivity across the Parkway landscape. Section 4.4 Special-Status Species give detail on the special-status plants and wildlife species that are known to occur in the Parkway. Section 4.5 Invasive Species describes the dominant, non-native plant and wildlife species that adversely impact native plants and wildlife in the Parkway. Section 4.6 Wildfire summarizes wildfire's impacts on natural resources, describes conditions that influence the prevalence of wildfire in the Parkway, and provides a history of wildfire activity in the Parkway.

Native vegetation on the banks of levee borrow pit in the Woodlake Area. Photo Credit: Wildlife Conservation Board

Nomenclature used throughout the document follows Jones et al. (1992) for mammals, American Ornithologists' Union (1996) for birds, Jennings (1983) for reptiles and amphibians, and Baldwin et al. (2012) for plants. Vegetation communities were classified according to the *Manual of California Vegetation (MCV), 2nd Edition* (Sawyer et al. 2009) and/or *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986).

4.1 VEGETATION COMMUNITIES AND WILDLIFE HABITATS

Vegetation community structure and composition gradually transitions from low elevation Sierra Nevada Mountain foothills between Folsom Dam and Nimbus Dam, to the Sacramento River valley floor downstream of Nimbus Dam, and then to the LAR confluence with the Sacramento River. Between Nimbus Dam and the Sacramento River, valley floor riparian habitats occur within a narrow band along the banks of the LAR. Here, topographically variable uplands support mainly hardwood forests and grasslands (Figure 4-1 Vegetation Communities). At the lower end of the river corridor, near the confluence with the Sacramento River, the flat valley floor supports a structurally diverse complex of grassland, elderberry savanna, freshwater marsh, riparian scrub and woodland, and deciduous hardwood forest. Parkway vegetation is intrinsically tied to channel dynamics, topography, elevation, distance from the river, and frequency of inundation (Watson 1985).

A mosaic of vegetation communities has been mapped within the Parkway (Figure 4-1 Vegetation Communities). The Parkway contains 10 vegetation communities and two land cover types: developed land and unvegetated areas. The following vegetation community and land cover descriptions were derived from data provided by Regional Parks natural resource management staff, the River Corridor Management Plan (RCMP) (Jones & Stokes 2002), and the American River Parkway Floodway Vegetation Management Plan (FVMP) (EDAW 2009). Existing communities are defined by vegetation attributes and characteristics, such as structure, growth form, floristic composition, and canopy cover. In some instances, physical factors, such as successional relationships and landform type, were used to distinguish vegetation types across the Parkway.

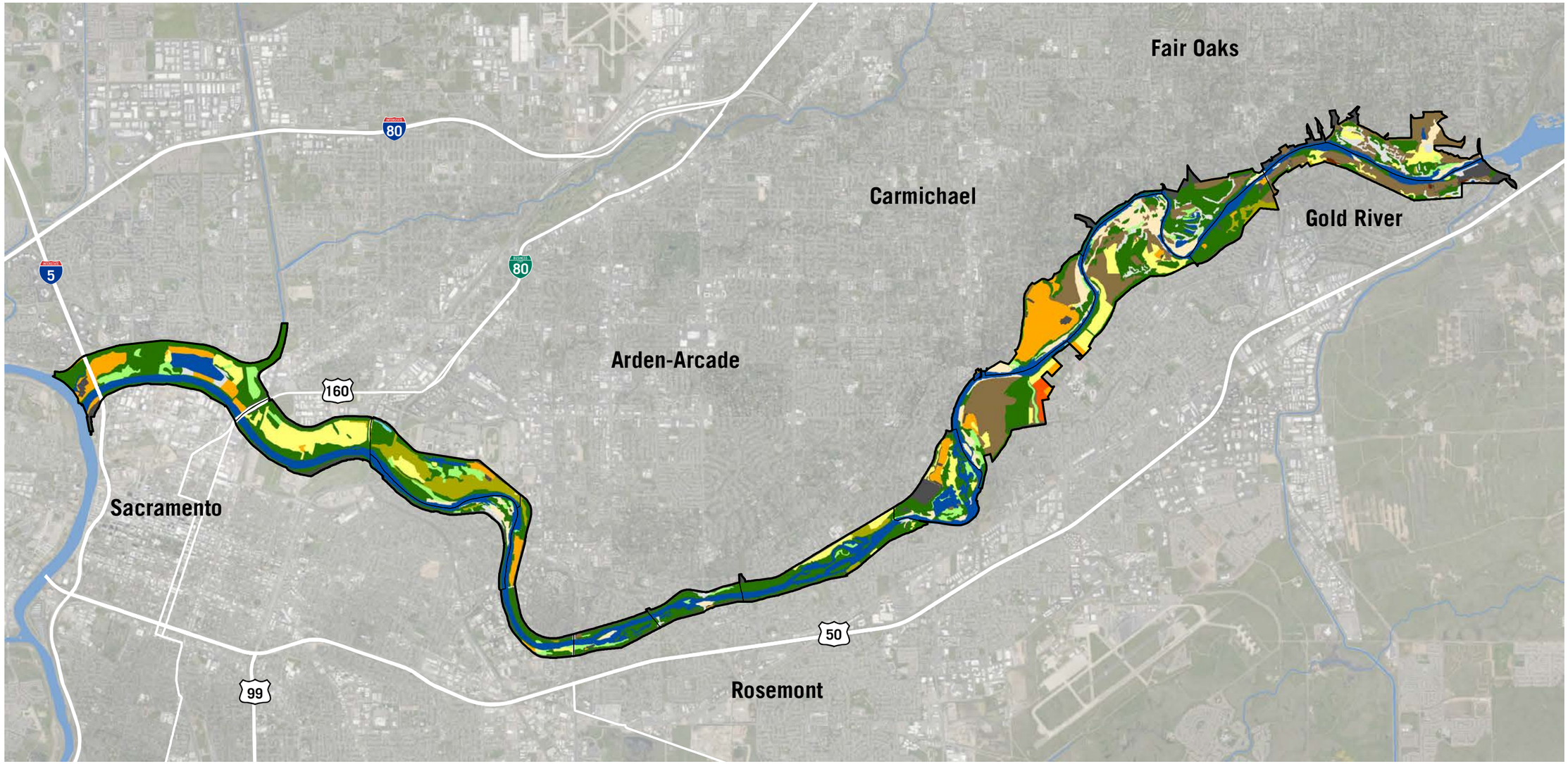
Where possible, vegetation communities were classified according to the *MCV* (Sawyer et al. 2009). Successional shifts in vegetative cover and composition due to hydrogeomorphic changes, vegetation management, fire, and other factors make it difficult to define the limits of all-natural communities according to the *MCV* classification system, which relies solely on the dominant species to define plant associations and alliances. As such, it does not accurately characterize the hydrogeomorphic components that influence plant communities in the Parkway. In these instances, vegetation classifications are based on the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986).

4.1.1 Valley and Foothill Grassland

The Parkway contains 525 acres of valley and foothill grasslands (Holland 1986). The largest contiguous area of valley and foothills grasslands occurs in the Woodlake Area, although other notable grasslands are present in the Rossmoor Bar, Discovery Park East, River Bend, Upper Sunrise, and Sailor Bar Areas. These communities provide habitat for pollinators and opportunities for raptor and other bird species' foraging and ground nesting. However, decades of anthropogenic impacts have facilitated the spread of non-native species and restricted the establishment of native perennial grasses and forbs. Extensive areas are dominated by invasive species such as yellow star thistle (*Centaurea solstitialis*), vetch (*Vicia* spp.), Bermuda grass (*Cynodon dactylon*), and pepperweed (*Lepidium latifolium*). It is important to emphasize that grasslands infested with invasive plant species provide limited habitat value for native plant and wildlife species. However, they could provide opportunities for future habitat restoration efforts that would support native species.

Other common non-native grass species observed within the valley and foothill grassland community include wild oats (*Avena* spp.), soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), red brome (*Bromus madritensis*), and foxtail barley (*Hordeum murimum*). Native grass species are occasional and include creeping wildrye (*Elymus triticoides*) and needlegrass (*Nassella* spp.). A variable mix of native and non-native forbs are common in these areas and include bur clover (*Medicago polymorpha*), filaree (*Erodium* spp.), California poppy (*Eschscholzia californica*), frying pan poppy (*Eschscholzia lobbii*), narrow tarplant (*Holocarpha virgata*), common madia (*Madia elegans*), telegraph weed (*Heterotheca grandiflora*), perennial mustard (*Hirschfeldia incana*), fennel (*Foeniculum vulgare*), poison hemlock (*Conium maculatum*), common sunflower (*Helianthus annuus*), and manroot (*Marah fabacea* and *M. watsonii*).

Figure 4-1 Vegetation Communities shows the mosaic of vegetation communities in the Parkway.



ESRI 2021

- Agricultural (27 ac)
- Developed (453 ac)
- Elderberry Savannah (227 ac)
- Freshwater Emergent Wetland (3 ac)
- Foothill Pine (6 ac)
- Gravel Bar Chaparral (277 ac)
- Open Water (1,131 ac)
- Oak Woodland/Forest (729 ac)
- Riparian Woodland/Forest (1,813 ac)
- Riparian Scrub (218 ac)
- Turf/Turf with Trees (422 ac)
- Unvegetated (174 ac)
- Valley Foothill Grassland (525 ac)

0 1 2 Miles

Figure 4-1
Vegetation Communities

Valley and Foothill Grassland (Native Component)

Within the Parkway, 179 acres of valley and foothill grassland support a significant component of native grasses and forbs, such as wildrye, needlegrass, poppies, and tarplant. Areas that support the highest proportion of native forbs include Sailor Bar, Upper Sunrise, and the El Manto portion of Rossmoor Bar. Similarly, portions of Cal Expo and restored portions of SARA Park and Arden Bar have high-quality native grass components. These areas can be distinguished from other grasslands mapped along the Parkway by the presence of thinner, rockier soils and reduced competition from annual grasses and weedy invasive forbs. They often occur on tailings at previously mined sites.

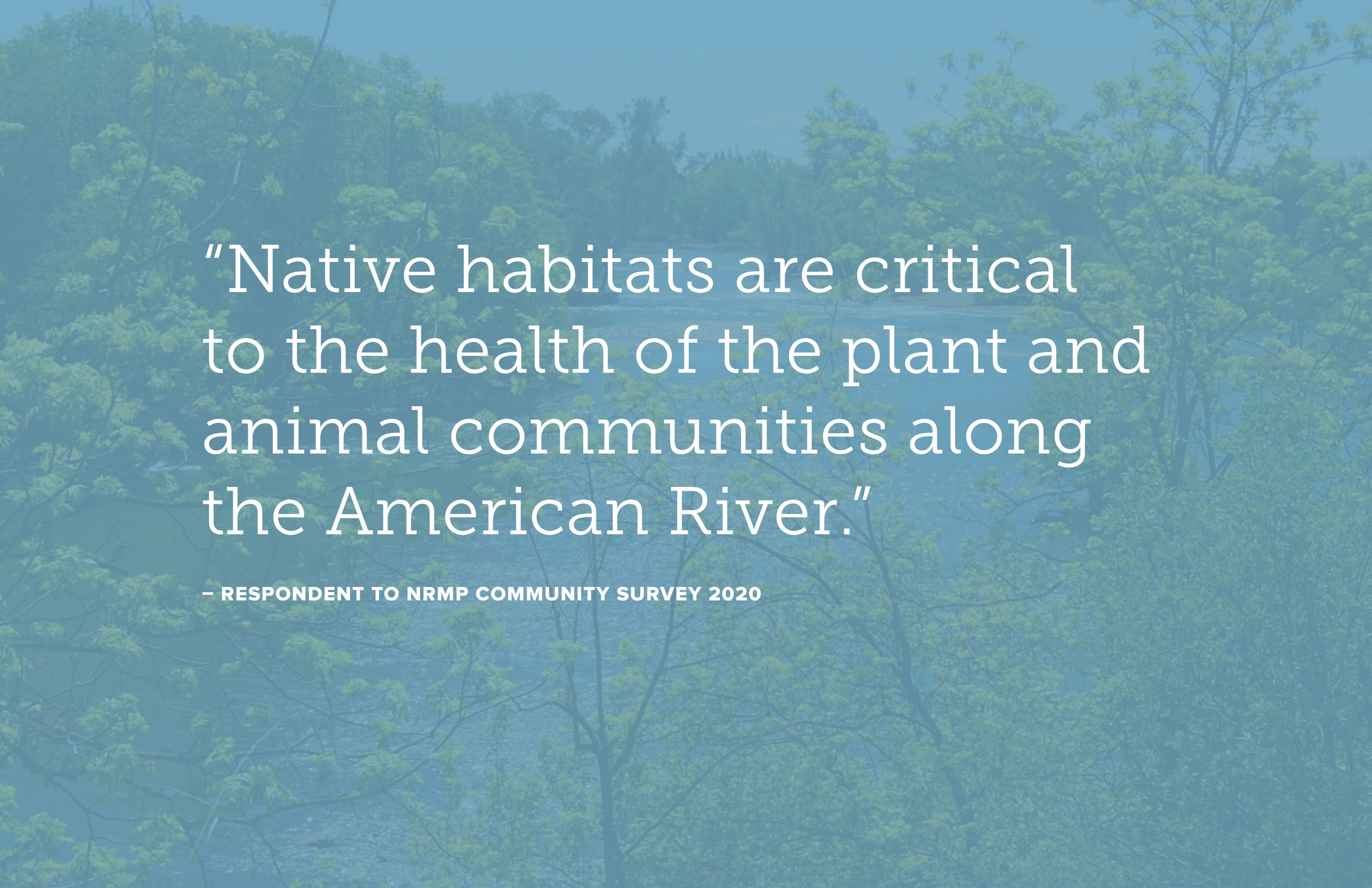
Native valley and foothill grassland habitats provide essential elements for the survival of many wildlife species, including upland refugia during flood events, foraging, resting, breeding, and shelter from predators. Common wildlife species associated with this habitat type include western fence lizard (*Sceloporus occidentalis*), common garter snake (*Thamnophis sirtalis*), western rattlesnake (*Crotalus oreganus*), California ground squirrel (*Otospermophilus beecheyi*), black-tailed jackrabbit (*Lepus californicus*), broad-footed mole (*Scapanus latimanus*), Botta's pocket gopher (*Thomomys bottae*), and meadow vole (*Microtus pennsylvanicus*). Grassland habitat provides important foraging habitat for coyote (*Canis latrans*) and a variety of raptors, including red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and several species of owls (Jones & Stokes 2002).

4.1.2 Riparian Forest and Woodland

Riparian habitat are found throughout the valleys and lower foothills of the Cascades, as well as in the Sierra Nevada and Coast Ranges. In general, these communities occur in broad, gently sloped valleys associated with current or historic riverine systems. Within the Parkway, riparian forest and woodland communities persist on stable upper terraces, channel bars, islands, and engineered embankments that rarely flood, but maintain shallow depths to perennially available groundwater (Jones & Stokes 2002). The vegetation structure of riparian forest and woodland habitat consists of an upper layer of winter deciduous trees and a multi-layered subcanopy of riparian shrubs and tree saplings that can tolerate winter flooding and/or a year-round high-water table. The shaded understory is usually sparse, consisting of coarse woody debris, fallen branches, and leaf litter.

Riparian habitats play a critical role in providing food, water, wildlife corridors, protection from predators, nesting, and thermal cover for a multitude of species. Riparian habitats support the greatest diversity of wildlife because they contain a wider diversity of plant species and vegetative structure. Consequently, they provide a greater number of habitat niches and food resources for wildlife than other habitats in the Parkway. Riparian habitats support large numbers of insects and attract passerine (perching) birds, including several species of woodpeckers, warblers, and hummingbirds. In addition, several species of raptor, including red-tailed hawk, red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperii*), and great horned owl (*Bubo virginianus*), build their nests in the crowns of Fremont cottonwood, valley oak, and other large trees. Great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), and black-crowned night heron

Bannon Slough in the Discovery Park Area. Photo Credit: MIG



"Native habitats are critical to the health of the plant and animal communities along the American River."

– RESPONDENT TO NRMP COMMUNITY SURVEY 2020

Blue oak trees on slopes near pond in the Sailor Bar Area. Photo Credit: Regional Parks

(*Nycticorax nycticorax*) nest in rookeries in large trees along the Parkway. Natural cavities and woodpecker holes provide nesting sites for cavity-nesting species, including wood duck (*Aix sponsa*), common merganser (*Mergus merganser*), American kestrel, tree swallow (*Tachycineta bicolor*), and western screech owl (*Megascops kennicottii*) (Jones & Stokes 2002).

Mammals associated with these riparian habitats include spotted and striped skunks (*Mephitis mephitis*), raccoon (*Procyon lotor*), North American beaver, coyote, and mule deer (*Odocoileus hemionus*) (USACE 1996). In addition, several bat species likely roost in snags, crevices, cavities, and foliage of mature trees and forage for insects over the river. Riparian forest and woodland habitat provides foraging and breeding territory for several species of aquatic reptiles and amphibians, including western pond turtle (*Actinemys marmorata*), common garter snake, western skink (*Plestiodon skiltonianus*), western toad (*Anaxyrus boreas*), Pacific tree frog (*Pseudacris regilla*), and American bullfrog (*Lithobates catesbeianus*) (Jones & Stokes 2002).

A total of 1,813 acres of riparian forest and woodland habitats exist within the Parkway. The MCV (Sawyer et al. 2009) identifies several riparian forest alliances of the Central Valley that adequately describe riparian communities found in the Parkway. Other plant communities included here have a highly variable composition of dominant and associated species that are classified according to the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986). Regional Parks natural resource management staff mapped the following riparian alliances and vegetation community types according to dominant tree species in the canopy layer. Several riparian communities discussed below and depicted on the Parkway vegetation map (Figure 4.1 Vegetation Communities) represent an aggregation of smaller areas mapped in the field by Regional Parks.

White Alder

A total of 20 acres of naturally occurring white alder (*Alnus rhombifolia*) alliance (Sawyer et al. 2009) occurs in small stands, primarily on islands and riverbanks within the Arden Bar, Paradise Beach, Campus Commons, and Ancil Hoffman County Park Areas. The understory of these communities typically includes sandbar willow (*Salix exigua*), Goodding's black willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), and infrequent white alder and Fremont cottonwood (*Populus fremontii*) saplings. Non-native eucalyptus (*Eucalyptus* spp.) trees are encroaching into white alder riparian areas in the Arden Bar and River Bend Park Areas.

Hind's Walnut

Hind's walnut (*Juglans hindsii*) alliance (Sawyer et al. 2009) occurs as small, isolated stands that occupy 83 acres of Parkway between the Woodlake and Rossmoor Bar Areas. In Woodlake (17 acres, the largest stand has been partially damaged by fire. The tree canopy of these communities is dominated by Hind's walnut, with smaller, declining components of valley oak (*Quercus lobata*) and Fremont cottonwood. Mid-story species include Hind's walnut saplings, blue elderberry (*Sambucus nigra* ssp. *caerulea*), sandbar willow, California blackberry (*Rubus ursinus*), and Himalayan blackberry (*Rubus armeniacus*). Common understory species include California grape (*Vitis californica*) and manroot.

Fremont Cottonwood

Approximately 583 acres of Fremont cottonwood alliance (Sawyer et al. 2009) is distributed intermittently along the length of the Parkway, with more than half located on broad floodplains downstream of the Campus Commons Area. Fremont cottonwood forests also is present in narrow bands along the edges of confined LAR channel segments, and in portions of the Sailor Bar, Upper Sunrise, and Sacramento Bar Areas. Small patches of Fremont cottonwood woodland, characterized by a more open canopy, persist from the Paradise Beach to Sailor Bar Areas, with more than half of these patches concentrated in the Sacramento Bar and Upper Sunrise Areas. The Discovery Park Area contains the largest contiguous stand of cottonwood woodland in the Parkway.

Other canopy components in this community include Goodding's black willow, interior live oak (*Quercus wislizeni*), valley oak, and Hind's walnut. Typical mid-story species include willows, boxelder (*Acer negundo*), Oregon ash (*Fraxinus latifolia*), and blue elderberry. The understory tends to be sparse in areas with dense tree cover that is heavily shaded and periodically flooded. Canopy openings support California wild rose (*Rosa californica*), California and Himalayan blackberry, blue elderberry, poison oak (*Toxicodendron diversiloba*), mugwort (*Artemisia douglasiana*), and various annual forbs. In some stands, particularly in portions of the Discovery Park Area, trees are draped with California wild grape. Upright wood snags are often present in the understory.

The gradual decline in the health and extent of Fremont cottonwood forests and woodlands in the Parkway can be attributed to several environmental factors. Fire is the largest immediate threat, as the Parkway has lost many acres of cottonwood forest and woodlands to wildland fire over the last decade. Changes in flood regimes also pose a threat because cottonwoods rely on spring flooding and sediment deposition for successful reproduction. Many stands are not reproducing and are transitioning to valley oak and/or Hind's walnut woodland communities. In addition, black locust (*Robinia pseudoacacia*) is invading some areas of cottonwood forest. Within powerline easements at the Cal Expo and Campus Commons Areas, cottonwood trees are regularly removed by utility companies as part of ongoing vegetation management programs. In locales where habitat restoration efforts have been attempted, North American beaver (*Castor canadensis*) activity tends to limit the successful establishment of newly planted cottonwood saplings. The healthiest cottonwood stands in the Parkway that receive periodic flooding occur in small stands in the Discovery Park, Woodlake, Upper Sunrise, Paradise Beach, and Sailor Bar Areas, as well as around the Bushy Lake area of Cal Expo.

Valley Oak

The valley oak alliance (Sawyer et al. 2009) is a transitional woodland and forest type that integrates with riparian habitats and upland oak woodlands and forests. A total of 407 acres have been mapped, with the largest contiguous stand occurring within the Discovery Park Area on Bannon Island. A second smaller, but scenic and high-quality example, can be found in the Lower Sunrise Area. This community has dense tree canopy dominated by valley oak and occasional interior live oak with other riparian trees, such as white alder, Oregon ash, Fremont cottonwood, box elder, Goodding's black willow, and Hind's walnut. Areas of valley oak woodland along the narrow section of the middle LAR are co-dominated by cottonwood. Riparian tree species can be found reproducing in the understory, with poison oak and blackberry species providing additional ground cover. In

TOP *Fremont cottonwood trees in the Discovery Park Area. Photo Credit: Regional Parks*
BOTTOM *Valley oak trees in the Ancil Hoffman County Park Area. Photo Credit: Regional Parks*

other areas of the Parkway, mature valley oak tree health is declining, particularly within the Ancil Hoffman County Park Area. This is due to invasive species, including Chinese elm (*Ulmus parviflorus*) and tree of heaven (*Ailanthus altissima*), encroaching upon valley oak woodland communities, and reducing the reestablishment of oaks. Other factors, including sudden oak death (SOD) disease caused by the fungus *Phytophthora ramorum* and periodic drought worsened by climate change, have negative impacts on long-term native oak health.

Great Valley Mixed Riparian Forest

Great Valley mixed riparian forest (Holland 1986) is distributed throughout 674 acres of the Parkway. This community has a highly variable species composition with deciduous hardwood forest co-dominated by three or more tree species, including white alder, valley oak, Fremont cottonwood, Hind's walnut, California sycamore (*Platanus racemosa*), box elder, Oregon ash, and various willow species. Interior live oak is also a common component of mixed riparian forests upstream of Arden Bar, particularly in the Upper Sunrise and Sailor Bar Areas. Many of these deciduous hardwood riparian species are reproducing in the understory. The understory to mid-story contains occasional standing snags, saplings, California wild rose, blackberry, wild grape, and blue elderberry. Black locust and tree of heaven are invading areas of mixed riparian forest and woodland throughout the Parkway. Mixed riparian stands trending toward a more open canopy (25 – 50 percent cover) occur in heavily mined areas of the Rossmoor Bar and Sacramento Bar Areas, with smaller stands distributed downstream to the Discovery Park Area. In mixed riparian stands that support a large component of both valley oak and cottonwood trees, the cottonwood component is shifting toward interior live oak dominance.

Non-Native Introduced Trees and Shrubs

Non-native tree and shrub species occupy 46 acres within the riparian vegetation community described above, including tree of heaven, Chinese tallow tree (*Triadica sebifera*), eucalyptus, black locust, red sesbania (*Sesbania punicea*), and tamarisk (*Tamarix* spp.). Although tamarisk occurs infrequently throughout the Parkway, it is not yet eradicated. These species frequently colonize and alter the vegetation structure and composition of their communities, diminishing wildlife habitat quality by minimizing habitat diversity (EDAW 2009).

4.1.3 Riparian Scrub

The Parkway contains 218 acres of riparian scrub (Holland 1996), with large patches located in the Discovery Park, Cal Expo, River Bend Park, and Sailor Bar Areas. Riparian scrub habitats consist of mid- to early successional shrubs and small trees that grow on sand bars, gravel bars, and recent alluvial sediment deposits, as well as near the edge of the low-flow channel and pond margins that are adjacent to abandoned riverine terraces. The stature of trees and shrubs is usually low-growing and sparse due to frequent or recent scouring or flooding. Dominant species include sandbar willow, arroyo willow, Goodding's black willow, white alder, box elder, and cottonwood and ash saplings. Common overstory species on drier stream terraces and islands that are subject to less frequent flooding include valley oak, Fremont cottonwood, and California sycamore. Common understory species include mugwort and other herbaceous species such as non-native perennial and annual grasses and perennial mustard.

The largest areas of early successional riparian scrub communities are located on high flow-scoured gravel bars and islands in the eastern Cal Expo and Paradise

TOP *Riparian woodland/forest and grazed vegetation in the Sailor Bar Area. Photo Credit: Regional Parks*
BOTTOM *Valley foothill grassland and riparian woodland/forest in the Cal Expo Area. Photo Credit: Regional Parks*

Beach Areas. Small patches also occur regularly along the river and high-flow channels upstream of the Sailor Bar Area. Mid-successional riparian scrub with variable species composition is found in small, 1- to 3-acre patches at Discovery Park. Other larger areas include the low-lying flood-prone areas and islands found in the Arden Bar and River Bend Park Areas. Mid-successional riparian scrub dominated by willows grows in disturbed areas along utility easements in the vicinity of Bushy Lake within the Cal Expo Area. Many small 1- to 3-acre patches are also scattered upstream as far as the Sacramento Bar Area.

Like other riparian habitat types discussed in this section, riparian scrub habitat plays a critical role in the support of numerous wildlife species by providing food, water, and shelter that is stream- or river-dependent.

Pond and blue oak trees in the Sailor Bar Area. Photo Credit: Regional Parks

4.1.4 Oak Woodland and Forest

The Parkway contains 729 acres of oak woodland and forest vegetation communities (Holland 1986). The overstory is dominated by a variety of hardwood species including interior live oak, California buckeye (*Aesculus californica*), valley oak, and blue oak (*Quercus douglasii*). Oak woodland and forest communities provide the largest patches of contiguous natural habitat, with the most extensive area situated within the River Bend Park Area. The following oak woodland alliances and mixed oak woodland types were mapped and characterized by Regional Parks natural resource management staff.

Interior Live Oak

A total of 583 acres of interior live oak alliance (Sawyer et al. 2009) grows along elevated floodplains in the upper reaches of the LAR. Approximately half of this acreage occurs within the River Bend Park Area, with other large areas found in the Ancil Hoffman County Park, Rossmoor Bar, Sacramento Bar, and Upper Sunrise Areas. The overstory of this vegetation alliance is dominated by interior live oak with occasional valley oak and Hind's walnut. Very few snags (typically valley oak) are present in this community. Blue elderberry, coyote brush (*Baccharis pilularis*), California coffeeberry (*Frangula californica*), California buckeye, toyon (*Heteromeles arbutifolia*), and poison oak are common in the mid-story, with Dutchman's pipevine (*Aristolochia californica*) occurring in the canopy driplines. In general, interior live oak forest is a stable ecosystem, with live oak saplings well represented in the understory, indicating the species is regenerating well. The health of individual old trees is in decline, but the forest canopy is generally in good health.

Blue Oak

A total of 80 acres of blue oak alliance (Sawyer et al. 2009) occurs mainly within the Sailor Bar Area, along with small areas mapped at Ancil Hoffman County Park and Sunrise Bluffs. The canopy of this community is dominated by blue oak with occasional interior live oak and valley oak. Blue elderberry, toyon, poison oak, and blue oak saplings are common in the mid-story. The understory supports annual grasses and several native forbs, including harvest brodiaea (*Brodiaea elegans* ssp. *elegans*), soap root (*Chlorogalum* sp.), California poppy, lupines (*Lupinus* spp.), and common madia. Occasional non-native and invasive plant species occurring in the understory include yellow star thistle, Himalayan blackberry, periwinkle (*Vinca minor*), Chinese

tallow, and Italian thistle (*Carduus pycnocephalus*). The blue oak ecosystem is stable within the Sailor Bar Area, with healthy mature trees, as well as saplings. There are heritage blue oak trees at Sailor Bar and most trees are in good health. At Ancil Hoffman County Park, there are patches of heritage blue oak forest, with both healthy and declining oaks observed on the bluffs.

Mixed Oak Forest

A total of 65 acres of mixed oak forest (Holland 1986) occurs in the Nature Study Area of Ancil Hoffman County Park upstream of the Rossmoor Bar and Upper Sunrise Areas. The overstory is co-dominated by valley oak and interior live oak, often with a minor component of Fremont cottonwood and Hind's walnut. The mid-story includes blue elderberry, coyote brush, poison oak, and blackberry, and exhibits natural recruitment of interior live oak and Hind's walnut saplings. The understory supports annual grasses, creeping wild rye (*Leymus triticoides*), fennel, poison hemlock, and Dutchman's pipevine. Heritage trees and snags are present in some locations. Species dominance transitions to interior live oak at Sailor Bar. A majority of overstory trees in this community are in good health. However, a portion of mixed oak forest in Ancil Hoffman County Park near the Effie Yeaw Nature Center is in decline.

Oak woodlands and forests are of great ecological importance because of their relative scarcity in the region and their high value to wildlife. These communities provide critical breeding habitat for a range of wildlife species. Many bird species nest in tree limb cavities. A wide variety of mammals use oak woodland and forest habitat, including mule deer, black-tailed jackrabbit, western gray squirrel (*Melanerpes formicivorus*), and California ground squirrel. Common bird species in this community include several species of owls, woodpeckers, Western scrub jay (*Aphelocoma californica*), California quail (*Callipepla californica*), wild turkey (*Meleagris gallopavo*), and numerous passerine (perching) species. Reptile and amphibian species found here include southern alligator lizard (*Elgaria multicarinata*), western fence lizard, western rattlesnake, California kingsnake (*Lampropeltis californiae*), and common gopher snake (*Pituophis catenifer*).

4.1.5 Foothill Pine

A total of six acres of foothill pine alliance (Sawyer et al. 2009) occurs within the Upper Sunrise Area. This woodland community is botanically diverse and distinct from other vegetation types in the Parkway. Foothill pine forms the overstory with interior live oak saplings in the understory. Common shrubs and small trees in the understory include sticky monkeyflower (*Diplacus aurantiacus*), buckbrush (*Ceanothus cuneatus*), mock orange (*Philadelphus lewisii*), toyon, coyote brush, and poison oak. The understory also contains native forbs and grasses in canopy openings.

Many of the common wildlife species in adjacent oak woodland habitats discussed above also occur in foothill pine habitat.

4.1.6 Gravel Bar Chaparral

Chaparral communities are characterized by small- to medium-sized shrubs with semi-woody, flexible stems and branches (Holland 1986). A total of 274 acres of chaparral occurs within the Parkway in small, interspersed stands that often intergrade with riparian woodland and forest habitat along high floodplain benches and terraces of the LAR. Widely scattered patches of chaparral also appear on cobbly gravel bars at the Rossmoor Bar, Ancil Hoffman County Park, River Bend Park, and Sacramento Bar Areas. Characteristic

Valley foothill grassland in the Cal Expo Area.
Photo Credit: Regional Parks

chaparral shrub species include deerweed (*Acmispon glaber*), lupine, coyote brush, California brickellbush (*Brickellia californica*), California buckwheat (*Eriogonum fasciculatum*), and California coffeeberry. In shrub canopy openings, this community supports a sparse to intermittent herbaceous understory of native grasses and forbs including western goldenrod (*Euthamia occidentalis*), pearly everlasting (*Anaphalis margaritacea*), lupine, California poppy, clarkia (*Clarkia* sp.), and rayless golden aster (*Hetherotheca oregano*). Invasive species, such as Spanish broom (*Spartium junceum*), are common in this habitat type.

Many of the common wildlife species in adjacent oak woodland habitat discussed above also occur in chaparral habitat.

4.1.7 Elderberry Savanna

A total of 227 acres of elderberry savanna (Holland 1986) occurs within the Parkway, with the highest concentration at the Cal Expo Area. Elderberry savanna is open grassland with low-growing, scattered shrubs. Common species in the shrub layer include blue elderberry and coyote brush, with occasional valley oak saplings and patches of sandbar willow. This community tends to support a patchy understory of annual grasses, creeping wildrye, yellow star thistle, vetch, fennel, and poison hemlock. Elderberry savannas were planted in the 1980s for mitigation in the Cal Expo, Discovery Park, SARA Park, River Bend Park, Lower Sunrise, and Sailor Bar Areas. These restored sites were also planted with a variety of riparian species and are expected to transition into Great Valley mixed riparian forest (Holland 1986).

Many of the common wildlife species in adjacent riparian forest, woodland, and oak woodland habitats discussed above also occur in elderberry savanna.

4.1.8 Freshwater Emergent Wetland

Freshwater emergent wetland communities (Holland 1986) are one of the most productive habitats in California. This habitat type occurs on low-lying topographic areas such as ponds, depressions, and urban drainages on terrace floodplains, as well as on low stream terraces that are frequently saturated or flooded. The Parkway contains three acres of freshwater emergent wetland habitat within the Cal Expo Area. Unmapped freshwater emergent wetland occurs as an understory component to areas mapped as riparian woodland and forest within secondary channels, point bars, in-channel bars, active floodplains, and low-lying topographic areas, such as ponds and depressions, that are frequently inundated or saturated.

Freshwater emergent wetland vegetation is composed of upright, rooted hydrophytic monocots (grass-like plants) and forbs, as well as floating emergent aquatic plants. Vegetation composition within this habitat type varies according to the amount and duration of soil saturation associated with subtle elevation gradients. Common species include sedges (*Carex* spp.), rushes (*Juncus* spp.), horsetail (*Equisetum hyemale*), tall cyperus (*Cyperus eragrostis*), spike rush (*Eleocharis* spp.), cocklebur (*Xanthium strumarium*), and perennial pepperweed on intermittently saturated soils; broadleaf cattail (*Typha latifolia*), bulrush (*Schoenoplectus* spp.), seep monkeyflower (*Erythranthe guttata*), smartweed (*Persicaria punctata* and *P. lapathifolia*), watercress (*Rorippa* spp.), and marsh purslane (*Ludwigia peploides*) on permanently saturated soils; and mosquito fern (*Azolla filiculoides* and *A. mexicana*) and other floating emergent aquatic plants in permanently inundated areas of the Parkway.

Freshwater emergent wetlands provide food, cover, and water for numerous bird, mammal, reptile, and amphibian

TOP *Gravel bar chaparral in the Ancil Hoffman County Park Area. Photo Credit: Regional Parks*
BOTTOM *Blue elderberry shrub. Photo Credit: Jim Wadsworth*

Canada geese flying over river in the SARA Park Area. Photo Credit: Wildlife Conservation Board

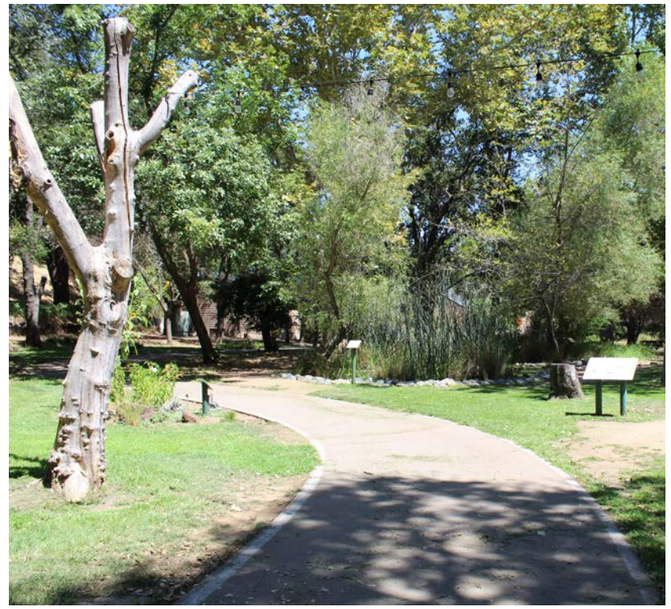
species. Many wildlife species require emergent wetlands throughout their entire life cycles. Freshwater emergent wetlands are associated with ponds and backwaters, and provide resting and foraging areas for waterfowl, shorebirds, wading birds, red-winged blackbirds, and swallows (USACE 1996). Marshes are also used by aquatic mammals, such as muskrat (*Ondatra zibethicus*), mink (*Neovison vion*), North American river otter (*Lontra canadensis*), and North American beaver. Reptiles and amphibians, including western pond turtle, common garter snake, Pacific treefrog, Western toad, and American bullfrog, use the marsh for foraging and breeding (USFWS 1991). Freshwater marshes provide important habitat for wood duck, great blue heron, American bittern (*Botaurus lentiginosus*), shorebirds, owls, and hawks. Upland species, like California quail and black-tailed hare, take cover and forage at the margins of freshwater marshes. Freshwater emergent wetland habitats closest to residential and suburban areas are occupied by a variety of bird species adapted to urban environments, such as rock pigeons, scrub jay (*Aphelocoma californica*), mockingbird (*Mimus polyglottos*), and house finch (*Haemorhous mexicanus*), as well as mammals such as raccoons and skunks.

4.1.9 Open Water

A total of 597 acres of the Parkway is characterized as open water. This includes both riverine habitats within primary and secondary channels of the LAR, as well as off-channel ponds. Riverine habitats are defined by intermittent or continually running water, including rivers and streams. The open water of riverine habitat, including the river, unvegetated shoreline, gravel bars adjacent to the river channel, and off-channel ponds, provide resting and foraging areas for waterfowl, shorebirds, wading birds, belted kingfisher (*Ceryl alcyon*), black phoebe (*Sayornis nigricans*), and tree swallow. Aquatic mammals, including North American beaver, muskrat, and river otter use open water as movement corridors and for foraging on submerged plants and invertebrates (USFWS 1991, USACE 1996). Species, such as North American beaver, river otter, muskrat, water birds, and waterfowl, use the open water aquatic zone (Jones & Stokes 2002). Openwater also provides habitat for numerous resident and anadromous fish species, including chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), and American shad (*Alosa sapidissima*).

Habitats associated with lakes are also considered open water habitat and are characterized by depressions filled with standing water. This habitat type can vary in size, from small ponds to large areas such as flooded lakes or reservoirs. The primary lacustrine features are Urretia Pond, Bushy Lake, William B. Pond, and the shallow pools at Sacramento Bar. Lacustrine habitat typically supports species of plankton, as well as other microorganisms in the still, open water. Lacustrine habitats are important for reproduction, food, water, and cover requirements for many mammals, birds, reptiles, and amphibians. Lacustrine habitats exist

Turf with trees in the Discovery Park Area. Photo Credit: MIG



Nature interpretive area at the Effie Yeaw Nature Center in the Ancil Hoffman County Park Area. Photo Credit: MIG

throughout California, and often occur alongside riverine and freshwater water emergent wetland habitats.

4.1.10 Unvegetated Areas

A total of 174 acres of the Parkway consists of unvegetated land, which is characterized as areas with less than two percent herbaceous cover and less than 10 percent tree or shrub cover. Within the Parkway, unvegetated land cover types include disturbed areas (both via anthropogenic and riverine processes), mine tailings, and gravel bars. Many wildlife species use unvegetated areas. For example, some raptors nest in exposed ledges, certain bird species such as bank swallows (*Riparia riparia*) construct nests or take cover in sand or gravel areas, and bats forage along riverbank walls.

4.1.11 Developed Areas

A total of 453 acres of the Parkway is developed with parking lots, recreation trails, structures, bridges, roadways, and levees. These areas are either devoid of vegetation or vegetated with non-native landscaping. They are typically located closest to city centers and suburban areas. Wildlife species found in these areas are adapted to disturbed conditions and include scrub jay, mockingbird, house finch, raccoon, Virginia opossum (*Didelphis virginiana*), western grey squirrel (*Sciurus griseus*), and skunk.

4.1.12 Agriculture

Soil Born Farms is located in the River Bend Park Area and consists of orchards and irrigated row and field crops.

4.1.13 Turf / Turf with Trees

Turf areas maintained for recreation and facility maintenance make up a large percentage of the Parkway. Turf habitat occurs at overflow parking areas and sporting/recreation fields. Turf with trees habitat appears primarily within the Ancil Hoffman County Park and Discovery Park Areas. Due to regular mowing and other active landscape maintenance activities, trees do not tend to reproduce naturally in these habitats, and there are few saplings in the understory. Many picnic areas are shaded with heritage trees, which are declining and gradually being removed as they become hazardous. Planting and caging new trees is a high priority for Regional Parks in these locales.

4.2 SENSITIVE HABITAT

The Parkway contains a wide variety of sensitive habitats used by common and special status species for foraging, breeding, and sheltering (Figure 4-2 Sensitive Habitat). Sensitive habitat includes designated special status vegetation communities, habitat that supports state and/or federally listed species, and habitat identified as critical for the recovery of federally listed species.

4.2.1 Critical Habitat

Critical habitat is a term defined in Section 3(5)A of the Endangered Species Act (ESA) as a specific geographic area that contains physical or biological features essential for the conservation and recovery of a threatened or endangered species, and that may require special management and protection. Figure 4-2 Sensitive Habitat depicts the location of critical habitat as designated by the U.S. Fish & Wildlife Services (USFWS). The Parkway contains critical habitat for steelhead, chinook salmon, and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*; VELB).

USFWS critical habitat for VELB exists just north of the Woodlake Area and within the River Bend Park, Ancil Hoffman County Park, Rossmoor Bar, and Lower Sunrise Areas.

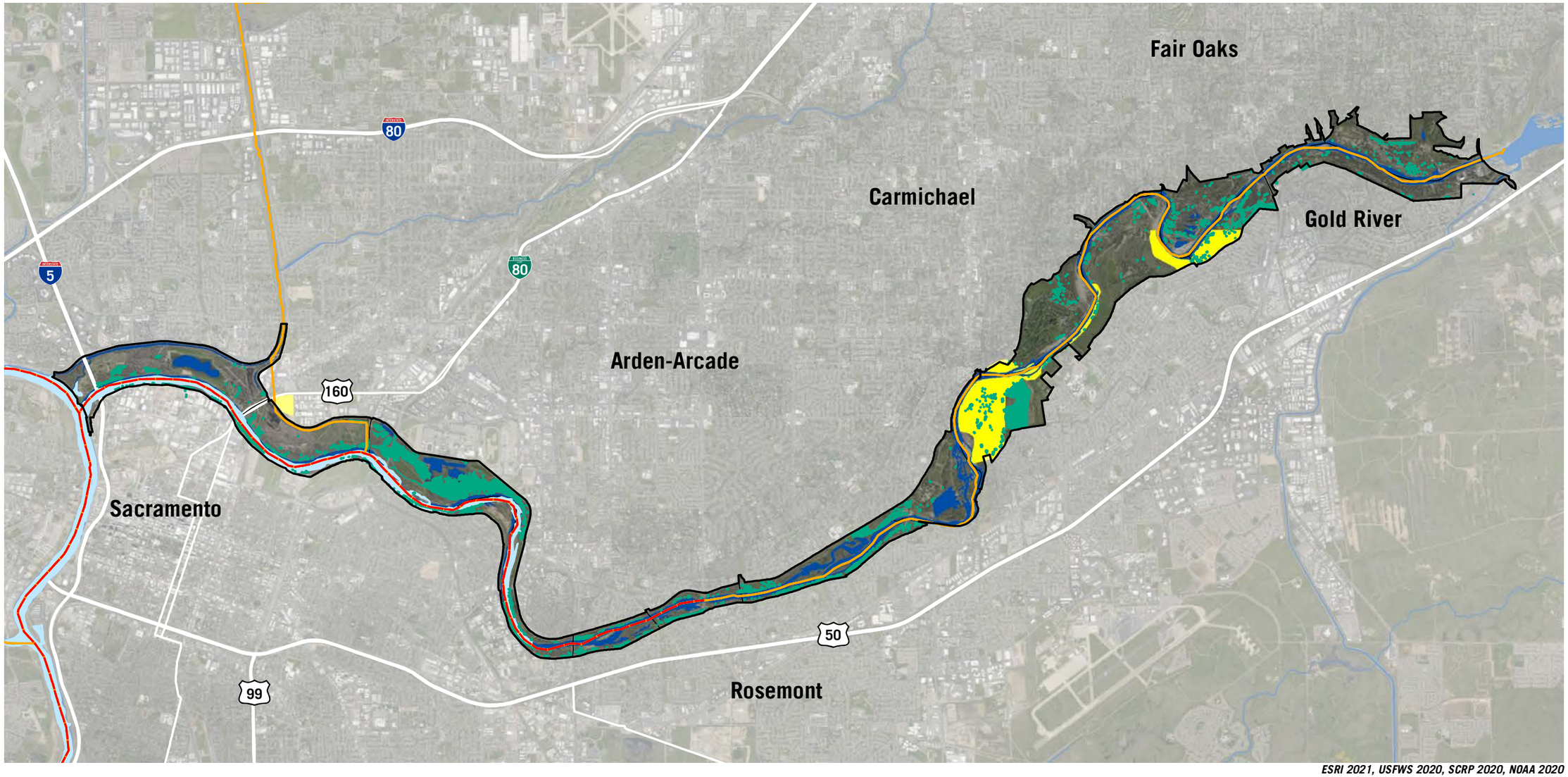
Chinook salmon Sacramento River winter-run Evolutionary Significant Unit (ESU) critical habitat is outside of the Parkway limits in the Sacramento River, immediately downstream of the confluence of the Sacramento and American Rivers. Chinook salmon Central Valley spring-run ESU has critical habitat extending through the LAR from the Watt Avenue overpass to its confluence with the Sacramento River. Critical habitat for steelhead Central Valley Distinct Population Segment (DPS) extends from the Nimbus Dam to the LAR's confluence with the Sacramento River. Critical habitat for green sturgeon extends from the LAR's confluence with the Sacramento River to the North Sacramento Freeway/Lincoln Highway overpass (NOAA Fisheries 2019; Figure 4-2).

California poppies surrounding elderberry shrub in the Cal Expo Area. Photo Credit: Wildlife Conservation Board

4.2.2 Blue Elderberry Habitat

The federally threatened VELB is closely associated with blue elderberry and typically occurs in riparian forest and woodland habitats (See Section 4.1.2 for community description). Figure 4-2 Sensitive Habitat depicts those areas where elderberry have been identified and mapped by County and local groups (e.g., American River Parkway Foundation (ARPF)). Elderberry shrubs grow most frequently along higher-order riparian reaches and on higher terraces where plant roots have access to the water table, but are not frequently inundated (Talley 2005, Vaghti et al. 2009). It can also persist within current floodplains, historic floodplains, terraces, bluffs, and atop levees within savanna or woodland habitat. Elderberry habitat continues to be surveyed thoroughly at the River Bend Park, Ancil Hoffman County Park, Rossmoor Bar, and Lower Sunrise Areas, and included in USFWS-designated critical habitat for VELB (USFWS 2017)

Figure 4-2 shows the locations and types of sensitive habitats in the Parkway..



Steelhead Critical Habitat
Chinook Salmon Critical Habitat
Essential Fish Habitat
Valley Elderberry Longhorn Beetle Critical Habitat
Blue Elderberry Habitat

ESRI 2021, USFWS 2020, SCRP 2020, NOAA 2020

0 1 2 Miles

Figure 4-2
Sensitive Habitat

4.2.3 Essential Fish Habitat

Beginning at Campus Commons and continuing downstream, the American River is designated as Essential Fish Habitat (EFH) (Figure 4-2 Sensitive Habitat). EFH is regulated by the National Oceanic and Atmospheric Association, National Marine Fisheries Service (NOAA NMFS). Protection of EFH is mandated through changes implemented in 1996 to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to protect the loss of habitat necessary to maintain sustainable fisheries in the United States. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" [16 USC 1802(10)]. NMFS further defines essential fish habitat as areas that "contain habitat essential to the long-term survival and health of our nation's fisheries." EFH can include the water column, certain bottom types such as sandy or rocky bottoms, vegetation such as eelgrass or kelp, or structurally complex coral or oyster reefs. Under regulatory guidelines issued by NMFS, any federal agency that authorizes, funds, or undertakes action that may affect EFH is required to consult with NMFS (50 CFR 600.920).

4.2.4 Shaded Riverine Aquatic (SRA) Habitat

Shaded Riverine Aquatic (SRA) habitat is defined as the nearshore aquatic area occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this valuable cover type include: (a) adjacent banks composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water, and (b) water containing variable amounts of woody debris, such as leaves, logs, branches, and roots, as well as variable depths, velocities, and currents (USFWS 1992). These attributes provide high-value feeding areas, burrowing substrates, escape cover, and reproductive cover for numerous regionally important fish and wildlife species.

SRA habitat is available for aquatic species in or adjacent to all Parkway Areas. SRA habitat is most abundant within or adjacent to the Discovery Park, Woodlake, Campus Commons, Howe Avenue, Watt Avenue, Sara Park, and Arden Bar Areas. The LAR experiences high temperatures in the summer months, and the dark and wide main channel is particularly vulnerable to heat absorption and conduction. Sensitive aquatic species use SRA habitat to shield themselves from extreme temperatures. This habitat also provides cover that protects spawning, juvenile, and/or small aquatic wildlife species from predation.

In accordance with a Biological Opinion issued by NOAA NMFS (WCR-2014-1377), SRA is being mapped using aerial photography and field verified from the SARA Park Area (River Mile 12) downstream to the confluence of the American and Sacramento Rivers as part of the US Army Corps of Engineers (USACE) levee repairs activities under the American River Common Features General Reevaluation Report Project (GRR) (ESA 2018).

TOP *Shaded riverine aquatic habitat in the Howe Avenue Area. Photo Credit: Regional Parks*
BOTTOM *Tadpoles in restored area of Cordova Creek in the River Bend Park Area. Photo Credit: Wildlife Conservation Board*

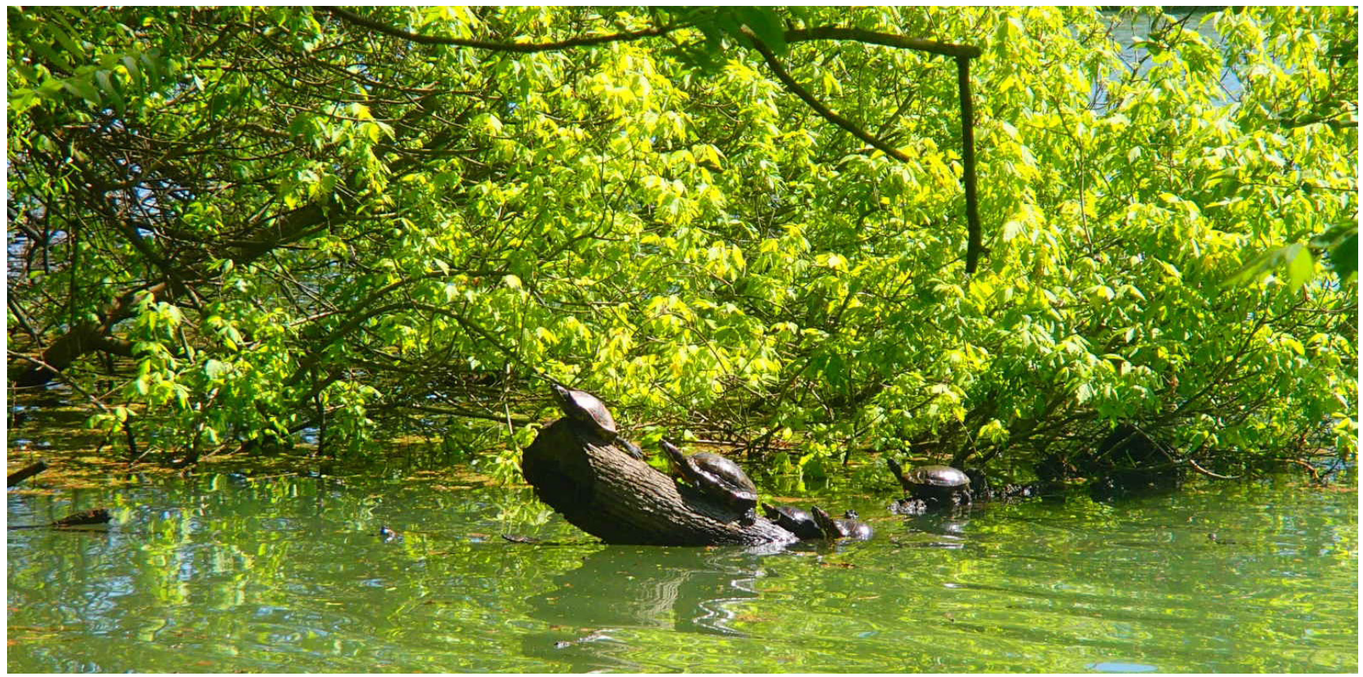
“The American River and its Parkway are the most important link between the Sacramento River and the Sierra Nevada Mountains and are an oasis in the urban/suburban sprawl of California’s capital region.”

— RESPONDENT TO NRMP COMMUNITY SURVEY 2020

4.3 HABITAT CONNECTIVITY

A mosaic of different habitat types (including, but not limited to: riparian forest, woodland, scrub, valley and foothill grassland, and freshwater marsh) provides essential diversity and areas for wildlife to complete multiple life cycle stages, while also providing corridors for dispersal. Likewise, the broad channel of the LAR provides nursery, foraging, and migration habitat for aquatic and semi-aquatic species through back and side channels, submerged vegetation, tree shading, undercut banks, and gravel deposits.

Habitat loss and fragmentation associated with urbanization pose a threat to biodiversity (McDonald et al. 2008). Connected landscapes are preferred over fragmented landscapes because they provide opportunities for species to maintain ecological processes and support wildlife populations (Beier and Noss 1998). Urban development resulting in habitat loss and fragmentation can impact resident and migratory wildlife by impeding movement, increasing risk of direct mortality, and exposing species to disease (Spencer et al. 2015). The following connectivity definitions and designations are consistent with those used in the development of the California Department of Fish and Wildlife's (CDFW's) northern Sierra Nevada foothills (NSNF) fine-scale connectivity modeling project (Krause et al. 2015). The Parkway is in the NSNF Region 2 South subsection. Figure 4-3 Regional Wildlife Connectivity and Figure 4-4 Parkway Wildlife Connectivity show connectivity in the Parkway at regional and local watershed scales (CDFW BIOS 2020).



Turtles basking on log in off channel backwaters in the SARA Park Area. Photo Credit: Wildlife Conservation Board

4.3.1 Landscape Blocks

Landscape blocks are continuous protected lands that form the basis of the NSNF Project analysis. Landscape blocks are designated as protected lands of 100 acres or more, including: a) areas managed for biodiversity conservation designated as United States Geological Survey (USGS) Gap Analysis Program (GAP) Status Code GAP 1 or 2; b) mixed-use public lands designated as USGS GAP Status Code GAP 3 that intersect with Large Intact Blocks identified by the California Essential Habitat Connectivity Project; and c) areas under conservation easement.

Landscape block coverage extends from SARA Park to the eastern boundary of the Parkway. Urban development to the north and south, as well as Hazel Avenue to the east, constrain the block. To the west, park lands continue, but they do not qualify as landscape blocks.

4.3.2 Wildlife Linkages

Wildlife linkages represent pathways for wildlife movement. Wildlife linkages were delineated by the NSNF Project using a least-cost corridor analysis for nine migratory species, in addition to suitable habitat and patch analyses

for 21 resident species. The species selected are diverse, yet representative of the region, and are sensitive to habitat fragmentation. Species-specific data and fine-scale vegetation mapping were used to model habitat suitability.

For migratory species included in the analysis (Table 4-1), least-cost corridors were modeled. Riparian corridors and land facet corridors were also analyzed; the latter providing data for suitability under different climate scenarios. For resident species included in the analysis, habitat patches within dispersal distance were modeled. Depending on the species, resident species could take many generations to travel a corridor.

The Parkway contains 863 acres of wildlife linkages (Figure 4-4 Parkway Wildlife Connectivity). The NSNF represents an important corridor for wildlife migration, connecting the Central Valley to the Sierra Nevada and encompassing corresponding wildlife corridors (Krause et al. 2015). The wildlife linkages in the Parkway are among the westernmost linkages in the NSNF region. The NSNF region is generally more urbanized in the west, including around the City of Sacramento and surrounding agricultural areas. Habitat linkages become more numerous to the east, oftentimes overlapping.

Wildlife linkage B66_B16 is in the eastern portion of the Parkway and includes the Rossmoor Bar, Sacramento Bar, Lower Sunrise, Sunrise Bluffs, Upper Sunrise, and Sailor Bar Areas. This wildlife linkage contains predicted suitable habitat for acorn woodpecker (*Melanerpes formicivorus*), California ground squirrel, California quail, Cooper's hawk, pallid bat (*Antrozous pallidus*), wood duck, and yellow-billed magpie (*Pica nuttalli*).

TABLE 4-1 SPECIES INCLUDED IN THE WILDLIFE CORRIDOR ANALYSIS

COMMON NAME	SCIENTIFIC NAME
Migratory Species	
Black bear	Ursus americanus
Black-tailed jackrabbit	Lepus californicus
Bobcat	Lynx rufus
Dusky-footed woodrat	Neotoma fuscipes
Gray fox	Urocyon cinereoargenteus
Mountain lion	Puma concolor
Mule deer	Odocoileus hemionus
Western gray squirrel	Melanerpes formicivorus
Western pond turtle	Actinemys marmorata
Resident Species	
Acorn woodpecker	Melanerpes formicivorus
Arboreal salamander	Aneides lugubris
California ground squirrel	Otospermophilus beecheyi
California kangaroo rat	Dipodomys californicus
California quail	Callipepla californica
California thrasher	Toxostoma redivivum
Coast horned lizard	Phrynosoma coronatum
Cooper's Hawk	Accipiter cooperii
Foothill yellow-legged frog	Rana boylii
Gopher snake	Pituophis catenifer
Heermann's Kangaroo Rat	Dipodomys heermanni
Lark sparrow	Chondestes grammacus
Limestone salamander	Hydromantes brunus
Mountain quail	Oreotyx pictus
Northern pygmy owl	Glaucidium gnoma
Pallid bat	Antrozous pallidus
Racer	Coluber constrictor
Southern alligator lizard	Elgaria multicarinata
Spotted towhee	Pipilo maculatus
Wood duck	Aix sponsa
Yellow billed magpie	Pica nuttalli

Gravel bar chaparral, riparian scrub, and Fremont cottonwood trees in the Watt Avenue Area. Photo Credit: Regional Parks

Riparian woodland plantings at a mitigation site in the Rossmoor Bar Area. Photo Credit: Regional Parks

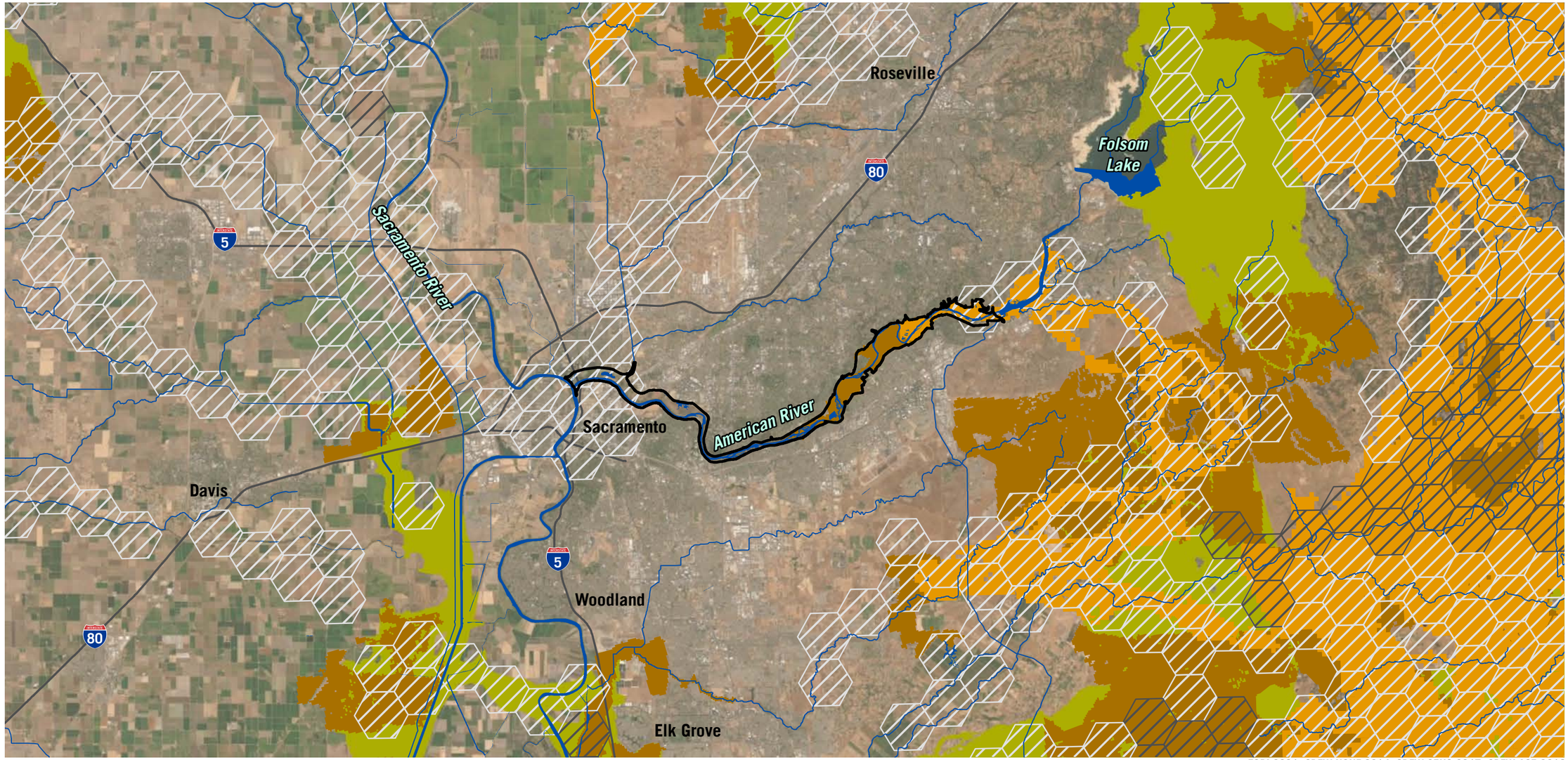
The B66_B16 wildlife linkage is primarily constrained to the LAR riparian corridor, roughly spanning the width of the Parkway, up to approximately 0.8 mile wide. Bluffs to the north of the river mark the boundary of the adjacent urbanized landscape. The linkage is limited by residential development in Fair Oaks to the north and residential and commercial development in Gold River, the City of Rancho Cordova, and the Nimbus Hatchery to the south. Though limited, connectivity is maintained under major roads including Sunrise Boulevard and Hazel Avenue. Minor road crossings, including Fair Oaks Bridge and the Jim Jones Bridge, do not disrupt connectivity.

Figure 4-3 illustrates wildlife connectivity in the greater Sacramento area, and Figure 4-4 displays connectivity components in and adjacent to the Parkway.

4.3.3 Riparian Corridors

The entire LAR provides a continuous 22.6 mile (4,747 acres) riparian corridor through the Parkway, offering food, water, and cover to local wildlife species (Figure 4-3 Regional Wildlife Connectivity). Riparian corridors in the NSNF region run predominantly east-west and complement the north-south oriented wildlife linkages. The LAR riparian corridor is one of just three locations that offer habitat connectivity across Capital City Freeway/Highway 80, a major barrier to regional connectivity. Capital City Freeway intersects the riparian corridor in the Cal Expo and Paradise Beach Areas.

In addition to terrestrial connectivity, the LAR riparian corridor offers aquatic connectivity for local and migratory fish species. However, many aquatic species, including anadromous salmonids, are limited in their upstream runs due to a number of fish passage barriers such as the Folsom Dam upstream of the Parkway. Historically, salmonids had access to an abundance of streams reaching into the Sierra

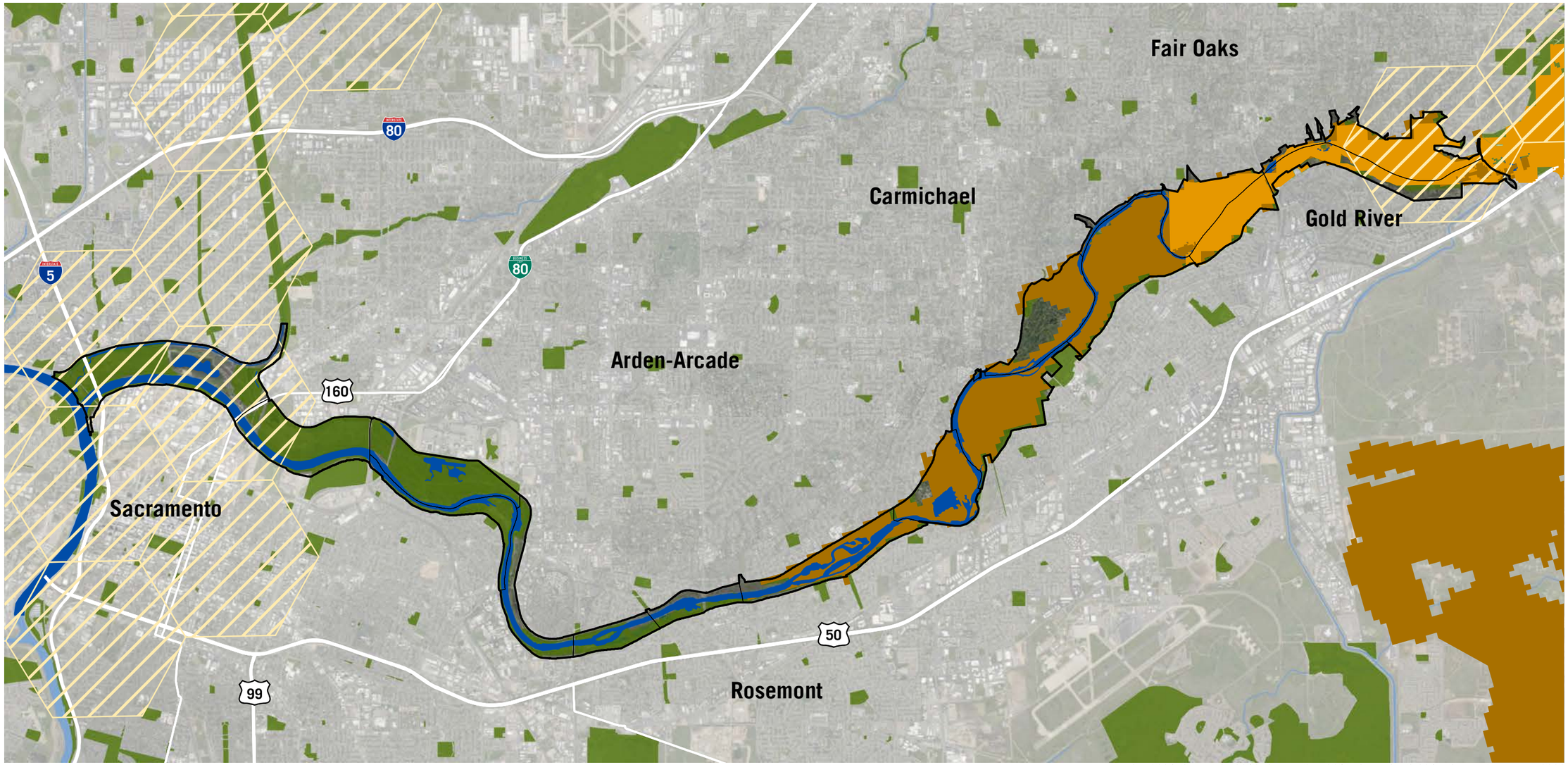


Irreplaceble and Essential Corridor
Conservation Planning Linkage
Wildlife Linkages
Natural Landscape Blocks
Essential Connectivity Area

ESRI 2021, CDFW NSNF 2014, CDFW CEHC 2017, CDFW ACE 2019

0 3 6 Miles

Figure 4-3
Regional Wildlife Connectivity



Conservation Planning Linkages
Wildlife Linkages
Natural Landscape Blocks
California Protected Area

ESRI 2021, CDFW ACE 2019, CDFW NSNF 2014, CDFW CEHC 2017, GreenInfo Network 2020

0 1 2 Miles

Figure 4-4
Parkway Wildlife Connectivity

Interior live oak trees in the River Bend Park Area. Photo Credit: Regional Parks

Gravel bar chaparral in the Sacramento Bar Area. Photo Credit: Regional Parks

Nevada. Currently, chinook salmon and steelhead trout are captured and spawned at the Nimbus Hatchery, located just upstream of the eastern terminus of the Parkway. Several fish passage projects are being considered in the American River watershed. The North Fork, Middle Fork, and South Fork of the American River are tributaries to the main stem American River, upstream of the Parkway. Their headwaters lie in the Sierra Crest in Tahoe and Eldorado National Forests. The western terminus of the Parkway area is the confluence of the American River with the Sacramento River, which then flows south to the Sacramento-San Joaquin River Delta and into the Pacific Ocean.

4.3.4 Areas of Conservation Emphasis (ACE)

CDFW maintains an Areas of Conservation (ACE) database that presents coarse-level information for conservation planning and wildlife connectivity. The Parkway contains ACE Conservation Planning Linkages at both the upstream (Sailor Bar and Upper Sunrise) and downstream (Discovery Park and Woodlake) extents (Figure 4-4 Parkway Wildlife Connectivity). These linkages represent the preferred connections between core natural areas and are important in maintaining habitat connectivity.

4.3.5 California Protected Areas

The California Protected Areas Database (CPAD) represents those lands identified by public agencies and nonprofit organizations as protected open space. It includes national, state, and regional parks, forests, preserves, wildlife areas, land trust preserves, and open space parks and lands. The majority of the Parkway is included in the database as a California Protected Area (Figure 4-4 Parkway Wildlife Connectivity).

4.4 SPECIAL-STATUS SPECIES

The Parkway provides important habitat for many special status species. Special status species are defined as:

- Plants and animals listed, proposed, or candidates for listing as threatened or endangered under the California Endangered Species Act (CESA) or ESA;
- Animals designated as Species of Special Concern (SSC) by CDFW;
- Animal species that are "Fully Protected" (CFP) in California (Fish and Game Codes 3511, 4700, 5050, and 5515);
- All nesting bird species and bat species protected under California Fish and Game Code sections 3503, 3503.5, 3512, and 4150-4155;
- Bat species designated on the Western Bat Working Group's (WBWG) Regional Bat Species Priority Matrix as: "RED OR HIGH." This priority is justified by the WBWG as follows: "Based on available information on distribution, status, ecology, and known threats, this designation should result in these bat species being considered the highest priority for funding, planning, and conservation actions. Information about status and threats to most species could result in effective conservation actions being implemented should a commitment to management exist. These species are imperiled or are at high risk of imperilment";
- Species protected by the goals and policies of local plans such as the Parkway Plan, which include anadromous and resident fishes, as well as migratory and resident wildlife; and

Interior live oak trees in the River Bend Park Area. Photo Credit: Regional Parks

- Plants occurring on the California Native Plant Society (CNPS) electronic Rare Plant Inventory. This inventory has four lists of plants with varying rarity. These lists are: Rank 1, Rank 2, Rank 3, and Rank 4. Although plants on these lists have no formal legal protection (unless they are also state or federally listed species), CDFW requests the inclusion of Rank 1 and 2 species in environmental documents. In addition, other state and local agencies may request the inclusion of species on other lists as well. The Rank 1 and 2 species are defined below:
  - Rank 1A: Presumed extinct in California;
  - Rank 1B: Rare, threatened, or endangered in California and elsewhere;
  - Rank 2A: Plants presumed extirpated in California, but more common elsewhere; and
  - Rank 2B: Rare, threatened, or endangered in California, but more common elsewhere.

Additionally, CNPS updated its lists in 2006 to include "threat code extensions" for each list. For example, Rank 1B species would now be categorized as Rank 1B.1, Rank 1B.2, or Rank 1B.3. These threat codes are defined as follows:

- .1 is considered "seriously endangered in California (over 80 percent of occurrences threatened/high degree and immediacy of threat)";
- .2 is "fairly endangered in California (20-80 percent of occurrences threatened)"; and
- .3 is "not very endangered in California (less than 20 percent of occurrences threatened or no current threats known)."

- CDFW's Biogeographic Data Branch maintains the California Natural Diversity Database (CNDDB), a computerized inventory of information on California's rare plants, animals, and natural communities. The CNDDB maintains a "Special Animals List" which contains "...all the animal species tracked by the Department of Fish and Wildlife's CNDDB, regardless of their legal or protection status". The Special Animals list includes species, subspecies, or ESU where at least one of the following conditions applies:
  - Officially listed or proposed for listing under the State and/or Federal Endangered Species Acts;
  - Taxa considered by the CDFW as SSC;
  - Taxa that meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the California Environmental Quality Act (CEQA) Guidelines;
  - Taxa that are biologically rare, very restricted in distribution, or declining throughout their range, but not currently threatened with extirpation;
  - Population(s) in California that may be peripheral to the major portion of a taxon's range, but are threatened with extirpation in California;
  - Taxa closely associated with a habitat that is declining in California at a significant rate (e.g., wetlands, riparian, vernal pools, old growth forests, desert aquatic systems, native grasslands, valley shrubland habitats, etc.); and
  - Taxa designated as a specialstatus, sensitive, or declining species by other state or federal agencies, or a non-governmental organization (NGO) and determined by the CNDDB to be rare, restricted, declining, or threatened across their range in California."

VELB is the most common federally listed (threatened) terrestrial species known to occur in the Parkway. VELB is found only in association with its host plant, blue elderberry, which grows in several habitats throughout the Parkway. Least Bell's vireo (*Vireo bellii pusilus*; federal and state endangered) occurs in limited areas of the Parkway, particularly at the confluence of the American and Sacramento Rivers. Western yellow-billed cuckoo (*Coccyzus americanus*; federal and state threatened) is infrequently observed migrating through the Parkway, but suitable nesting habitat is not present.

Nesting colonies of bank swallow, a state threatened species, have been observed on steep, unvegetated banks at the River Bend Park, Sailor Bar, and Cal Expo Areas. But they have not been found within the Parkway in recent years and are considered locally extirpated. State threatened Swainson's hawks (*Buteo swainsoni*) are also known to nest in riparian woodland and forest habitat in the Parkway. State endangered and CFP bald eagles (*Haliaeetus leucocephalus*) nest at Lake Natoma and are observed in spring while foraging, during migration, and occasionally in the winter months. Several state SSC birds are known to nest in the Parkway, including white-tailed kite (*Elanus leucurus*), Cooper's hawk, burrowing owl (*Athene cunicularia*), great blue heron, and great egret. The Western pond turtle has been observed at Bushy Lake and the Nature Study Area in Ancil Hoffman County Park. Other SSC are occasionally observed foraging in or migrating through the Parkway.

Chinook salmon Central Valley spring-run ESU population 6, Central Valley fall-run and late fall-run ESU population 13, and Sacramento River winter- run ESU population 7 have potential to occur within the reach of the American River that flows through the Parkway. These ESU populations are listed under CESA and/or ESA or are otherwise considered special status. In addition, steelhead of the Central Valley DPS population 11 are listed as federally threatened and have potential to occur within the Parkway.

The only sensitive plant species currently identified is Sanford's arrowhead (*Sagittaria sanfordii*) (CNPS Rare Plant Rank 1B.2). Suitable habitat for this low-lying, creeping perennial herb includes standing or slow-moving freshwater ponds, marshes, and ditches.

Fremont cottonwood trees in the Discovery Park Area. Photo Credit: Regional Parks

4.5 INVASIVE SPECIES

Non-native invasive plant and wildlife species occur throughout the Parkway in every vegetation community type. Where dominant, non-native species prevent native plants and wildlife from establishing, disturb hydrologic and sediment transport processes, increase risk of wildland fires, and discourage some recreational uses. In addition, they are toxic and transmit disease to native wildlife, provide poor-quality habitat for wildlife, and are predators of native wildlife.

4.5.1 Plants

Over time, the expansion of residential, commercial, industrial, and flood control infrastructure developments along the LAR corridor has introduced non-native species into the Parkway. Most of the original native vegetation along the Parkway has been altered by historical land uses such as farming, gravel mining, and gold mining in the nineteenth and twentieth centuries. Currently, natural and human-induced disturbances in the Parkway impact ecosystem dynamics relative to the structure and composition of native vegetation.

Numerous infestations of non-native and invasive plants now dominate large portions of Parkway habitats. For the purposes of the NRMP, non-native plant species refer to those species introduced to California after European settlement. Invasive species refers to those non-native species that have spread into wildland areas through human activity, adversely affecting native habitats and ecosystem processes. The incursion of non-native and invasive plant species has reduced the overall abundance and diversity of native plant communities, impaired wildlife habitat quality, altered floodplain geomorphology, and discouraged some recreational uses along the Parkway.

Pampas grass in the Ancil Hoffman County Park Area. Photo Credit: Regional Parks

There are over 250 non-native plant species that occur in the Parkway, but only a small number are considered invasive (CAL-IPC 2020, SCRP 2008). Regional Parks has ranked non-native invasive species according to how severely they affect localized ecosystem processes, triggering the need for management action. The following five species have been ranked as the highest priority species: yellow star thistle (*Centaurea solstitalis*), Chinese tallow tree, red sesbania, giant reed (*Arundo donax*), and Spanish broom. These target species meet one or more of the following criteria:

- Are highly invasive or aggressive colonizers;
- Prevent native species from regenerating;
- Are toxic or provide low-quality habitat values for wildlife;
- Reduce water yields;
- Obstruct passage of floodwaters;
- Reduce streambank stability; and
- Are highly flammable.

The single largest noxious weed infestation in the Parkway is yellow star thistle, covering nearly half (an estimated 548 acres) of the agricultural fields and annual grasslands (Figure 4-5 Invasive Plant Species). Yellow star thistle is intolerant of flooding and generally restricted to upland settings, but it can quickly reinvade and dominate sites within several years following a flood event due to its extensive seed bank. Populations are generated from seed, so long-term management goals are focused on vegetation type conversion, which involves removing the invasive plants

and seed bank and replacing them with native species. As the native plants establish and consume more resources, the seed bank will be reduced due to lack of suitable germination conditions (SCRP 2008).

Several other invasive species populations are rapidly expanding in the riparian vegetation of the LAR (Eva Butler and Associates et al. 2000). Red sesbania is expanding along shorelines of streams and ponds. During the 2017 floods, red sesbania seed banks flourished, and populations rapidly expanded. Volunteers and staff were able to remove dense stands, with difficult to reach areas treated with herbicides the next fall. Chinese tallow tree, giant reed, Spanish broom, and tamarisk are also expanding in riparian habitats and can rapidly colonize exposed bar surfaces and stream banks. These species may strongly affect hydraulic roughness during high-flow events and can affect erosion and sedimentation processes. Moreover, infestations crowd out native riparian trees and shrubs and decrease habitat diversity for wildlife.

Invasive species removal and management can be beneficial economically and ecologically. Although it is nearly impossible to completely eradicate certain invasive species, management efforts help to prevent environmental degradation in the Parkway. For most perennial, woody tree, and shrub species, it is possible to drastically reduce the population by removing all mature plants and new growth; thereby decreasing the seed bank and reducing regrowth. Performing continuous management reduces the environmental impacts of invasive species and reduces maintenance costs in the long term (SCRP 2008).

The ARPF maps and manages exotic plant species populations as part of the Invasive Plant Management Plan (IPMP) (SCRP 2008) to guide management decisions related to invasive species (Figure 4-5 Invasive Plant Species). Established in 1997, the IPMP program has been implemented for Phase I and Phase II, and is now in the maintenance phase. Phase I of the IPMP began with background studies, mapping, and data compilation; completing localized removal projects; and monitoring and mapping invasive plant populations throughout the Parkway (Eva Butler and Associates et al. 2000). Since partnering with the ARPF, volunteer stewardship has been very successful in controlling and managing priority invasive species without the extensive use of herbicides (SCRP 2008).

The second phase of the IPMP focused on eradicating all mature target weeds while controlling seedlings, re-sprouts, and new colonies to reduce the seed bank and prevent re-infestation. Other Phase II goals included actively restoring riparian woodland, removing yellow star thistle, restoring native grasslands and oak woodlands, and further establishing the volunteer stewardship program for long-term invasive control (Eva Butler and Associates et al. 2000). The Parkway's integrated pest management program includes hand removal, cut and paint herbicide application, and targeted backpack spray application. Use of herbicides is limited to minimize damage to surrounding species and encourage native seed germination. The goal of the program is to use contractors and volunteers to eradicate mature invasive species and control regrowth.

Early stages of the IPMP implementation included biomass removal of mature target weeds. Invasive plant removal focused on mapping and eradicating incipient stands of giant reed, tree of heaven, Spanish broom, yellow star thistle, red sesbania, and Chinese tallow tree (Eva Butler and Associates et al. 2000). These are considered high priority for removal because they colonize rapidly

TOP *Perennial pepperweed in the Woodlake Area. Photo Credit: Regional Parks*
BOTTOM *Red sesbania. Photo Credit: Regional Parks*

and spread along streams. A series of strong storm events in the 2016-2017 and 2018-2019 winters created challenges for IPMP removal efforts. Additional resources and labor are required to control target weeds in areas where Parkway trail infrastructure access is limited by storm-related damage. In addition, increased water supplies promote germination of buried seed banks and proliferation of certain weed species. Invasive species present, but not currently high priority for removal, include perennial pepperweed, tree of heaven, black locust, Himalayan blackberry, vinca (*Vinca major*), yellow flag iris (*Iris pseudoacorus*), Chinese pistache (*Pistache chinensis*), and cherry plum (*Prunus dulcis*).

The maintenance phase (Phase III) of the IPMP includes the removal and timing of treatments as determined by plant blooming periods, aquatic species dynamics, and accessibility of river flows. Non-invasive methods (e.g., hand pulling) are employed by staff and volunteers when possible. The volunteer program continues to be an important resource for the program. Information from the pilot program is being gathered to determine the most effective methods for removing target species from the Parkway. In general, most large shrubs and trees, including Spanish broom and Chinese tallow tree, can be completely removed with annual or bi-annual efforts. Native species revegetation is recommended in these areas to stabilize soil and discourage invasive seedling germination (SCRP 2008). The number of species to be targeted ultimately depends on available funding, impacts to recreation, and ecosystem and flood control infrastructure (SCRP 2008).

4.5.2 Fish and Wildlife

The LAR and its associated riparian corridors represent major regional waterway and travel routes for exotic fish and wildlife species movement. As with plants, the increasing urbanization, anthropogenic changes to hydrology, and general change in land use within the LAR vicinity has resulted in the increase of non-native wildlife species. Changes to vegetation described above have decreased habitat availability for native wildlife species, while simultaneously increasing habitat availability for non-native wildlife species. Within Sacramento County, there are 98 documented occurrences in the USGS Nonindigenous Aquatic Species (NAS) database. The NAS definition of "nonindigenous aquatic species" includes those species that enter a body of water or aquatic ecosystem outside of the historic or native range (USGS 2021). Like plants, USGS reports that most of the nonindigenous introductions are due to "human activities since the European colonization of North America" (2021) While many species are introduced from countries outside of North America, several are also native to North America, but are classified as nonindigenous as they have been introduced to drainages outside their native drainages within North America.

For the purposes of this document, the term "invasive" also encapsulates NAS included in the USGS database. Invasive species threaten native wildlife through predation, parasitism, competition, and introduction of disease. In addition, some species, including nutria (not included in the NAS database), have severe negative environmental and agricultural impacts. The following invasive wildlife species have been ranked as the highest priority species for management: mute swan (Cygnus olor), brown-headed cowbird (*Molothrus ater*), southern watersnake (*Nerodia fasciata*), northern watersnake (*Nerodia sipedon*), red-eared slider (*Trachemys scripta elegans*), and American bullfrog (*Lithobates catesbeianus*).

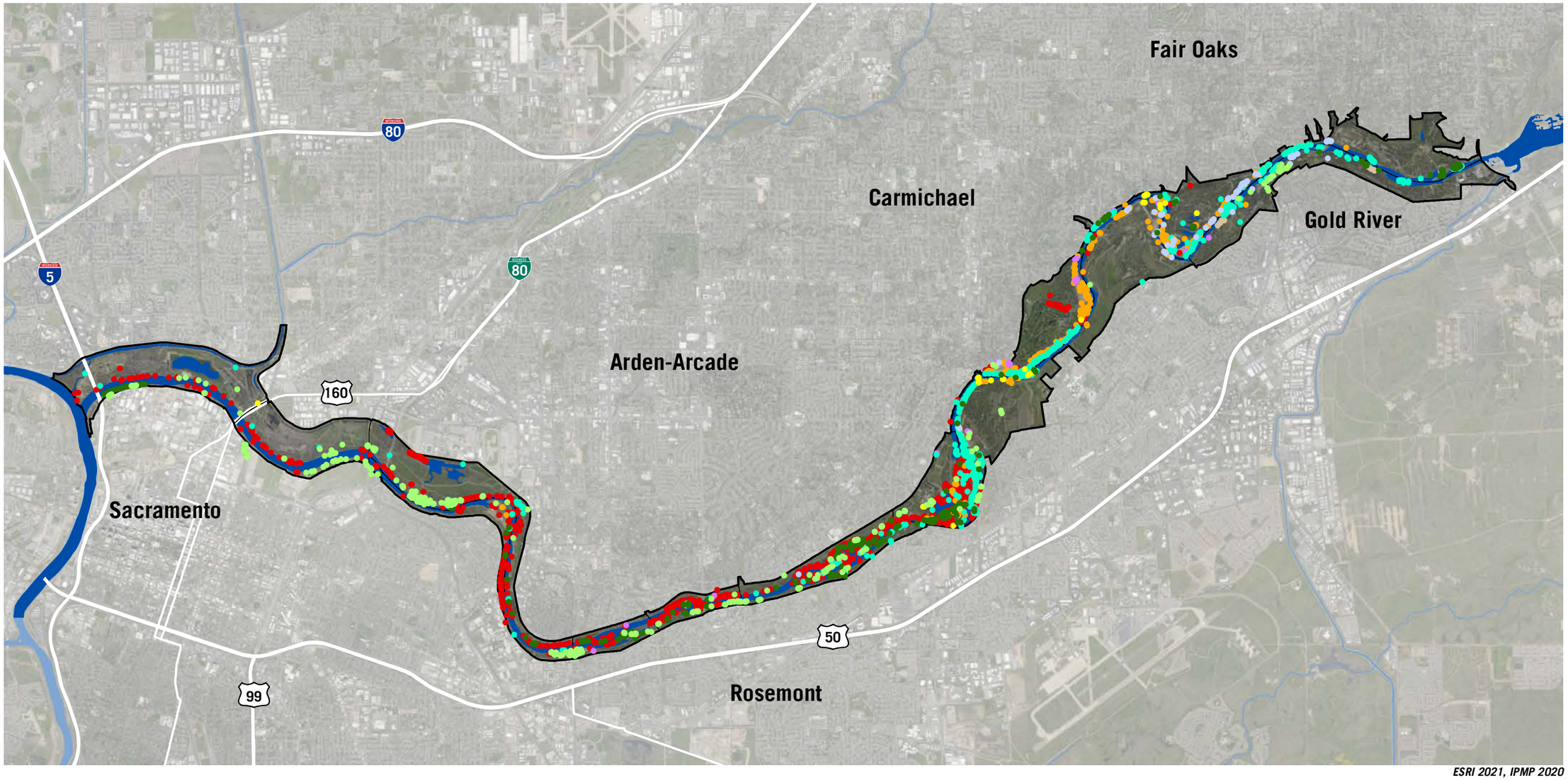
The Invasive Species Program at CDFW manages the detection and eradication/reduction efforts of the invasive wildlife species of highest priority. Figure 4-5 shows the locations of current and past locations of invasive plant species in the Parkway. A brief description of these species and their potential impact to the Parkway is provided below.

MUTE SWAN

Native to northern and central Eurasia, mute swans arrived in the United States in captivity for use by private breeders in zoos, parks, and as ornamental livestock (CDFW 2021a). Adult mute swans are solid white, with a black patch attached to their bright orange beaks. Adults can measure 4-5.5 feet in length and weigh 25-30 pounds (CDFW 2021a). Mute swans are aggressive and consume large amounts of submerged aquatic vegetation, so they have been used in parks and open space to reduce waterfowl populations and algal growth. However, within the Parkway, mute swans can harm native waterfowl and reduce aquatic vegetation required for multiple life stages of native fish and wildlife. There are unconfirmed observations of mute swans along the Parkway (iNaturalist 2021a).

BROWN-HEADED COWBIRD

Brown-headed cowbird is in the blackbird family and is relatively nondescript, with males having a glossy black body with mild green iridescence and a dark brown head. Females are drab, with a grayish-brown body and lighter coloration on the head, breast, and underside of the body (CDFW 2021b). Adults range in size from 6-8.5 inches in length and have a wingspan of 12-15 inches. Originally native to the Great Plains region of the United States, the range of brown-headed cowbird has vastly expanded



ESRI 2021, IPMP 2020

- Arundo Donax
- Chinese Tallow
- French Broom
- Oleander
- Pampas Grass
- Pyracantha
- Red Sesbania
- Scotch Broom
- Spanish Broom

0 1 2 Miles

Figure 4-5
Invasive Plant Species

through human habitat modification and introduction of non-native livestock grazing. This species is now present year-round throughout much of California (CDFW 2021b). Brown-headed cowbirds are co-adapted with herding mammals, and feed on insects attracted to cattle and other grazers such as deer, elk, and bison. Due to the grazing herds' nomadic travel patterns, brown-headed cowbirds adapted by becoming nest parasites—laying their eggs in the nests of other birds and leaving them to rear the cowbird young, often at the expense and/or death of their own due to the voracious appetite and quick growth of the cowbird chicks. Adult brown-headed cowbirds will also remove the eggs of the host nest. For this reason, brown-headed cowbirds represent a large threat to native bird species within the Parkway. The endangered least Bell's vireo within and near the Parkway is of particular concern.

SOUTHERN WATERSNAKE

Believed to be introduced through the pet trade and subsequent release, aquatic southern watersnakes within California are likely derived from the native Florida subpopulation (*N. f. picitiventris*). Adults are broad in stature and can reach up to 5 feet in length, with highly variable body colors (brown, black, yellow-brown, tan, gray, or red; CDFW 2021d). Southern watersnakes have established populations in multiple locations within Sacramento County, including directly east of the Parkway near Lake Natoma (CDFW 2021d). Southern watersnakes are a predator of native wildlife in California, including many threatened and endangered amphibians, fish, reptiles, and birds. The state and federallisted giant garter snake is of particular concern within the Sacramento region due to the overlap in habitat and competition for prey species, and the high reproductive rate of the southern watersnake.

NORTHERN WATERSNAKE

Believed to be introduced through the pet trade and subsequent release, aquatic northern watersnakes within California were introduced from one of four original subpopulations: Lake Erie, midland, common, and Carolina (CDFWe 2021). Adults are broad in stature and can reach from 2-4.5 feet in length. They have black, dark brown, or reddish crossbands toward the head; rows of blotches towards the tail; and their bellies can be white, yellow, or orange, commonly with dark half-moon shaped spots (CDFWe 2021). Northern watersnakes are known to occur in Roseville, north of Sacramento. Northern watersnakes may be a predator of native wildlife in California, including many threatened and endangered amphibians, fish, reptiles, and birds. The state and federallisted giant garter snake is of particular concern within the Sacramento region due to the overlap in habitat and competition for prey species.

RED-EARED SLIDER

Red-eared sliders are medium-sized turtles that are native in the Mississippi Valley, from Illinois south to the Gulf of Mexico, and from New Mexico east to West Virginia. Adults range in size from 3.5-14.5 inches in length and are typically identified by their red "ear," a short red stripe extending behind the eyes, although this may be less apparent in older individuals. The shells are olive to brown in color with yellow stripes and the plastrons are typically yellow or brownish orange, with dark spots in the center of each scute (shell plate). Red-eared sliders were, and continue to be, introduced globally, primarily through the domestic pet trade. Red-eared sliders typically outcompete the native western pond turtle because of their quicker sexual maturity, more frequent and larger clutch sizes, larger adult size (and subsequent larger caloric demand and space occupied at basking sites), and very general habitat preference. This out-competition further exacerbates the already steady loss of the western pond turtle's native habitat along the West Coast of the United States. Red-eared sliders are also disease vectors, spreading bacteria, including Salmonella spp., to native wildlife, including western pond turtle. There are many observations of red-eared slider along the Parkway (EDDMapS, 2021; iNaturalist 2021b).

AMERICAN BULLFROG

The American bullfrog is the largest North American frog, with adults reaching 3.5-8 inches in length, and identified by their characteristic large, noticeable tympanum (earlike membrane). The bullfrog is native to the central and eastern United States. It was first accidentally introduced to the western United States in the early 20th century via stocking lakes with fish. Further introductions of the species took place via the exotic pet trade and other unmanaged imports for a variety of purposes. They are now widespread throughout California, but are notably absent from the Sierra Nevada. Bullfrogs are notorious for eating "anything they can fit into their mouths" (CDFW 2021g). For this reason, they are an enormous conservation issue to endemic California wildlife. Adult bullfrogs are a predator of western pond turtle and other native wildlife species at various stages of life. Larval bullfrogs eat algae, aquatic vegetation, and invertebrates, but also consume larvae and hatchlings of other amphibians and reptiles. There are numerous observations of American bullfrog along the Parkway (iNaturalist 2021c).

4.6 WILDLAND FIRE

Wildland fire is a term that includes any non-structure fire originating in an area of wildland vegetation, aside from prescribed fires ignited for management purposes (NPS and USFS 2020). It includes wildfires that may be caused by lightning, volcanic activity, accidental human activities (including sparks from vehicles or equipment, fireworks, escaped prescribed fires, campfires), and arson (USFS 2020). Naturally ignited wildfires are long-standing phenomena that occur in most terrestrial ecosystem types and are considered integral to natural ecosystem processes and patterns (Neary et al. 2005). Wildfires have long induced environmental changes that underpin the continued persistence of native grasslands, shrublands, forests, and other ecosystem types across the globe (Agee 2006). Historically, wildfires occurred periodically according to location-specific return intervals (Nunamaker et al. 2007). Human activities have altered historic fire return intervals (FRI) and the ways in which wildland fires impact natural landscapes (Moritz et al. 2018). Fire scientists hypothesize that aggressive state and federal fire suppression activities in California in the past century have extended the state's average FRIs and led to an unnatural accumulation of fuels in wildland areas (Nunamaker et al. 2007). This recent management trend of fire suppression, in combination with the development of new communities abutting wildland areas, may be creating a future in which increasingly severe and destructive wildland fires become the norm in California and elsewhere.

4.6.1 Fuel, Weather, and Topography in the Parkway

Fire behavior is dependent upon the location-specific characteristics of three factors, including fuels, weather, and topography, as described below and shown in Figure 4-6 Fire Behavior Triangle.

Fuels – The combustible materials that allow for the ignition and spread of a fire.

Weather – Temporary atmospheric conditions, including wind, rain, temperature, and humidity.

Topography – The physical features of land, including slope, elevation, and aspect (the direction a slope faces).

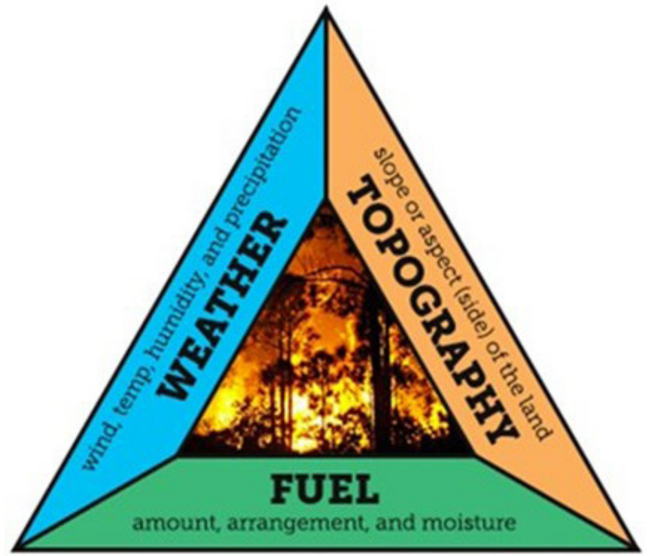


FIGURE 4-6 FIRE BEHAVIOR TRIANGLE

(Source: Google Images)

Fuels

A key consideration in wildland fire prevention is the reduction or elimination of fuels. Fuels are the only characteristic of the natural landscape that land managers can realistically attempt to control. Grasses, shrubs, trees, and organic ground litter, such as fallen leaves, needles, and twigs, are typical fuels (NPS and USFS 2020). Fuel loads, defined as the overall quantity of fuels in an area, are measured in weight per unit area (generally per acre). Fuels are characterized in terms of quantity, size, moisture content, flammability, and location/arrangement, all of which contribute to the intensity and severity of a wildland fire (Nunamaker et al. 2007). Large quantities of fuels will contribute to more intense fires. Physically small fuels tend to ignite faster and burn quicker, while large fuels may take longer to ignite and will likely burn for extended periods of time. Dry fuels ignite easier than those with higher moisture content. Dryness is usually determined by a combination

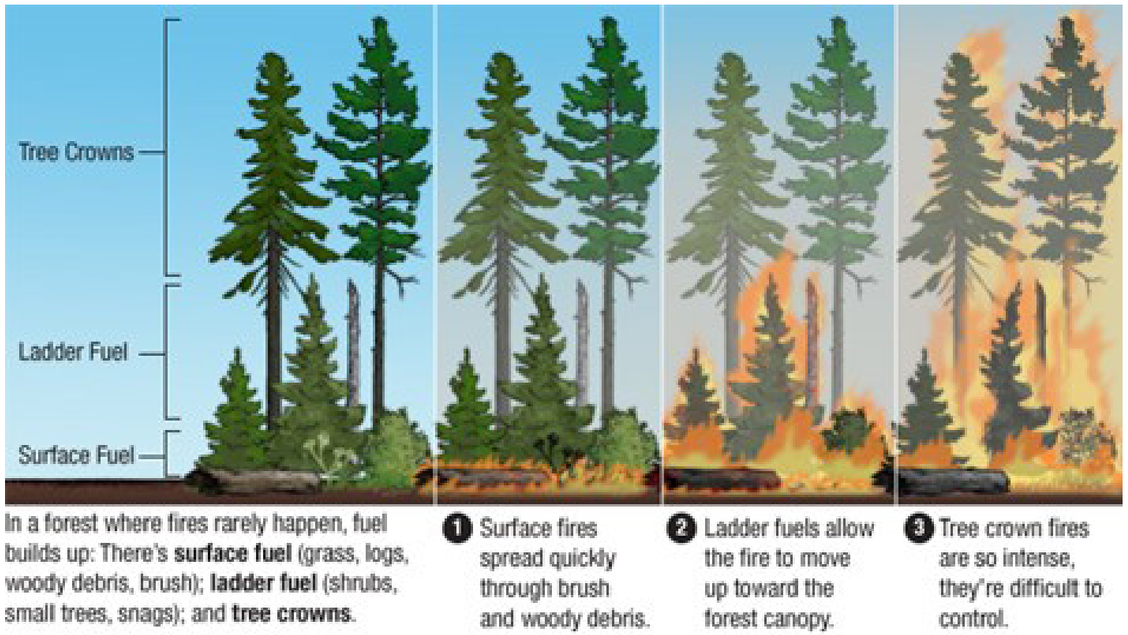
of the life stage of the fuel, season, and recent weather events. Finally, the location of fuels contributes to the type of fire produced. Groundcover fuels (e.g., grasses, fallen wood, and organic litter) produce surface fires. Fuels located 6 to 15 feet in elevation (e.g., small trees, low-hanging branches, and shrubs) may act as ladder fuels that allow fire to spread

into the crowns of trees in the overstory. Figure 4-7 Fuel Profile depicts the fuel profile of a fire-suppressed forest with accumulated groundcover/surface fuels and ladder fuels.

The Parkway contains a variety of potential fuels. The Discovery Park, Woodlake, Cal Expo, Rossmoor Bar, and Sailor Bar Areas contain contiguous patches of valley and foothill grassland and elderberry savanna with ample herbaceous fine fuels, such as grasses and small shrubs, that dry and ignite quickly. Riparian forest, woodland and oak forest, and woodland vegetation communities that occur throughout the Parkway contain fine understory fuels, mid-story semi-woody and woody fuels, and large, woody trees in the overstory. Chaparral and riparian scrub vegetation communities are found interspersed with riparian forest and woodlands in the Discovery Park, Cal Expo, River Bend Park, Lower Sunrise, and Upper Sunrise Areas, as well as on gravel bars in the Rossmoor Bar, Ancil Hoffman County Park, River Bend Park, and Sacramento Bar Areas. These areas contain semi-woody vegetation in the form of shrubs, with small trees intermixed. See section 4.1 for additional discussion on the characteristics of the vegetation types that may act as fuels in the Parkway.

FIGURE 4-7 FUEL PROFILE

(Source: USFS)



Invasive Vegetation

Several invasive plant species increase wildland risk during fire season. Most plant species pose a heightened risk of ignition in summer and fall. However, giant reed, pampas grass, Spanish broom, French broom, and Scotch broom are of particular concern because of their significant fuel loads, height, density, and flammability in comparison to native riparian forest species. The role of invasive species in increasing wildland fire risk in the Parkway highlights the need for continued and strategic management of non-native invasive plants, both to improve overall ecosystem health and for wildland fire prevention.

Giant reed, a grass that can grow up to 30 feet tall, is distributed along forested riparian areas in the Parkway. Pampas grass is a large grass species that can reach 6 to 13 feet in height and invades the Parkway's inland riparian and floodplain areas. Giant reed and pampas grass produce significant quantities of dry biomass that increase fuel loads in native vegetation communities (CAL IPC 2020a; CAL IPC 2020b). Spanish broom, French broom, and Scotch broom are large shrubs that grow in dense stands (USFS 2020). Spanish broom grows 10 to 15 feet in height in riparian areas and sandbars. French broom grows to up to 10 feet high and has been observed in the Rossmoor Bar, Sacramento Bar, and Lower Sunrise Areas. Scotch broom grows 6 to 10 feet, and is observed in patches throughout the Parkway. These species ignite readily and may act as ladder fuels, facilitating the spread of surface fires into ladder fuels, and subsequently to the tree crowns.

Weather

Weather conditions, such as air temperature, humidity, precipitation regime, and wind speed, have considerable influence over the ignition, intensity, and movement of wildland fires. High temperatures heat fuels and allow faster ignition than low temperatures. Low humidity levels indicate less water vapor in the air, which dries fuels and allows them to ignite and burn more quickly. Similarly, the presence or absence of recent rains can impact the moisture levels in fuels. High wind speeds supply existing fires with more oxygen and push flames toward unburnt fuels (NPS 2017).

Long-term weather conditions and patterns characterize a region's climate. Climate influences a region's "fire season" when weather conditions create prime wildland fire conditions. In general, fire season in California spans from early summer (June) to fall (October-November), when temperatures are high, humidity is low, and fuels are dry or dying. The Sacramento Valley is characterized by hot, dry summers, leading to increased seasonal wildland fire risks (USGS 2020).

As discussed in Chapter 3.0 Parkway Setting, climate change may significantly alter weather patterns in the Sacramento Valley and the Parkway in the future. Changing climatic conditions may result in consistently higher temperatures and altered precipitation patterns, resulting in more extreme weather conditions (e.g., extended summer seasons and drought) (Houlton 2018). As a result, changing climate conditions may extend and prolong the period in which fuels remain in the Parkway in absence of regular precipitation and flooding. Although Regional Parks cannot directly influence weather conditions in the Parkway or the climate of the Sacramento Valley region, fuels and other wildland fire risks can be strategically managed in anticipation of changing climate conditions.

Topography

The Parkway is quite flat, though the bluffs in the LAR's upper reaches represent steeply sloped areas. Steep slopes enable fire to travel rapidly uphill as hot air rises and heats the vegetation further upslope. Flat and gently sloping areas generally have little impact on wildfire intensity or severity (NPS 2017). Though the Parkway contains bluffs with steep slopes, bluff faces are often unvegetated or sparsely vegetated, which prevents potential fires from "leaping" from the base to top. Bluffs typically border the river or very narrow rocky areas where human ignition of wildland fire would be uncommon, though there are recorded instances of wildland fires at the tops of bluffs in the Parkway. Topography plays far less of a role in influencing wildfire activity in the Parkway compared to that of fuels and weather/climate.

4.6.2 Wildland Fire Impacts

Wildland fire affects biological resources in both the short- and long-term. It can revitalize or degrade these resources to varying degrees based on site-specific natural resource characteristics (including floral and faunal species composition and soils composition), fire characteristics (including intensity and severity), and recent weather events (Agee 2006).

Vegetation

The impact of fire on vegetation varies by ecosystem type. Habitats with moderate moisture supplies, such as riparian forests and wetlands, are less likely to experience substantial changes in vegetation due to fire relative to drier habitats, such as upland forests, shrublands, and grasslands. Vegetation mortality and recovery in burned areas depends on the characteristics of plant species and fire severity. An individual plant's resistance to fire mortality depends partly

Burned cottonwood tree in the Howe Avenue Area.
Photo Credit: Regional Parks

on the location of its growth tissues. Trees with thick bark that protect inner tissues and plants with rhizomes (thick underground stems) are more likely to survive and recover after a fire compared to understory plant species with shallow root systems (Miller 2000). Depending on intensity, the lethal heat produced by a fire may reach varying depths. A low or moderate severity fire may heat only understory plants, organic litter, duff (decomposing organic materials), and surface soils. A high severity fire may produce lethal temperatures deep in the soil that would not only kill surficial plant materials, but may also kill shallow subsurface roots (Miller 2000). Although tree bark usually protects trees from fire mortality, a high severity fire that burns the cambial (active growth) layer or that scorches tree crowns may also result in death. Finally, fire may not result in immediate mortality. Rather, it may weaken the natural defenses of the plant, resulting in future susceptibility to disease or insect damage (Miller 2000).

Burned trees in the Howe Avenue Area. Photo Credit: Regional Parks

Vegetation recovery in burned areas is heavily influenced by species reproduction dynamics. A species capable of regeneration may be able to produce post-fire sprouts if adequate growth tissues are retained. Non-lethal fire can induce seed germination when the outer layer of the seed is cracked or ruptured by the heat of a fire. This allows water to enter the seed and stimulate growth. Seed banks may germinate and reestablish following a ground-clearing fire, although severe fires may produce lethal heat that destroys even the seed bank. In these cases, the reestablishment of native species may occur only through seed deposition via wind, wildlife, water flow, or a similar transportation vector (Miller 2000).

Fires can enable the proliferation of invasive species. If given the opportunity, invasive plant species will outcompete native species revegetating a burned area (Zouhar et al. 2008). Invasive species, such as yellow star thistle, red sesbania, Chinese tallow, pyracantha, and oleander, are adapted to colonize burned areas through introduction of seeds from off-site or from fire-induced germination of seeds present in the seed bank.

Soils

Fire can potentially impact the physical, chemical, and biological characteristics of soil. The most important effect of fire on the physical properties of soil is loss of organic matter on or near the surface. This weakens soil structure and may reduce soil productivity. The transfer of heat from the litter and duff layers of soil through the surface layer and deeper can increase the hydrophobicity (i.e., water repellence) of soils. Both loss of soil structure and increased hydrophobicity increases postfire water runoff and erosion potential. The degree to which the physical properties of soil are impacted by fire is largely dependent on the severity of the event and the temperature threshold of the soils (Neary et al. 2005).

Wildland fire can alter the chemical properties of soils. Organic matter plays an important role in nutrient cycling (the process in which organic and inorganic matter is removed and introduced back into the production of living matter) and water retention in soils. The combustion of soil organic matter may either volatilize (evaporate or disperse in vapor) nutrients or make the nutrients stored within the organic matter more readily available to plants

Grazed (photo left) versus ungrazed (photo right) vegetation. Photo Credit: Regional Parks

and other organisms. Important nutrients, particularly nitrogen, are often transferred away from a site by water runoff and erosion. Ultimately, the intensity and severity of a fire determine the degree of change in soil chemical characteristics.

Finally, fire may impact the biological properties of soil, including the microorganisms responsible for decomposition and mineralization processes. While microorganisms are generally resilient to fire and eventually recover to pre-fire levels, fire may completely eradicate the microorganisms found in the litter and duff soil layers. The degree to which a fire impacts soil biology is dependent on fire intensity, severity, and soil microbial composition (Neary et al. 2005).

Water

Wildland fire has the potential to alter hydrologic cycles (the movement of water to and from land, surface water bodies, and the atmosphere), such as the infiltration of water into soils; the storage of water in plants, organic litter, and snow; and the quantity of water travelling in surface waters and via overland flow. Decreased infiltration of water into soils and elimination of surface organic matter and litter can induce flooding events resulting from intermediary increased erosion and runoff, as discussed in the Soils section above.

Wildland fire also affects water quality by introducing sediment to surface waters through flooding and erosion, increasing nutrient loading in surface waters, introducing heavy metals (e.g., mercury, arsenic, and selenium) from surrounding soils and other geologic sources, and conveying fire retardant chemicals into surface waters. Water quality is particularly affected by fire severity, rather than intensity, as a severe fire is more likely to result in large fuel consumption, nutrient release, and erosion (Neary et al. 2005).

Wildlife

The impacts of wildland fire on wildlife can be direct or indirect. Direct impacts include injury and mortality from flames and smoke inhalation. Indirect impacts include both short-term and long-term wildlife movement in response to the fire and changes in the food supplies of a habitat area (Smith 2000).

Overall, wildland fires do not typically injure or kill large proportions of wildlife populations. However, fires that are large, intense, fast-moving, and uniform can be devastating to wildlife, regardless of species. Wildlife at highest risk of perishing during a wildland fire are those that nest and live above ground and have limited mobility. Small mammals, such as voles, that nest underground have a higher likelihood of surviving a wildland fire than do rabbits and mice. Limited mobility in bird populations during the nesting season increases the fire-induced mortality rates of some species. Fledglings nesting closer to the ground are most vulnerable. Mortality rates in large mammal species are typically low due to their high mobility. Many reptilian and amphibian species prefer moist habitats, such as riparian forests and wetlands that are typically less prone to wildland fire. Reptiles and amphibians are most vulnerable during molting phases and as juveniles. Some species can burrow when threatened by fire, thus minimizing their population losses associated with wildland fire. Though there is comparatively less research on fire-related mortality

and injury to insects and other invertebrates, individuals in immature or immobile life stages, such as the larval stage, are most vulnerable (Smith 2000).

Across many wildlife populations, emigration from an active fire is temporary. Most populations return to the burned area after varying periods of time depending on the extent of damage and recovery of their habitats. In fact, many wildlife species are attracted to burning or recently burned areas. Shortly following a fire, predatory and scavenger avian species seek out mammalian and invertebrate corpses, while non-predatory species may seek out burned trees for nesting. Similarly, predatory mammalian species may be attracted to corpses or live populations of prey species congregating near the boundaries of burned areas. In addition, predator species may visit burned areas because they lack substantial cover, and it is easier to find prey.

4.6.3 The Wildland-Urban Interface

Wildland fires impact human development most frequently in the wildland-urban interface (WUI). The USFS defines WUI as human development, often in the form of residential communities, that either intermingle with or abut areas with dense wildland vegetation according to the following criteria:

- Intermix: Areas with ≥6.18 houses per km2 and ≥50 percent cover of wildland vegetation; and
- Interface: Areas with ≥6.18 houses per km2 and <50 percent cover of vegetation located <2.4 km of an area ≥5 km2 in size that is ≥75 percent vegetated. (USFS 2010)

While the general concept of WUI is largely similar among various governments, agencies, and organizations, WUI definitions may vary. For example, the Parkway and surrounding human development do not meet the USFS's criteria for WUI, but most of the Parkway is mapped as WUI by the Sacramento Metropolitan Fire District (Metro Fire), which serves unincorporated Sacramento County and the incorporated cities of Rancho Cordova and Citrus Heights (Wildland Res Mgt et al. 2014). Metro Fire's WUI includes the portion of the Parkway between Watt Avenue and the Folsom Dam. The Healthy Forest Restoration Act (HFRA) passed by Congress in 2003 encourages communities containing lands that may be considered WUI to develop Community Wildfire Protection Plans (CWPP) in which local wildfire risks and priorities are defined and explored (Wildland Res Mgt et al. 2014). Metro Fire's CWPP identified WUI areas within its District boundaries using the following parameters:

Using a set of spatially defined data that characterizes vegetation and parcel boundaries, the following set of decision rules were established to determine which properties should be included within the WUI:

1. The boundary of the WUI will fall on the parcel boundary;
2. All parcels are greater or equal to one-half acre;
3. Any parcel where the total percentage of all fuel types is greater than one-half acre;
4. Any parcel where surface fuels are present;
5. Any parcel greater than 80 acres; and
6. Any parcel with a 1,000-foot buffer around wildlands that are greater than 80 acres. (p. 4-1)

The CWPP's WUI map places most of the Parkway (within District boundaries) and adjacent communities within a District-designated WUI (Figure 4-8 Wildfire). The CWPP

Mowed firebreak between planted oak trees.
Photo Credit: Regional Parks

states that areas located within the District's mapped WUI are "targeted for increased levels of fire prevention, preparedness, response, and recovery plans. Parcels in this designation are typically subject to more stringent regulations regarding ignition-resistant construction, defensible space creation and maintenance, and heightened levels of education regarding fire prevention" (Wildland Res Mgt et al. 2014, p. 4-1). Although the Parkway may not be considered WUI by federal definition, the Parkway and surrounding communities compose a locally designated high fire risk zone in which fire risk and hazard management are prioritized.

The City of Sacramento Fire Department (Sacramento City Fire) is responsible for fire response and fire-related vegetation management activities in the Parkway from the confluence of the Sacramento River and American River to Watt Avenue. Though Sacramento City Fire does not have a CWPP, its Fire Prevention Division conducts fire prevention activities, including vegetation management, in the Parkway (Sacramento City Fire 2017).

Regional Parks relies on Metro Fire and Sacramento City Fire not only to extinguish fires in the Parkway, but also as a partner in reducing fuels, maintaining existing fire breaks, rehabilitating burn areas, and conducting prescribed burns. Regional Parks' 2018 Fire Fuel Reduction Action Plan includes prescribed burns in partnership with both Metro Fire and Sacramento City Fire (Regional Parks 2020). Metro Fire's CWPP identifies and maps planned fire fuel and risk reduction projects, including prescribed burn areas, fuel reduction maintenance, burn area rehabilitation, sprinkler system updates, fire break management, and access route improvements in the Parkway.

4.6.4 Parkway Wildland Fire History

Wildland fire history in the Parkway can be categorized into pre- and post-human periods. Prior to prehistoric human settlement of the Sacramento Valley, native grassland, riparian, and woodland ecosystem types most likely burned naturally according to ecosystem and location-specific FRI (Nunamaker et al. 2007). Nearly 10,000 years ago, indigenous peoples' burning practices began to impact the natural fire regime of the area. Many indigenous groups used fire to increase the production of specific plants for food, basket-making, and rope-making, as well as to reduce understory vegetation fuel loads to prevent large, destructive fires (Anderson and Moratto 1996). USFS notes the California Dry Steppe's (in which the Sacramento Valley is located) historical fire regime changed again beginning with early European settlement: "Historic occurrence of fire has changed from frequent, fast-moving fires to infrequent small fires, or fire has been mostly excluded because of conversion to irrigated agriculture and urban uses" (USFS Pacific Southwest Region 2020).

In 1998, County natural resources staff began maintaining annual records of wildland fire in the Parkway. Data was collected by a variety of sources, including County natural resources staff (1998 – 2008), Regional Parks rangers' 311 reports (2016 and 2017), and Sacramento City Fire and Metro Fire (2018). Several notable issues exist with the data. First, there is inconsistency in the details included in annual records, likely because different entities that contributed the data do not report wildland fire data in the same way. In addition, records from the Regional Parks rangers may be incomplete in cases where Sacramento City Fire and Metro Fire responded to Parkway fires but did not contact a Parkway ranger.

Despite the noted issues with the data, when analyzed as a whole, the records illustrate several potential patterns in the Parkway's recent wildland fire history. Wildland fires in the Parkway have impacted mostly wildland vegetation (grasses and shrubs in particular). The majority of wildland fires in the Parkway have occurred in the Discovery Park, Woodlake, Cal Expo, Rossmoor Bar, and River Bend Park Areas. Finally, most wildland fires in the Parkway can be attributed to human activity, though the type of human activity is not always known. Human activity known to have caused wildland fires in the Parkway includes accidental fires started by campfires, arson, and embers travelling from other fires in the Sacramento area.

Figure 4-8 Wildfire shows the locations of wildfires and controlled and training burns in the Parkway from 1998 – 2015, and the portions of the Parkway and surrounding lands designated as WUI by Metro Fire and Sacramento City Fire.

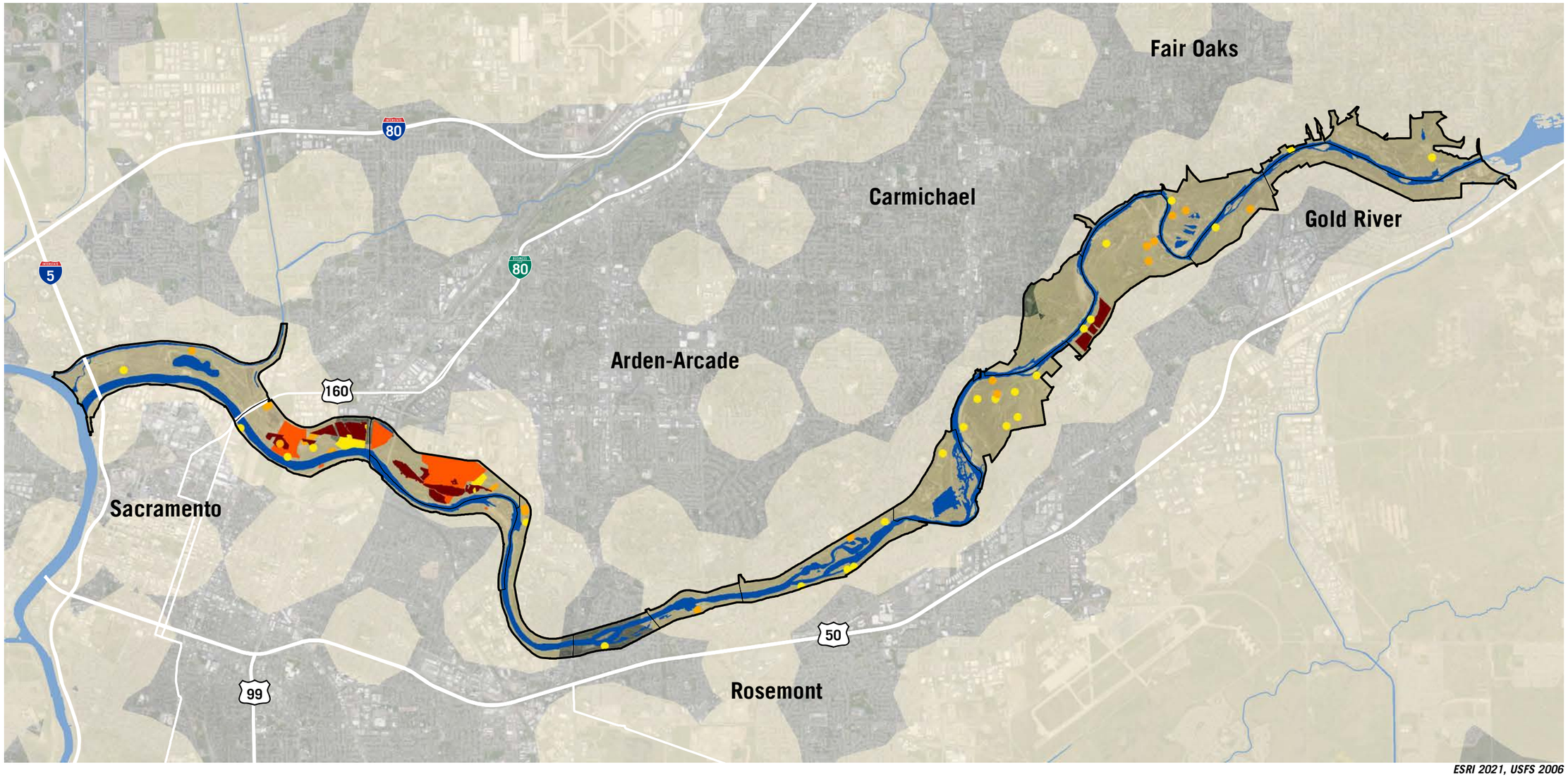


Figure 4-8
Wildfire